Honeywell

ENERGY SAVINGS PLAN

Prepared for:

North Hunterdon-Voorhees Regional High School District Board of Education

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Electronic Copy

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Executive Summary and Overview

Honeywell is pleased to submit an energy savings plan for the North Hunterdon - Voorhees Regional High School District in response to the RFP issued on November 12, 2009.

Based on Honeywell's extensive experience in working with school districts, we are confident that we will be able to deliver a financially viable, comprehensive solution for your buildings that will address existing facility concerns. Our plan will encompass projects that achieve both energy and operational efficiencies and create a more comfortable and safe environment via an actionable Energy Savings Improvement Program (ESIP) in accordance with NJ PL2009, c.4.

The Energy Savings Plan is the core of the ESIP process. It describes the energy conservation measures that are planned and the cost calculations that support how the plan will pay for itself in reduced energy costs. Under the law, the ESP must address the following elements:

- ❖ The results of the energy audit;
- ❖ A description of the energy conservation measures that will comprise the program;
- ❖ An estimate of greenhouse gas reductions resulting from those energy savings;
- ❖ Identification of all design and compliance issues and identification of who will provide these services;
- ❖ An assessment of risks involved in the successful implementation of the plan;
- ❖ Identify the eligibility for, and costs and revenues associated with the PJM Independent System Operator for demand response and curtail able service activities;
- ❖ Schedules showing calculations of all costs of implementing the proposed energy conservation measures and the projected energy savings;
- ❖ Maintenance requirements necessary to ensure continued energy savings, and describe how they will be provided; and
- ❖ If developed by an ESCO, a description of, and cost estimates of a proposed energy savings guarantee.

It is the intent of this document to provide all the required information for the North Hunterdon - Voorhees Regional High School District to determine the next steps in implementing an Energy Saving Improvement Program (ESIP) throughout the districts' buildings. The next step is to develop a specific agreement authorizing Honeywell to proceed with an implementation program that meets the requirements of the law and of your RFP. The ECM's selected by the School District will serve as the basis of that agreement and may be of any combination of projects outlined in this plan so long as they pay for themselves in accordance with PL2009, C.4.

Our Energy Savings Plan is organized to clearly define compliance with the law in a structure that provides for an informed decision in selecting ECM's, as well as projecting costs, savings and green house reductions.

A- Independent Energy Audit – This section includes as reference to the independent energy audit (Appendix I) as previously received by the board in October of 2009. The entire audit is included as Appendix I and a comparison can be made of the Energy Conservation Measures (ECM's) outlined in that audit to the additional ECM's described in the overall Energy Saving Plan (ESP). As a mater of comparison, the original audit identified 6 ECM's and the overall ESP is comprised of 28 potential ECM's for consideration into a final implementation program.

The remainder of this section includes a baseline preliminary utility analysis (PUA) which is an overview of the current usage within the district and a cost per square foot by school for utility expenses. This report clearly defines the current expenses for the School District and compares it to the costs of other school districts in the region as a benchmark. Within this benchmarking process, we have identified that the schools have between 145 and 167 Energy Use Intensity (EUI) rating. This rating indicates that the schools energy use falls below the regional mean standard for energy efficiency and consumption. This means there is plenty of room for improvement within the plan we have outlined for the District.

B- Identified Energy Conservation Measures – This section includes a more detailed description of the ECM's we have selected and identified for your District. It is specific by school, scope, savings methodology and environmental impact. It is intended to provide an overview of the projects and not detailed specifications for construction. It identifies ALL potential ECM's for the District for the purposes of inclusion in the program. Final selected ECM's are to be determined by the School District in conjunction with Honeywell during the Project Development Phase of the ESIP process.

C-Financial Analysis – This section spells out the financial impact of each ECM in simple payback terms without financing costs and in accordance with PL2009, c.4.

In addition to the first spreadsheet that outlines ALL ECM's considered, we have identified several recommendations available for the School District for consideration in the Project Development Phase with simple payback and SAMPLE cash flow outlines.

Scenario A – This scenario will not meet the requirements of the 15 year term in accordance with PL 2009, C.4.

For information purposes only, this scenario is a consideration for all projects recommended with the input of State Aid as outlined in the referendum projects recently identified by the board of education. It also outlines all potential projects now and in the future should financial conditions and/or technologies change to make these ECM's financially acceptable. This scenario may accomplish many of the aspects of the Referendum if the money from the State is provided to subsidize a portion of these ECM's. The State Aid would significantly improve the cash flow of all projects. However, solar projects of the size outlined in the independent energy audit are not possible without the replacement of the roof in its current condition. A smaller solar project would be possible along with the rest of the projects outlined under scenario's B and C.

Scenario B – Is a consideration for doing as many projects as possible without the State Aid and stay in compliance with the law. If the State Aid is applicable, the ROI only improves. This scenario will also allow the school district to complete several projects outlined in the referendum projects for both schools. Under this scenario, the conversion from electric to gas, the cooling of the 1968 wing of the North Hunterdon HS may still be accomplished. Additionally, the Air Handling Units at Voorhees HS will be completely refurbished or replaced as outlined in the referendum projects.

Scenario C – Is a consideration of a project that allows the District to complete many of the same projects outlined in scenario B without the conversion to gas in the 1968 wing. The only significant difference for the board, is that the ROI is so positive on this project, that it may be completed in less than a 15 year agreement and therefore save additional interest charges on the overall project by shortening the term of the agreement

With these options available, the school district has a very good opportunity to implement a program that can pay for itself within the requirements of the law while upgrading your facilities with zero impact on your taxpayer base.

D- Energy Calculations and Greenhouse Gas reduction summary – This section includes all the required energy calculations to ensure compliance with the law and to confirm the energy savings can and will be achieved. These calculations are in fact subject to an independent 3rd party engineering firm review for verification.

A summary of all savings include a **reduction in 5.3 Million kWh** (kilowatt hours of electricity), almost **119,750,000Therms** (Gas) and **3895 Tons of Green house Gas (GHG) emissions**. It is the equivalent of removing **680 cars** from the road for an entire year and is the same as planting **410 acres of forest**.

E- M&V/Project Management Summary – This section includes all available methods of verification and measurement of calculating energy savings. These methods are compliant with the International Measurement and Verification protocols as well as other protocols previously approved by the Board of Public Utilities in New Jersey.

F- Design Approach – This section includes a summary Honeywell's best practices in the successful implementation of an ESIP project. It provides an overview of our project management procedure, construction management and a sample time frame for the overall completion of the project. Within the sample schedule, we clearly define the stage designated for compliance with architectural, engineering and bidding procedures in accordance to New Jersey Public contracts law.

We welcome this opportunity to partner with your district in the improved operation and efficiency of your facilities with the successful implementation of this energy savings plan.

Sincerely,

Joseph J. Coscia
Account Executive
Honeywell International

Audit Reports
Section A

- Preliminary Utility Analysis

Honeywell

Honeywell Energy Analysis Team (HEAT)

Preliminary Utility Analysis

North Hunterdon Voorhees BOE
Annandale, NJ

Helping customers manage energy resources to improve financial performance

North Hunterdon Voorhees BOE

2009 Baseline Summary

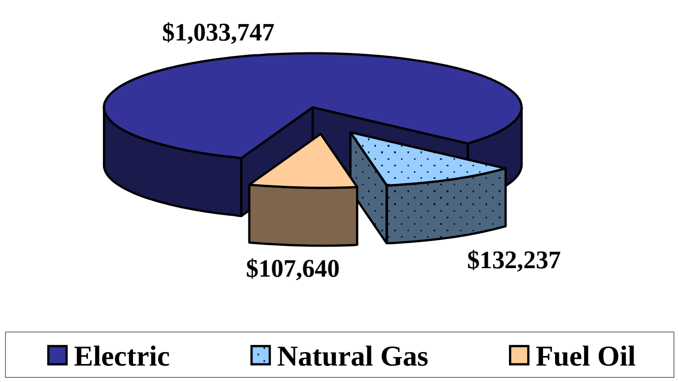
	January 2009 - December 2009			January 2008 - December 2008		
	Electric	**Natural Gas**	**Fuel Oil**	**Electric**	**Natural Gas**	**Fuel Oil**
Utility Costs*	$1,033,747	$132,237	$107,640	$1,085,244	$163,511	$167,458
Utility Usage (kWh, Therm, Gal)	6,537,084	117,821	59,497	6,918,487	120,254	70,342
$ Cost/Unit (kWh, Therm, Gal)	$0.158	$1.12	$1.81	$0.157	$1.36	$2.38
Electric Demand (kW)	18,979			19,128		

Current Yr vs. Prior Yr	**Electric**	**Natural Gas**	**Fuel Oil**
Change in Cost	-5%	-19%	-36%
Change in Usage	-6%	-2%	-15%
Change in $ Cost/Unit	1%	-17%	-24%
Change in Electric Demand	-1%		

Optimum use of facility will keep usage down and help reduce costs

* Costs include energy and demand components, as well as taxes, surcharges, etc.

Actual Cost by Utility - Current Year



Energy Benchmarking

The calculation of EUI (Energy Use Intensity) is shown below. EUI, expressed in kBtu/sf, is normalized for floor area, the most dominant influence on energy use in most buildings. Its use usually provides a good approximation of how your building's energy performance compares to others. Site EUI indicates the rate at which energy is used at your building (the point of use). Source EUI indicates the rate at which energy is used at the generation sources serving your building (the point of source) and indicates the societal energy penalty due to your building The lower the EUI, the higher the rating, indicating that the building is more efficient than other buildings. The greater the EUI, the lower the rating, indicating that there is an opportunity for higher potential benefits from operational improvements.

To compare the buildings shown below to each other, and to determine the ranking of the buildings from having the most to the least opportunity for demand-side improvements from a financial perspective, please see the Site EUI ranking below.

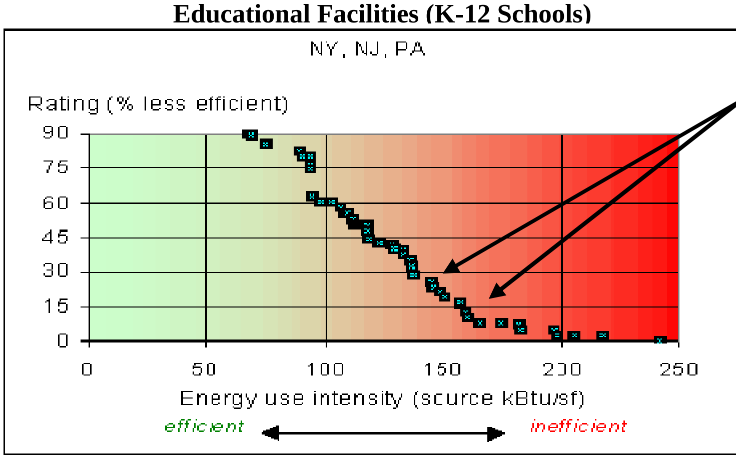
The Source EUI below has been applied to a Department of Energy statistical model from the Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark. The Department of Energy has estimated energy use and cost reductions for building source EUI ratings (percentiles) in the table below. Please see the DOE Regional Source EUI Comparison graph below to rate your building in relation to the regional distribution of similar type buildings. (Note: The Source EUI includes the inefficiencies of electrical generation and transmission. A reduction in 'electrical' source EUI includes a benefit in terms of reduction of air pollution emissions and green house gases, and is thus an indicator of societal benefit.)

Source EUI Rating for your Building	Energy use and cost reduction potential (%)	Walk-thru energy assessment recommended?
above 60%	**below 25%**	**No**
40 to 60%	**20 to 35%**	**Maybe**
20 to 40%	**35 to 50%**	**Yes**
Below 20%	**above 50%**	**Definitely**

Current year consumption

Site EUI Rank	Building	Annual Total Electrical Use (kWh)	Annual Total Non-Electrical Fuel Use (Therms, gallons)	Building Gross Floor Area (sq-ft)	Site EUI Rating	Source EUI: Annual Total Source Energy Use per Sq-Ft (kBtu/sf)	Rating (Regional Source EUI Comparison)
1	North Hunterdon High	3,462,810	117,821	284,219	**83**	**167**	**10%**
2	Voorees High	3,074,274	59,497	276,312	**68**	**145**	**28%**

Educational Facilities (K-12 Schools)

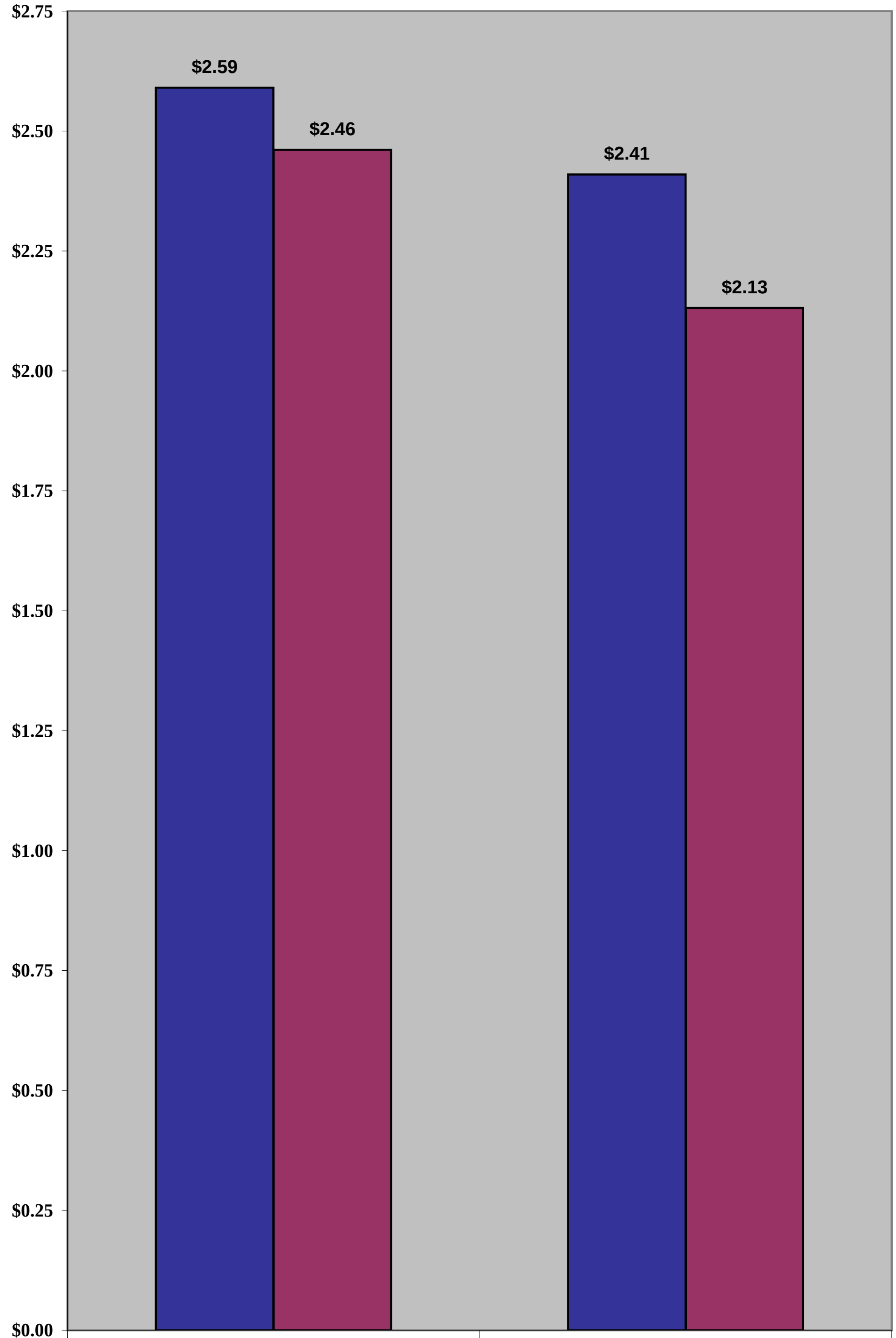


Source EUI	Est Regional Rating	Building
167	10%	North Hunterdon High
145	28%	Voorees High

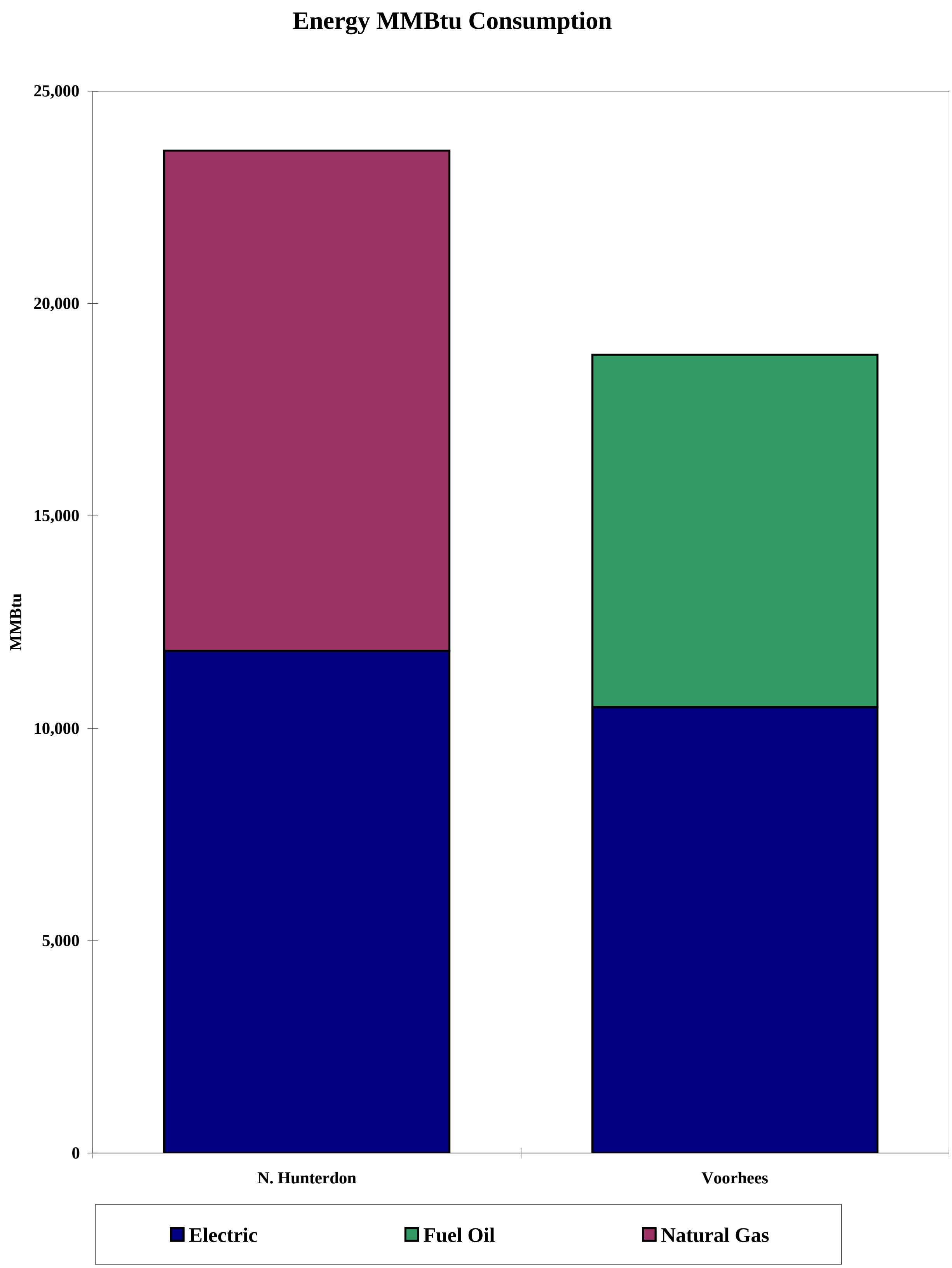
Source: Oak Ridge National Laboratory web site, http://eber.ed.ornl.gov/benchmark

Cost Per Square Foot Comparison

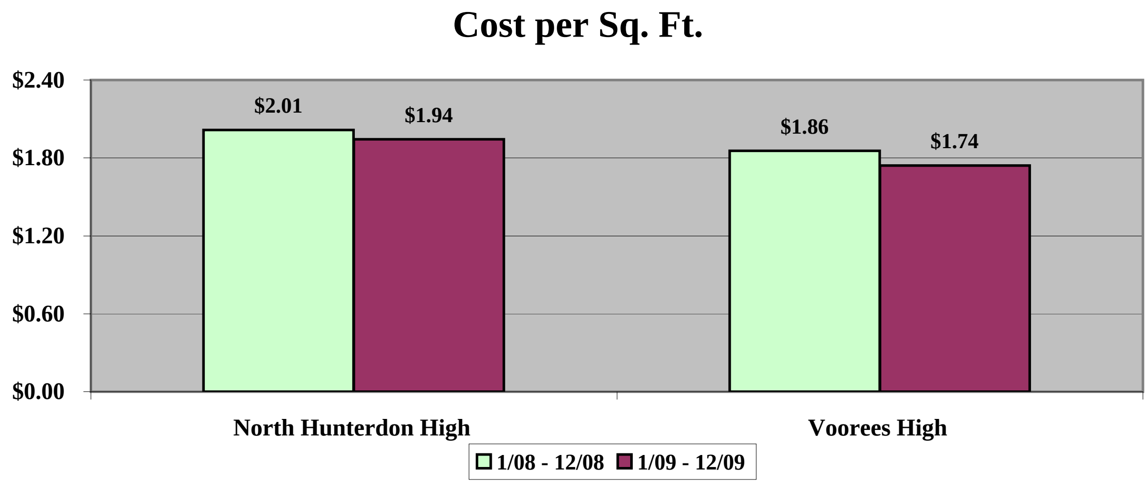
Electic, Natural Gas and Fuel Oil Costs Combined

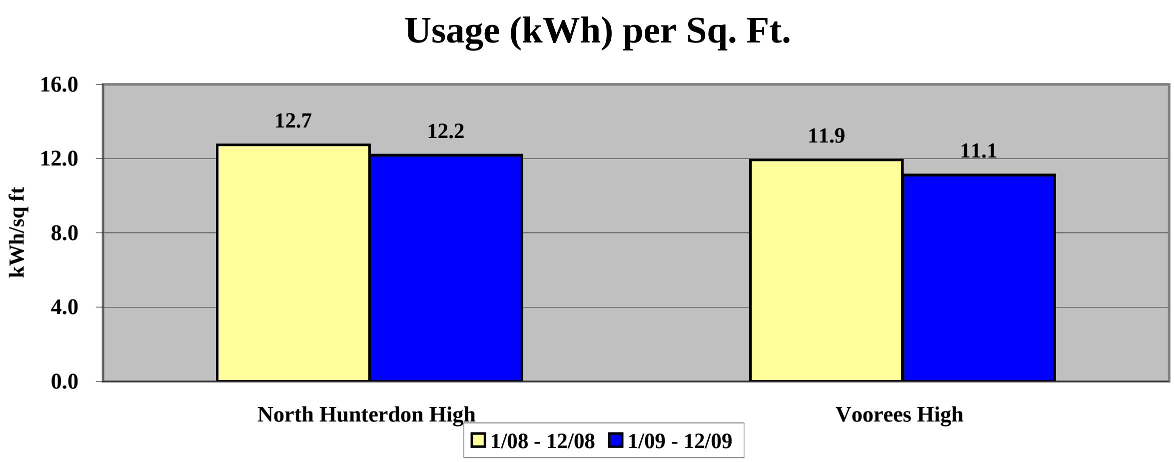


	1/08 - 12/08	1/09 - 12/09
North Hunterdon High	$2.59	$2.41
Voorees High	$2.46	$2.13

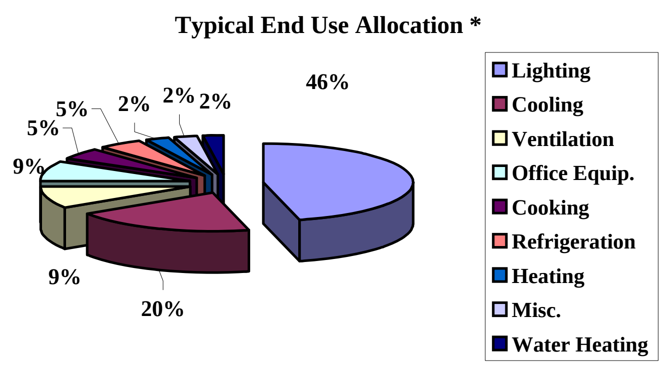

Energy MMBtu Consumption
MMBtu
25,000
20,000
15,000
10,000
5,000
0
N. Hunterdon
Voorhees
Electric
Fuel Oil
Natural Gas

Utility Analysis - Electric





Sources of Electric Consumption



Typical Allocation Applied to Your Electric Cost**

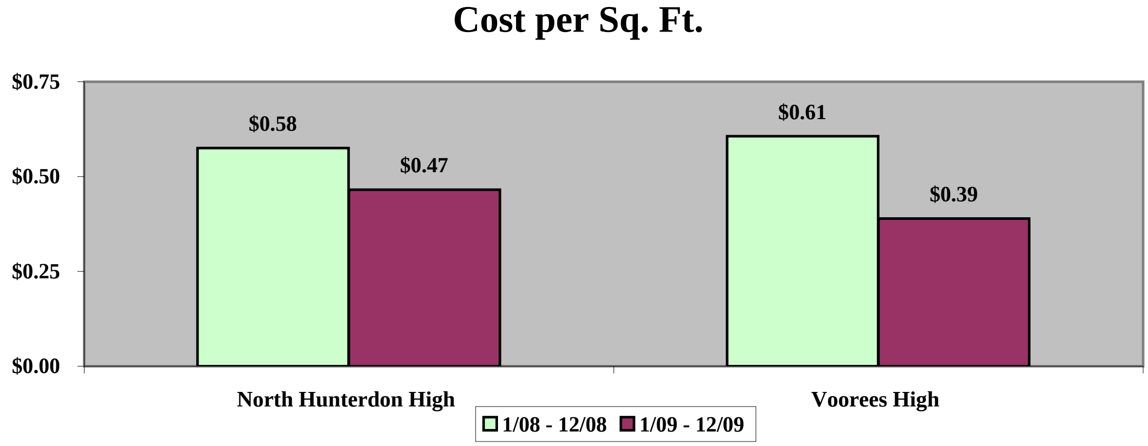
Lighting	$478,625
Cooling	$202,614
Ventilation	$95,105
Office Equip.	$88,902
Cooking	$48,586
Refrigeration	$48,586
Heating	$25,844
Misc.	$25,844
Water Heating	$22,742
Your 2009 Total Cost	**$1,033,747**

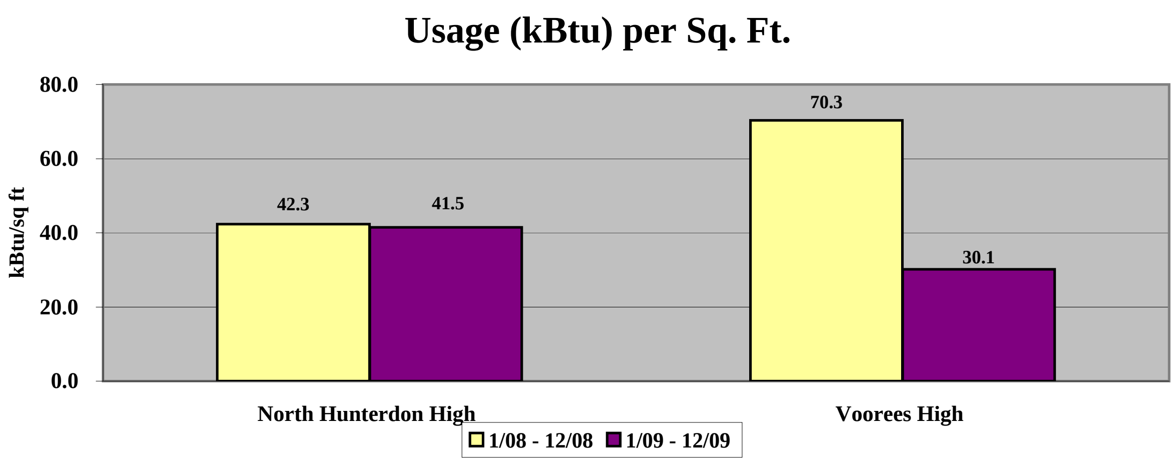
**This allocation is generic and is not a representation of the actual end use in your buildings included in this report.

*Source: Nashville Gas Commercial Benchmark Data by Business Segment (Schools) and Climate Zone (Central)

Utility Analysis - Heating

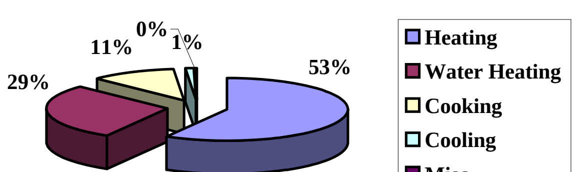
Usage per square foot has stayed fairly steady over the past year for all schools except Gardiner Manor, which has increaased significantly. Note: Fuel oil amounts represent deliveries, which may not reflect actual oil usage.





Sources of Natural Gas/Fuel Oil Usage

Typical End Use Allocation *



Typical Allocation Applied to Your Gas/Oil Cost**

Heating	$139,848
Water Heating	$69,324
Cooking	$27,346
Cooling	$2,639
Misc.	$720
Your 2009 Total Cost	**$239,877**

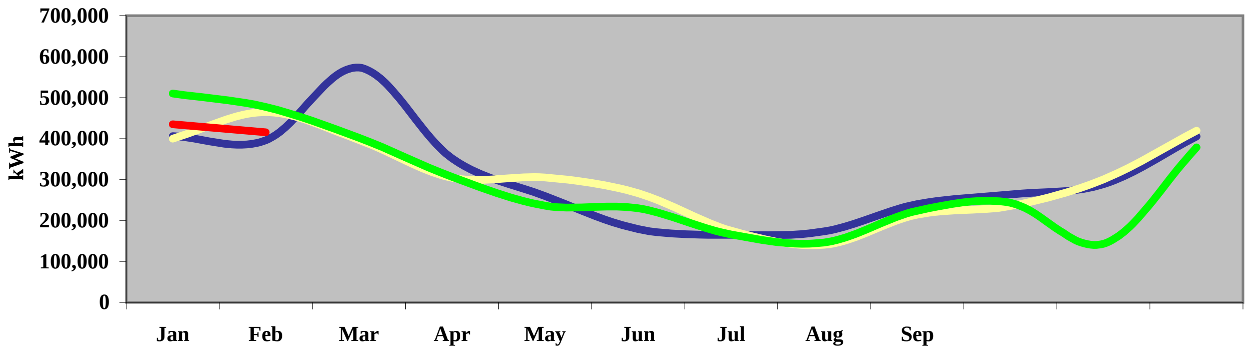
**This allocation is generic and is not a representation of the actual end use in your buildings included in this report.

*Source: Nashville Gas Commercial Benchmark Data by Business Segment (Schools) and Climate Zone (Central)

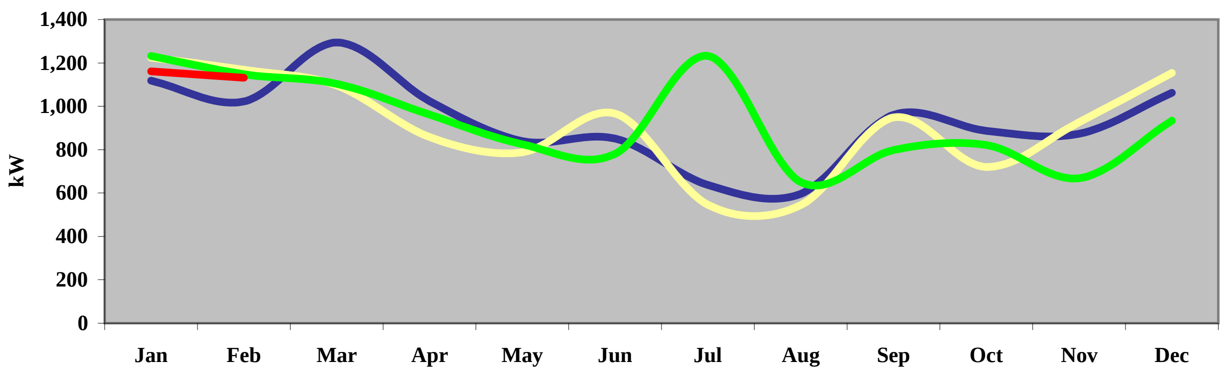
Usage Comparison

North Hunterdon High School

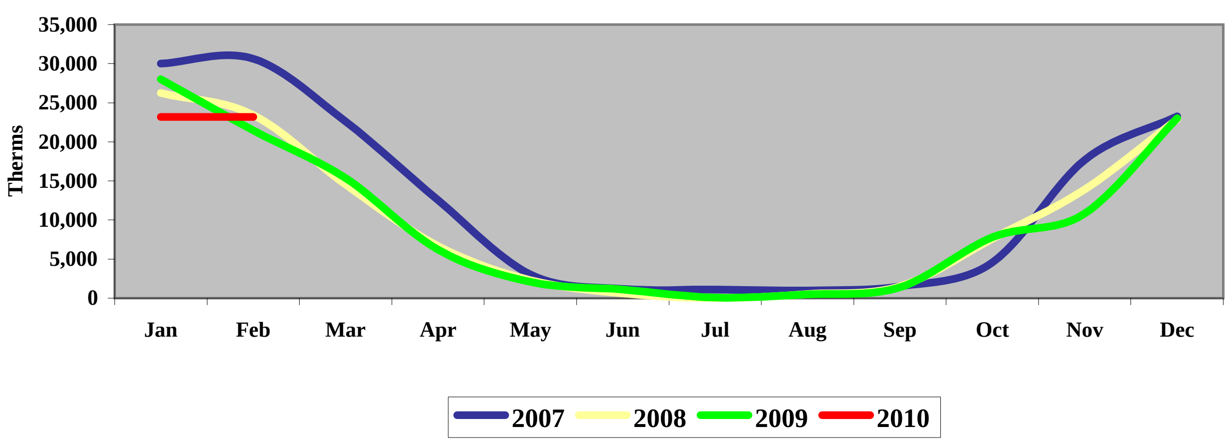
Electric Usage Detail



Electric Demand Detail



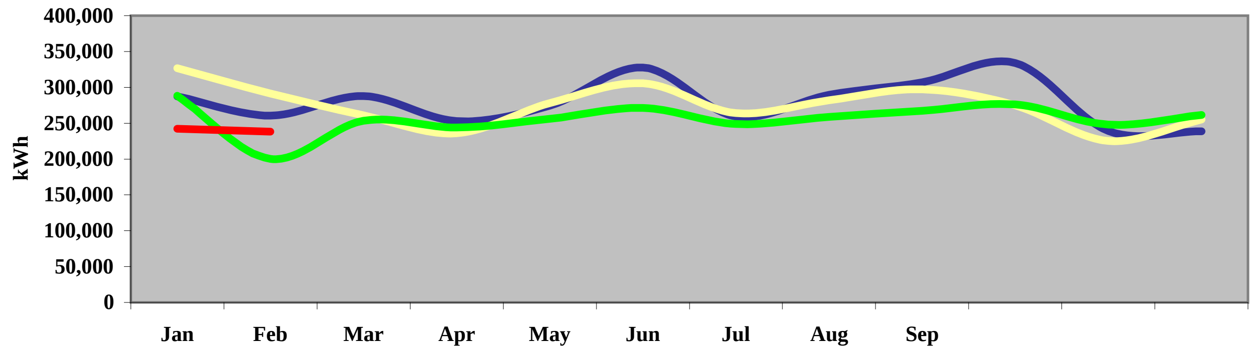
Natural Gas Usage Detail (HEAT)



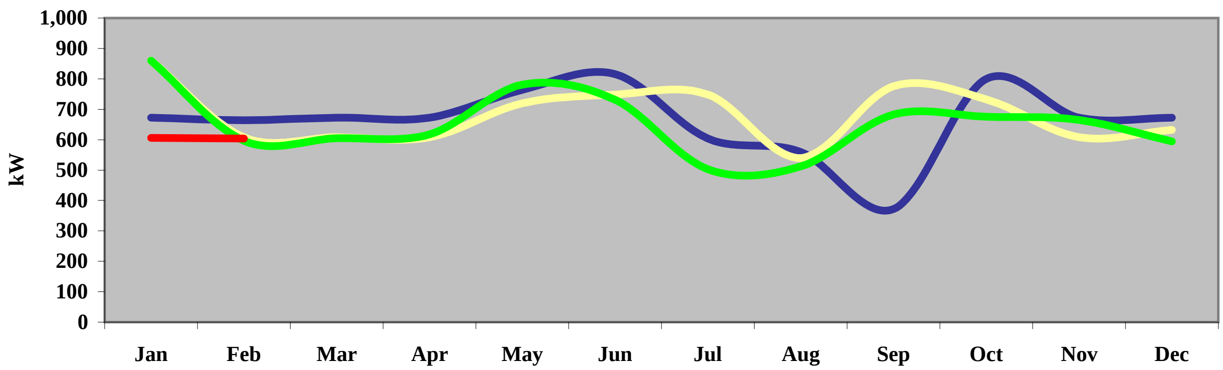
Usage Comparison

Voorhees High School

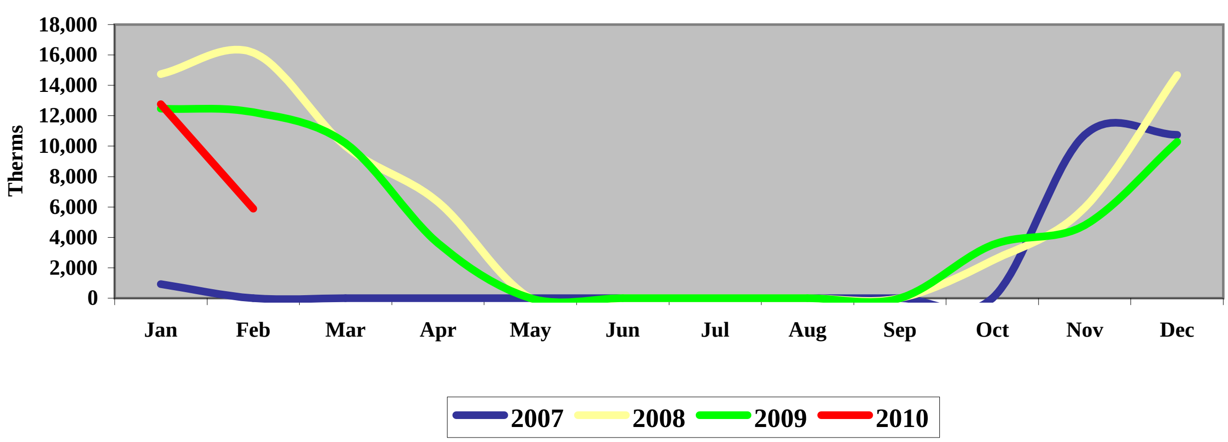
Electric Usage Detail



Electric Demand Detail



Fuel Oil Purchases Detail (HEAT)



INTRODUCTION

The information used to develop this Section was obtained through building surveys to collect equipment information, interviews with operators and end users, and an understanding of the components to the systems at the sites. The information obtained includes nameplate data, equipment age, condition, the system's design and actual load, operational practices and schedules, and operations and maintenance history. Honeywell has done a review of the ECM's which would provide energy and cost savings to the Voorhees and North Hunterdon High School facilities. This report aims to be an assessment of the feasibility and cost effectiveness of such measures, and an indication of the potential for their implementation.

The measures are listed below, as well as a general description of the energy auditing process. More detailed descriptions are also included.

Energy Conservation Measures:

ECM 1A	Lighting Retrofit and Motion Sensors
ECM 1B	Vending Misers
ECM 2A	New Burner Controllers
ECM 2B	DHW Heater Replacement
ECM 2C	AHU Replacements
ECM 2D	Converting Heating System from Electric to Gas
ECM 2E	Non Chemical Water Treatment
ECM 2F	RTU Replacements
ECM 3A	Building Management System Upgrades
ECM 3B	Demand Control Ventilation
ECM 3C	Chiller Replacement
ECM 4A	AHU Refurbishments
ECM 5A	Building Envelope Improvements
ECM 6A	Computer Controllers
ECM 7A	Transformer Replacements
ECM 7B	Install Premium Efficient Motors
ECM 7C	Variable Speed Drives on Pump Motors
ECM 8A	Install Photovoltaic Systems
ECM 8B	Wind Power
ECM 8C	Geothermal
ECM 9A	Steam Traps Repair
ECM 10A	Kitchen Hood Controllers
ECM 10B	Walk-In Freezer Controllers
ECM 10C	Kitchen Pre Rinse Sprayer
ECM 11A	Demand Response
ECM 12A	Water Conservation
ECM 12B	Roof Replacements

ECM	ECM Description	North Hunterdon HS	Voorhees HS
1A	Lighting Retrofit and Motion Sensors	✓	✓
1B	Vending Misers	✓	✓
2A	New Boiler Burner Controllers	✓	✓
2B	DHW Heater Replacements		✓
2C	AHU Replacements		✓
2D	Converting Heating System from Electric to Gas	✓	
2E	Non Chemical Water Treatment		✓
2F	RTU Replacements	✓	
3A	Building Management System Upgrades	✓	✓
3B	Demand Control Ventilation	✓	✓
3C	Chiller Replacement	✓	
4A	Convert Constant Volume Multi-Zone Units to VVT		✓
5A	Building Envelope Improvements	✓	✓
6A	Computer Controllers	✓	✓
7A	Transformer Replacements	✓	✓
7B	Install Premium Efficient Motors		✓
7C	Variable Speed Drives on Pump Motors		✓
8A	Install Photovoltaic Systems	✓	✓
8B	Wind Power	✓	✓
8C	Geothermal	✓	✓
9A	Steam Trap Repair	✓	
10A	Kitchen Hood Controllers	✓	✓
10B	Walk-In Freezer and Cooler Controllers	✓	✓
10C	Kitchen Pre Rinse Sprayer	✓	✓
11A	Demand Response	✓	✓
12A	Water Conservation	✓	
12B	Roof Replacements	✓	✓

Overview

Honeywell's staff has closely evaluated and audited the Voorhees and North Hunterdon High Schools facilities in order to develop the optimum mix of utility saving measures. These selected site-specific measures have been developed using the following process:

- Review Site Audits
- Engineering Team Site Visits
- Develop Measures
- Review Measures with Team

Reject and Accept Measures Based On:

1. Alignment with Critical Success Factors (CSF)
2. Value to the District
3. Economic Financial Payback
4. Equipment Service Life
5. Effect on Current Space Conditions

In developing the proposed measures, the following considerations were critical:

- Reduction of space heating and cooling loads by performing a systems review, with complete consideration of current indoor environmental quality standards.
- Review and redesign lighting systems noting reductions in the internal heat gain in the affected spaces.
- Load reduction measures always precede optimization measures.

The following project goals, as called for in the RFP, were also critical in the development of our RFP response:

- Automated heating and cooling controls with web based management
- High efficiency boilers and water heaters
- Lighting upgrades to high efficiency fluorescents
- Window replacements
- Air Handler replacements and controls
- Alternative energy systems
- Energy usage monitoring
- Energy Education, LEED, Energy Star Process

Bin weather data was used from a 15 year average reported from Newark Liberty International Airport, Newark, NJ. Assumptions for ventilation rates were predicted by using the building's population multiplied by 15cfm/person during occupied hours.

Reasonable infiltration rates were assumed based on the building's fenestration conditions and expected values for typical school buildings. A reduced infiltration rate was assumed for the unoccupied hours. Envelope heat loss calculations assumed a reasonable heat transmission rate (U value) based on the construction of the buildings. Wall area and glass area were estimated by supplied drawings and field photographs.

Current efficiencies were derived from assumed and later to be measured boiler efficiencies, and assumed system losses due to thermal losses, distribution losses and loose operational control. The current assumed boiler system efficiencies were then applied to the calculated load and calibrated to last year's actual fuel consumption.

Demand Sensitive Operation

Review existing and proposed thermal loads. For example, the review process will facilitate the application of:

1. Optimized flow rates (steam, water, and air)
2. Optimized operation of equipment, matching current occupancy use profiles and considering both outside and indoor space temperatures.

Benefits of Mechanical Improvements

Listed below are some of the benefits that the District would reap from the mechanical portion of the measures:

1. Avoid costly repairs and replace equipment that would have to be replaced in the next five years.
2. Improved compliance with ASHRAE Ventilation Standards.
3. Ability to trend ventilation rates; thus, insuring compliance through documentation.
4. Operating a more weather sensitive facility.
5. Allowing for a greater capability of central monitoring and trouble shooting via remote.
6. Greater operating flexibility.

Indoor Air Quality

Implementation of new energy-related standards and practices has contributed to a degradation of indoor air quality. In fact, the quality of indoor air has been found to exceed the Environmental Protection Agency (EPA) standards for outdoor air in many homes, businesses, and factories.

The American Council of Governmental Industrial Hygienists (ACGIH) in their booklet "Threshold Limit Values," has published air quality standards for the industrial environment. No such standards currently exist for the residential, commercial, and institutional environments, although the ACGIH standards are typically and perhaps inappropriately used. The EPA has been working to develop residential and commercial standards for quite some time.

Recent studies indicate that for even the healthiest students, indoor air pollution can reduce the ability to learn. As an example, if you were to place a number of students in a room where it's hot, there's little or no air circulation and other children are coughing and sneezing, their ability to concentrate drops significantly. Honeywell has addressed this issue by focusing on the proper operation and replacement of the unit ventilators and air handler equipment which will assure IAQ standards are met.

ECM 1A
Lighting Retrofit and Motion Sensors

Existing Conditions

Currently, there is mainly F32/T8, F34/T12 and F96T12HO fixtures in this project. We recommend the installation of the latest technology electronic T8 ballasts and **F32/T8 28-watt lamps** in the majority of the fixtures. Low power ballasts will be used whenever possible, to save more energy without compromising light levels. The existing lighting fixtures through the facilities appear to be the original equipment to the buildings, with the exception of a few renovated areas. The lenses for many of the 2' x 4' & 2' x 2' recessed fixtures in the hallways have since discolored. These lenses are considered light restrictive and replacement of these lenses to a clear flat prismatic acrylic lens is recommended.

Proposed Solution

Voorhees High School

- Gym - All HID fixtures in all gyms will be replaced with new T5 HO fixtures.
- Classrooms - The 2F96T8 pendant mounted fixtures will be replaced with new surface T8 32-watt lamp/electronic ballast wrap fixtures in the classrooms.
  - The 2 light and 4 light fixtures in the classrooms will be re-lamped and re-ballasted using T8 28-watt lamps and electronic ballasts.
  - Occupancy sensors will be installed in many classrooms.

- Offices - The 2 light and 4 light fixtures in the offices will be re-lamped and re-ballasted with T8 lamps and electronic ballasts.
  - The 2F96T8 pendant mounted fixtures will be replaced with new surface wrap fixtures in the offices.
  - Occupancy sensors will be installed in some offices.

- Stairwell - Many surface wrap fixtures in the stairwells will be replaced with new surface wrap fixtures.
  - The 2'x2' recessed biax fixtures in the stairwells will not included in our lighting upgrade proposing, however, we will be replacing the lenses.
  - The 2'x4' recessed fixtures will be retrofitted with T8 lamps and electronic ballasts.
  - The wall mounted fixtures will be retrofitted with T8 lamps and electronic ballasts.

- Auditorium - The 250 watt halogen lamps will not be retrofitted in the auditorium. HID fixtures on stage will be replaced with new T5 HO fixtures.
  - The wall mounted 4' T8 fixtures will be retrofit with T8 28-watt lamps & electronic ballast.

- Exterior: - Some of the wall mounted fixtures will be replaced with new wallpack equipped 42-watt compact fluorescent fixtures.
  - The Para floods mounted on ground and on wall will not be included in our proposal.

North Hunterdon High School

- Gym: Old Girl's Gym High Bay Metal Halide will be replaced with T5HO fixtures.
- Old Boy's Gym High Bay Metal Halide will be replaced with T5HO fixtures. Wrestling Room recessed HID's & incandescents will be replaced with T5HO fixtures.
- New Gym (2003) (filming done here) has 6-lamp 42w CFL's per high bay fixture. We will not address these fixtures.
- Boy's locker room has destroyed/vandalized ceiling tiles & fixtures. Recessed 3 lamp fixtures will be retrofit with 2 lamp 28-watt lamps (existing center lamp is mounted over ballast cover).
- Classrooms: Recessed parabolic & pendant uplight fixtures will be re-lamped & re-ballasted with 28-watt lamps & electronic ballasts in the classrooms. Many old surface wrap fixtures in prep rooms will be replaced with new surface wrap fixtures with reduced lamps & HI output electronic ballasts.
- Hallways/Stairs: Recessed parabolic fixtures will be re-lamped & re-ballasted with 28-watt lamps & electronic ballasts in the halls.
  - Older surface wrap fixtures will be replaced with new surface wrap fixtures in the halls. Recessed fixtures will be re-lamped & re-ballasted with 28-watt lamps & electronic ballasts in the stairs.
  - Older surface wrap fixtures will be replaced with new surface wrap fixtures in the stairs. Older/deteriorating wall mounted fixtures will be replaced with new wall mounted fixtures with T8 28-watt lamps & electronic ballasts.
- Exterior: New Metal Halide wallpacks will replace older/yellow wallpacks. CFL wallpacks will replace older wallpacks at entry doors.

Changes in Infrastructure

New lamps and ballasts will be installed as part of this ECM.

Customer Support and Coordination with Utilities

Coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced electric energy usage. A slight increase in heating energy is resultant from the reduced heat output of more efficient lamps.
Waste Production	All lamps and ballasts that are removed will be properly disposed.
Environmental Regulations	No environmental impact is expected.

ECM 1B
Vending Misers

The Voorhees and North Hunterdon High School facilities have plug loads, such as vending machines. As such, Honeywell has investigated the use of plug controllers for these areas.

Existing Conditions

Vending machines are located throughout the facilities, offering soft drinks to the occupants. A typical cold drink machine consumes over 3,000 kWh annually.

Item	Building	Type	Quantity
1	Voorhees High School	Cold Drinks Machines	11
2	Voorhees High School	Snack Machines	3
3	North Hunterdon High School	Cold Drinks Machines	11
4	North Hunterdon High School	Snack Machines	4

Proposed Solution

During the site visit, Honeywell noted vending machines providing the opportunity for energy savings by shutting off non-critical loads during the non-occupied periods.

To control the vending machines, Honeywell proposes to install a vending machine occupancy controller (VMOC) to manage the power consumption. Utilizing a Passive Infrared (PIR) Sensor, the VMOC completely powers down a vending machine when the area surrounding it is unoccupied. Once powered down, the VMOC will monitor the room's temperature and use this information to automatically re-power the vending machine at one to three hour intervals, independent of occupancy, to ensure that the vended product stays cold.

The VMOC also monitors electrical current used by the vending machine. This ensures that the unit will never power down a vending machine while the compressor is running, so a high head pressure start never occurs. In addition, the current sensor ensures that every time the vending machine is powered up, the cooling cycle is run to completion before again powering down the vending machine. The Coca Cola Company and Pepsi Corporation approve the proposed controller for use on their machines.

- Using state-of-the-art electronics, VendingMiser is able to automatically determine whether or not the compressor of the vending machine is operating. Therefore, VendingMiser will never short cycle the compressor.
- The VendingMiser uses a custom occupancy sensor to determine if there is anyone within 40 feet of the machine. VendingMiser waits for 15 minutes of vacancy and then completely powers off the vending machine. If the compressor is running, power down is delayed until the cycle-in-process is completed.
- Once powered off, VendingMiser will monitor the room's temperature, and based on this measurement will automatically re-power the vending machine to run a complete cooling cycle, and then powers it down again.
- If a customer approaches the vending machine while powered down, VendingMiser will sense the person's presence and power up immediately.

Interface with Existing Equipment

All of the plug load control devices are easily installed. The vending machine controllers are installed separately from the machine, and implementation will occur during working hours. A period of three (3) weeks will be required to make sure of proper calibration of the sensors.

With respect to the vending machines in your facilities, Honeywell has estimated the number and types of vending machines. During the implementation phase, Honeywell will check with the vendor about the type and specification of the vending machines as it relates to any internal time clocks which may exist inside the machine. Should this be the case, the savings and cost will be adjusted accordingly.

ECM 2A
New Boiler Burner Controllers

Existing Conditions

The information used in developing this Energy Conservation Measure (ECM) was obtained through interviews with building operators, conditions observed during visits to the buildings, manufacturer's technical literature for existing and new equipment, and data obtained through various technical publications.

Honeywell has evaluated both high school building's heating and domestic hot water equipment and distribution systems to identify areas for boiler plant optimization. The boilers at North Hunterdon HS (1950) boiler room No.2 have mechanical linkage to provide the air/fuel ration through the firing range. The old boilers at North Hunterdon and Voorhees HS are at the end of the useful life and will be replaced. The installation of new boilers will be provided by others.

Proposed Solution

Typically, boilers are sized to accommodate the coldest days (5% of a year). During these periods of maximum demand, the burner is constantly on and the boiler is operating at its maximum capacity. At all other times, the burner cycles on and off maintaining temperature or pressure in the boiler. It is during these periods of lesser demand, that the controller will learn the boiler make up rate, and efficiently manage the firing of the boiler.

The length of the burner's off-cycle is the best measure of total heating demand or load. In other words, the load is directly related to the time it takes for water (or steam) in the boiler to drop from its high-limit temperature (or pressure) to its low-limit or "call" setting. When demand is high, these off-cycles are short and the on-cycles are longer. When demand is lower, off-cycles are longer and on-cycles are reduced.

The device, which is a microprocessor based computer, constantly monitors the demand on the boiler by assimilating all factors affecting a buildings heating requirements, including occupancy, climate, wind chill, solar gain, type of building, and many others.

Most other energy saving devices only considers outdoor temperature. With this information, the controller then calculates the optimum time between off and on cycles, and controls burner ignitions accordingly. The Honeywell Controlinks controller reduces: fuel consumption, wear on parts, flue emissions, and electrical usage, when installed on any new or existing gas or oil burner.

Honeywell will retrofit the existing Burner Management System on the following Boilers with Honeywell Controlinks™ linkageless Fuel/Air Ratio Control system.

Honeywell Controlinks™ will integrate to the existing Burner Management Flame Safe Guard Controller (FSG) to monitor and control the burner fuel and air ratios to maintain proper combustion. The single actuator will be replaced with separate Direct Coupled Actuators (DCA) for Air and Fuel and will be connected to the existing Burner Control.

<u>Proposed Systems and Scope of Work</u>

Honeywell will retrofit the existing Burner Management System on the boilers listed below with Honeywell Controlinks™ linkageless Fuel/Air Ratio Control system.

Honeywell Controlinks™ will integrate to the existing Burner Management Flame Safe Guard Controller (FSG) to monitor and control the burner fuel and air ratios to maintain proper combustion. The single actuator will be replaced with separate Direct Coupled Actuators (DCA) for Air and Fuel(s) and will be connected to the existing Burner Control.

This retrofit will provide independent combustion curves for each fuel type and will separate light-off points including minimum/maximum firing rate points resulting in a precise firing rate control over the entire firing rate of the burner.

Combustion efficiency will be maximized throughout the combustion curve and will provide two independent fuel curves, achieving maximum efficiency for both fuels when switching between oil and gas.

<u>Scope of Work, Honeywell Control Links Controllers</u>

Honeywell Controlinks controllers will be installed on the following boilers: .

Building	Boilers					
	Boiler Make	Boiler Model	Qty	Input	Burner Make	Burner Model
Voorhees High School	Burnham	V-1123	3	5,218 MBH	Power Flame	CR4-OA
North Hunterdon HS 1950	Burnham	V-1117	2	5,268 MBH	Power Flame	CR3-G-25
North Hunterdon HS 1957	Burnham	V-1121	3	4,186 MBH	Power Flame	CR3-G-25

Benefits

This retrofit will provide independent combustion curves for each fuel on dual fuel burner systems and will provide separate light-off points as well as minimum/maximum firing rate points resulting in a precise firing rate control over the entire firing rate of the burner.

Combustion efficiency will be maximized throughout the combustion curve and will provide two independent fuel curves, achieving maximum efficiency for both fuels when switching between oil and gas.

Energy Savings Methodology and Results

The savings approach is based upon reducing the amount of boiler on time without reducing the heating response time or system capacity in response to warmer periods of the year and when demand for heating is low or non-existent. The relative savings is based upon the ratio of off time to burn time and the magnitude can vary from 10% to 15%. Honeywell uses a conservative 8% reduction of the base year fuel input.

Changes in Infrastructure

A new controller for each boiler will be installed and programmed. In addition to the controllers, training for maintenance personnel will be required.

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. The following is an example of equipment that may be utilized. Honeywell and the customer will determine final selections.
Equipment Identification	As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from greater boiler load control.
Waste Production	This ECM will produce no waste by products.
Environmental Regulations	No environmental impact is expected.

Utility Interruptions

Steam and proper phasing of conversion procedure will minimize gas interruptions.

Agency Support Required

Agency support will be determined upon acceptance of final design.

Honeywell

ECM 2B

Domestic Hot Water Heater Replacements

Existing Conditions

Domestic Hot Water (DHW) heater at the Voorhees HS is an AERCO water-to-water heat exchanger that is using the HW of the boiler to heat up the cold water for the building use. The boiler has to run through the summer season just to provide DHW for the school. There are boiler standby losses every time the boiler is in operation.

Existing Domestic Hot Water Heater

School	EXISTING			
	Hot Water Heater	Qty	Model	Type
Voorhees High School	AERCO	1	WW3E+08	Indirect Heater

Proposed System and Scope of Work

This ECM proposes to remove the AERCO DHW heater and install new dual fuel hot water heater. The heater will use heating oil or propane and will independent from the heating hot water boiler.

The following table indicates the sizes and quantities of new hot water heaters:

School	PROPOSED			
	DHW Heater	Qty	Rating MBH	Gallons
Voorhees High School	AO Smith	1	600	200

Scope of Work:
The following outlines the scope of work to install new hot water heater:

- Disconnect existing heater electric connections
- Remove existing piping
- Remove existing neater
- Rigging and setting in place new water heater
- Reconnect feed and supply water piping
- Furnish and install new vent piping
- Furnish and Install gas line to heater
- Furnish and Install oil line to heater
- Insulation of new hot water piping
- Connect electric power
- Start up and commissioning of new heater
- Maintenance operator(s) training

Energy Savings Methodology

SAVINGS	= (Boiler Standby Losses)/ η * FUELPRICE + [(New Heater Efficiency – Old Heater Efficiency)/New Heater Efficiency] * Annual Fuel Cost for DHW
FUELCOST	= {{[(500 * GPM * ΔT) * HR] / HV} * FUELPRICE} / ηFUEL
GPM	= Total Volumetric Flow Rate
ΔT	= Temperature Differential = Supply Hot Water Temperature - Return Hot Water Temperature
HV	= Fuel Heating Value
FUELPRICE	= Fuel Unit Cost
ηFUEL	= Efficiency of the Hot Water Boiler

Changes in Infrastructure
New energy-efficient gas-fired heaters will be installed in the boiler room.

Support and Coordination with Utilities
Coordination of the natural gas tie-in will be required.

Environmental Issues

Resource Use	Energy savings will result from reducing electrical usage by operating high efficiency heat transfer equipment that utilizes the lowest cost per Btu.
Waste Production	All disposals will be in accordance with all the applicable codes.
Environmental Regulations	All required permits and application would be handled.

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. Honeywell and the customer will determine final selections.
Equipment Identification	As part of the ECM design and approval process, specific product selection will be provided for your review and approval.

Changes in Infrastructure

New water heater will be installed at the Voorhees boiler room. Training for maintenance personnel will be required as well as an annual maintenance contract with the manufacturer is recommended.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods. Continuity of service must be maintained for the customer.

Environmental Issues

Resource Use	Energy savings will result from greater combustion efficiency
Waste Production	This measure will produce waste by products.
Environmental Regulations	Environmental impact is expected; all regulations will be adhered to in accordance with EPA and local code requirements.

ECM 2C
AHU Replacements

Existing Conditions

Air Handling Units (AHUs) 14 and 16 serve the Voorhees HS gymnasium and are beyond their useful life expectancy. The district suspects the units have never been fully utilized epecially with their heat revovery capabilities through their attached heat wheels. AHU 12 serves the cafeteria kitchen and adjacement prep rooms, in the past there has been operational issues which have caused on site personnel to punch holes in the heat recovery wheel to ensure properation exhaust operation of the device. Coupled with the units performance defficiencies is the fact that most if not all the units parts are obsolete and repair at this stage could prove costly.

North Hunterdon's Cafeteria B is served by one AHU which utilizes chilled water for cooling and electric resistance coils for heating. This unit also has lived beyond its useful life as well as being being extremely expensive to run due to the electric heat and operational issues.

Proposed Solution

Honeywell is proposing to replace these AHUs with new energy efficient units that will provide adequate service with minimum maintenance costs and save substantial energy costs over the long term.

The new units shall be installed at the same locations as existing. Electrical power shall be reconnected to the new motors. The new units will be equipped with factory installed microprocessor controls to improve unit efficiency as well as the unit's ability to communicate with the existing building management system.

It is the plan to convert the 68 Wing at North Hunterdon HS to a natural gas hydronic system and due to the proximity of the unit, the new AHU would be equipped with hot water heating coils rather than electric coils.

Scope of Work for AHU Replacements:
The list of the units installed at locations is depicted in the table below:

Location	Area Served	Quantity	Unit Size
Voorhees HS Gym Penthouse	Gymnasium	2	16,000 CFM
Voorhees HS Gym Machinery Room	Cafeteria Kitchen	1	17,400 CFM
North Hunterdon HS Roof	Cafeteria B	1	10,000 CFM

Scope of Work:
The following outlines the scope of work to install AHUs stated in the above table:

- Disconnect existing AHU electric connections
- Disconnect piping and air ducts from the unit
- Remove unit from the base
- Modify base for new unit if necessary
- Rigging and setting new unit at the base
- Inspect piping and air ducts before reconnecting them to the unit.
- Reconnect piping and air ducts
- Repair duct and piping insulation
- Connect electric power
- Start up and commissioning of new unit
- Maintenance operator(s) training

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. The following is an example of equipment being utilized. Honeywell and Voorhees/North Hunterdon HS Management will determine final selections.
Equipment Identification	Product cut sheets and specifications for generally used are available upon request. As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities
Coordination of the electrical tie-in will be required.

Environmental Issues

Resource Use	Energy savings will result from higher efficiency unit and demand ventilation control.
Environmental Regulations	No environmental impact is expected.

ECM 2D
Converting Heating System from Electric to Gas

Existing Conditions

The unit ventilators (UV) at North Hunterdon HS are old, not fully funtioning and cannot provide cooling for the classrooms. The UV heating is electric, which is very expensive source for heating.

Proposed Solution

Honeywell is proposing to replace the existing unit ventilators with new UVs that will be furnished with hot water heating coils and chilled water coils. The new unit will provide a more comfortable environmental for the students and teachers. The heating by hot water instead of electric source will also reduce the heating utility costs.

Scope of Work Roof Top Units

New UVs will be installed at the North Hunterdon HS at locations listed in the table below:

Equipment Type	Unit No.	kW	No. of Units	CFM
Unit Ventilator	1	16	23	1,250
Unit Ventilator	2	23.5	1	1,500
Unit Ventilator	3	9.9	1	1,000
Unit Ventilator	4	14.4	1	1,250
Unit Ventilator	5	18	6	1,250
Unit Ventilator	7	16	5	1,250
Unit Ventilator	8	36	1	2,000
Unit Ventilator	9	43.2	1	2,000

Equipment Type	Unit No.	kW	No. of Units	CFM
Unit Ventilator	10	43.2	1	2,000
Unit Ventilator	11	43.2	3	2,000
Unit Ventilator	12	25.5	2	2,000
Unit Ventilator	13	25.5	1	1,500
Unit Ventilator	14	22.8	1	2,000
Unit Ventilator	15	18	5	1,250
Unit Ventilator	16	18	1	1,250
Unit Ventilator	17	19.8	1	1,000
Unit Ventilator	21	43.5	1	2,000

Scope of Work:

The following outlines the scope of work to install new unit ventilators:

- Disconnect existing UV electric connections
- Disconnect piping from the unit
- Remove unit from compartment
- Modify compartment for new unit if necessary
- Setting and installing new unit
- Run hot water and chilled water piping to the UV
- Connect hot water and chilled water piping to the UV
- Terminate electric power
- Start up and commissioning of new unit
- Maintenance operator(s) training

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. The following is an example of equipment being utilized. Honeywell and Voorhees/North Hunterdon HS Management will determine final selections.
Equipment Identification	Product cut sheets and specifications for generally used are available upon request. As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Coordination of the electrical tie-in will be required.

Environmental Issues

Resource Use	Energy savings will result from higher efficiency unit and demand ventilation control.
Environmental Regulations	No environmental impact is expected.

ECM 2E
Non Chemical Water Treatment

Existing Conditions

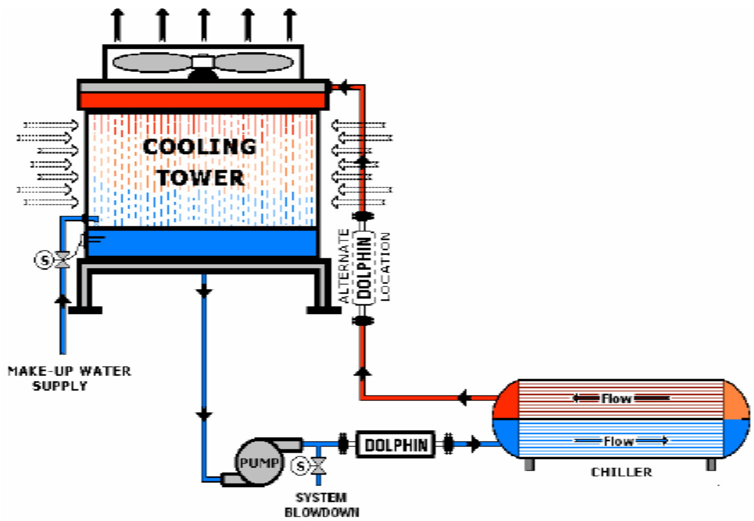
The cooling tower at Voorhees HS currently uses chemical water treatment systems to prevent scaling and biological build up. Mineral scale accumulates daily inside the boilers and cooling towers that keep us warm in the winter and cool in the summer. Scale is a main factor in causing loss of efficiency, increased fuel consumption, and if left unchecked, premature equipment failure. Adding chemicals to the circulating water systems of boilers and cooling towers has traditionally controlled scale. The chemicals manipulate dissolved mineral ions so that they don't precipitate as scale. When carefully administered, controlled, and monitored, chemicals can be effective. However, chemicals are a continuous expense and potentially hazardous to the environment when discharged into public waste water systems.

School	EXISTING TOWERS		
	Equipment	Qty	MBH
Voorhees HS	BAC Cooling Tower	1	6,000 MBH

Proposed Solution

Honeywell proposes installing Dolphin non-chemical water treatment systems at Voorhees HS. The new systems will result in a better heat transfer in the towers as well as the boilers as well as better combustion efficiency. Other attributes of the new system will be:

- Highly effective, non-chemical technique increases operational efficiency
- Reduces microbial contamination, potential health and safety problems at the same time reducing corrosion and scale deposition
- Scale is controlled and de-scaling possible. Excellent corrosion protection without the use of chemicals as well as consistent ease of operation
- Reduces the environmental footprint of a facility by eliminating toxic water treatment chemicals while at the same time mitigating the risk of accidental chemical spills, chronic chemical exposure.
- Chemical-free discharge water can be reused for other purposes and cycles of concentration increased, saving water and reducing cost



Scope of Work:
The following outlines the recommended domestic hot water heating boiler system modifications for each building:

- Furnish and install dolphin Non-Chemical WT System.
- Rigging and setting in place above described new equipment.
- Furnish and install monitoring controls.

Energy Savings Methodology

SAVINGS	= Annual Usage (Non-Treatment Fouling Factor – Treatment Fouling Factor)

Changes in Infrastructure
New energy-efficient non-chemical water treatment will be installed in the boiler room.

Support and Coordination with Utilities
Coordination of the dolphin device tie in will be required.

Environmental Issues

Resource Use	Energy savings will result from reducing electrical and gas usage by decreasing fouling factor of equipment and operating with increased efficiency
Waste Production	All disposals will be in accordance with all the applicable codes.
Environmental Regulations	All required permits and application would be handled.

Energy Savings Methodology and Results

In general, Honeywell uses the following approach to determine savings for this specific measure:

Existing Boiler Efficiency	= Existing DHW Production/ Existing Fuel Input
Proposed Boiler Efficiency	= Proposed DHW Production/ Proposed Fuel Input
Energy Savings $	= DHW Production (Proposed Efficiency – Existing Efficiency)

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. Honeywell and the customer will determine final selections.
Equipment Identification	As part of the ECM design and approval process, specific product selection will be provided for your review and approval.

Changes in Infrastructure

New boilers will be installed in itemized locations; in addition training for maintenance personnel will be required as well as an annual maintenance contract with the manufacturer.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods. Continuity of service must be maintained for the customer.

Environmental Issues

Resource Use	Energy savings will result from greater combustion efficiency
Waste Production	This measure will produce waste by products.
Environmental Regulations	Environmental impact is expected; all regulations will be adhered to in accordance with EPA and local code requirements.

ECM 2F
RTU Replacements

<u>Existing Conditions</u>
The Roof Top Units (RTU) at the North Hunterdon HS are old, ineficient and past their useful life. Replacing these units with high efficiency units (EER's > 12) can save substantial energy costs over the long term.

<u>Proposed Solution</u>
Honeywell is proposing to replace the existing RTUs at various roof locations (see table below for details). The new units shall be installed at the same locations as existing. Electrical power shall be reconnected to the new motors. The new units will be equipped with factory installed microprocessor controls to improve unit efficiency. The units will also communicate with the existing building management system.

<u>Scope of Work Roof Top Units</u>
New High EER RTU and condensing unit will be installed at the North Hunterdon HS:

Location Served	Quantity	RTU Tonnage	Existing Estimated EER	New EER
RTU - 33 Auditorium	1	25.6	7*	>12.1
RTU - 34 Auditorium	1	25.6	7*	>12.1
Auditorium - AH-2	1	7.9	7*	>12.1
HVAC-1 (1968 Wing)	1	13.0	7*	>12.1
RTU Cond. Unit 1	1	1.5	7*	>12.1
RTU Cond. Unit 2	1	24.0	7*	>12.1
RTU Cond. Unit 4	1	1.5	7*	>12.1
RTU – 30	1	12.0*	7*	>12.1
RTU – 35	1	12.0*	7*	>12.1
RTU – 36	1	12.0*	7*	>12.1
RTU – 37	1	12.0*	7*	>12.1
RTU – 38	1	12.0*	7*	>12.1
RTU – 39	1	12.0*	7*	>12.1
RTU – 40	1	12.0*	7*	>12.1

*Note * - Estimated Value*

Scope of Work:

The following outlines the scope of work to install RTU stated in the above table:

- Disconnect existing RTU electric connections
- Disconnect piping and air ducts from the unit
- Remove unit from the base
- Modify base for new unit if necessary
- Rigging and setting new unit at the base
- Inspect piping and air ducts before reconnecting them to the unit.
- Reconnect piping and air ducts
- Repair duct and piping insulation
- Connect electric power
- Start up and commissioning of new unit
- Maintenance operator(s) training

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. The following is an example of equipment being utilized. Honeywell and Voorhees/North Hunterdon HS Management will determine final selections.
Equipment Identification	Product cut sheets and specifications for generally used are available upon request. As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Coordination of the electrical tie-in will be required.

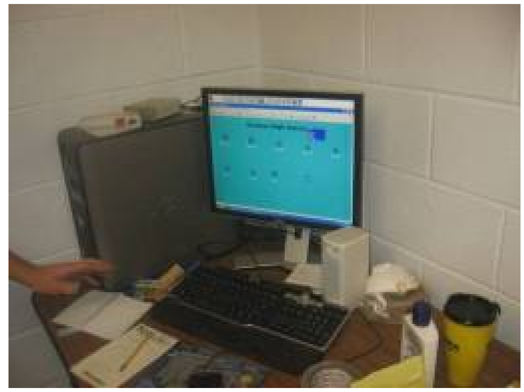
Environmental Issues

Resource Use	Energy savings will result from higher efficiency unit and demand ventilation control.
Environmental Regulations	No environmental impact is expected.

ECM 3A
Building Management System Upgrades

General

The existing building controls are primarily pneumatic, with some areas controlled by an existing Siemens control system. A new Dell PC (or equal) with web based ComfortPoint AX Supervisor software and graphics, 20" monitor, and printer. (location to be determined).



Voorhees High School

Proposed Scope:

Install new CP-600 router (location to be determined) and connect to Ethernet (Ethernet port provided by customer). Connect to new BACnet/Lon busses. A new Dell Personal Computer (PC) (or equal) with web based ComfortPoint (CP) AX Supervisor software and graphics, 20 inch monitor, and printer will also be provided. (Location to be determined)

AHUs

Currently there are (15) multi-zone units. There is one roof mounted unit that is on the existing Siemens BAS and the other (14) are pneumatic units. Three single zone units (12, 14 and 16) have heat recovery wheels with *Vari-Speed* controls that are not working. The units have a vertical hot deck/cold deck configuration with only one active coil depending on whether chilled water or hot water is running. The *inactive deck* is served by mixed air temperature.

Proposed Scope:

- Convert the (15) multi-zone units to Direct Digital Control (DDC) controlled Variable Volume Temperature (VVT) units.
- De-link hot deck, cold deck dampers. Install new DDC controller/panel and add sensors/actuators per the following point schedule.
- Install Mixed air, return air, hot deck supply, cold deck supply temperature sensors, Heating Coil (HC) Valve control (remote mounted I/P on existing pneumatic actuator line) and Mixed air damper control (2 new direct coupled actuators)
- Freeze stat status (existing freeze stat and wiring to remain)
- Replace pneumatic zone dampers actuator with new direct coupled electric actuator on each hot deck and each cold deck damper, typical for approx. 80 zones, 160 dampers total. (Note: De-linking of zone dampers under separate ECM-4A)
- Install new space zone sensors in place of existing pneumatic zone sensors and wire to unit control panel
- Wire supply fan VFD start/stop/status/control/alarm to controller (Note: New VFD and premium efficiency motor to be installed under ECM-7B)
- Wire new pressure sensor in unit to control VFD
- (3) AHUs with heat recovery wheels will most likely be replaced. Figure packaged units with factory mounted controls including DCV. Connect to BACnet bus.

CLASSROOMS:

There are (19) Trane classroom UV's with DDC connected to the Siemens BAS. There are approx.(9) DDC VAV boxes serving various classrooms. There is (1) Trane heat pump serving the stage dressing room area with factory installed DDC. This unit is not connected to the existing BAS. There are approximately (80) zones on the units grouped into 4 day/night zones The day/night zones are controlled by a pneumatic panels in the boiler rooms that were not being used with all zones remaining in the in 'day' mode.

Proposed Scope:

- Replace existing Siemens Univent and VAV controllers with CP series controllers (reuse existing wiring and field devices). Install wire space thermostat. Run BACnet bus to new controllers.
- Add BACnet *Flexstat* to control Trane heat pump. Connect to BACnet bus.
- Pneumatic day/night panels no longer required if multi-zone units are converted to DDC (per above). All day/night scheduling can be done via new controller.

BOILER ROOM:

The chilled water system has a Trane chiller w/VFD, a chilled water pump, a CW pump, and a staged fan cooling tower. All equipment is currently monitored/controlled by the existing Siemens Apogee system The hot water system consists of (3) boilers on the primary loop and (2) hot water zones (one smaller loop with pipe mounted circulators and one large loop with base mounted pumps. Each zone has 2 pumps in a lead/lag configuration.

Proposed Scope:

- Boilers being replaced. Run comm. bus to new boiler controller. Wire boiler controller to boilers. Connect controller to bus.
- Install new CP control panel for hot water system to control primary/secondary pumps.
- Wire start/stop/status/control/alarm from controller to new VFD of (2) large secondary HW pumps (Note: New VFD's and premium efficiency motors to be provided and installed under ECM-7B)
- Install and wire pressure sensor approx. 2/3 down system.
- Remove Siemens CHW controller from panel and replace with CP controller. (re-use existing wires/sensors)

North Hunterdon High School

General

The school consists of the original building which was built around 1950 and three main additions, one in 1957, one in 1968, and one in 2003. The 1950 wing has approx. 15 heating only UV's that are pneumatically controlled and have day/night pneumatic stats. The 1957 wing has approximately 6 electric UVs. The 1968 wing has approx. 40 electric UVs. These units are not using the outdoor air damper. The 2003 wing has approx. 25 small DDC controlled RTU's and 3 AHUs on a Trane Tracer system. Throughout the building there are several (approx 10) RTU's with space mounted programmable thermostats. There is a Barber Coleman web enabled controller near the auditorium that serves as a time clock for the occ/unnoc scheduling of most areas.

CLASS ROOMS:

- 1950 Wing: Demo existing pneumatic controls on the (15) UVs and retrofit with new CP series controls. Install and wire new space sensors. Connect controllers to BACnet bus.
- 1957 Wing: Demo existing pneumatic controls on the (6) UV's and retrofit with new CP series controls. Connect controllers to BACnet bus. Mount and wire new space sensor and connect controller to BACnet bus
- 1968 wing: (55) electric UV's being replace with new hot water UVs. Controls to be factory mounted and wired. Mount and wire new space sensor and new valves to controller and connect to BACnet bus. Add small controller for start/stop/status of the (2) new hot water boilers being installed in the wing and connect to BACnet.
- 2003 wing: All existing RTU's serving this wing to remain on Trane Tracer system. No new work at this time.

BOILER ROOM:

There are 4 low pressure steam boilers (2 old in one boiler room, 2 new in second blr rm). The 2 old boilers are being replaced with 3 new boilers). There are 2 rooftop air cooled chillers.

Proposed Scope:

- Wire 'Control Links' boiler control panel to the 3 new boilers. Wire start/stop status/alarm from each boiler to new CP control panel in room (for each boiler room).
- Connect controller to BACnet bus.

CAFETERIA "A"

The cafeteria is equipped with (4) ceiling hung UV's plus one UV in 'annex'.

Proposed Scope:

- Replace unit mounted digital stat with T7350H Lon communicating thermostat. (or BACnet Flexstat).
- Connect to Lon/BACnet bus. Add direct coupled OA damper actuator.

CAFETERIA "B"

Has 1 AHU with electric heat. The mixed air damper is set manually

Proposed Scope:

- Unit being replaced with packaged RTU.(fully packaged unit with open protocol). Run comm. bus to unit and mount space thermostat and wire to unit.
- Extend bus (BACnet) to new roof mounted chiller near the new RTU

LIBRARY:
Has 4 Nesbitt UV's with steam heat are controlled by unit mounted programmable thermostats and there is an RTU.

Proposed Scope:
- Replace unit mounted stat with T7350H Lon communicating thermostat. (or BACnet Flexstat). Connect to Lon/BACnet bus.
- Replace packaged unit thermostat with T7350H Lon communicating thermostat. (or BACnet Flexstat). Connect to Lon/BACnet bus.

AUDITORIUM:
The Auditorium has (2) McQuay RTUs. The units have remote on/off, fan speed controllers (in closet across the hall) and are started/stopped manually. They are not tied into the DDC system.

Proposed Scope:
- Units probably being replaced with packaged RTU. Run comm. bus to unit and mount space thermostat and wire to unit.

BOYS GYM:
Has (4) ceiling hung HV units. All 4 units are controlled by a single programmable stat. The units are also started/stopped via the Barber Coleman time clock.

Proposed Scope:
- Replace existing stat with Lon (or BACnet) communicating thermostat. Connect to Lon/BACnet) bus.
- Alt: Retrofit units with CP controls. Add CO2 for DCV.

THREE (3) STATION GYM:
The gym has (2) Trane units with DDC. The units already have CO2 sensors and DCV.

Proposed Scope:
- No work. System to remain on Trane Tracer system

GIRLS GYM:
Has (4) steam unit heaters. There is an outdoor air intake damper and an exhaust fan (mounted above hall ceiling on opposite sides of the gym.

Proposed Scope:
- Install/wire new controller to control all the unit heaters (fan only), exhaust fan, and OA damper. Connect controller to comm. bus.

Typical Sequence of Operation

Following sequence of operation shall be utilized where applicable:

1. Provide Day/Night Control (55 degree F).
   - Time of Day Scheduling.
   - Occupancy Scheduling.

2. Unit Ventilators:
   - Unit Ventilator Controls: Re-commission existing Direct Digital Controls for ASHRAE Cycle 2 automatic control.

3. Roof Top Units:
   - Star/Stop and alarms

4. Provide Day/Night Control for each zone.
   - Time of Day Scheduling.
   - Occupancy Scheduling.
   - Automatic Operation and Override capability of Day/Night control.

5. Provide Boiler Control.
   - On/Off Control Capability.
   - Lead/Lag Control.
   - Warm Weather Shutdown.
   - Boiler Run Time Optimization

6. CO2 Controllers
   - Install CO2 sensor in RA duct
   - VFD control
   - Supply fan control
   - Add in control sequence to flush area with OA for 30 minutes prior to occupancy
   - Add in control sequence to purge area with OA for 30 minutes post occupancy

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Energy Savings Methodology and Results

The energy savings for this ECM is realized at the buildings HVAC equipment due to better control of the HVAC system, night set-back and set-up temperatures, start/stop etc.

Environmental Issues

Resource Use	Energy savings will result from reduced electric energy usage and better occupant comfort.
Waste Production	This measure will produce no waste by products.
Environmental Regulations	No environmental impact is expected.

ECM 3B
Demand Control Ventilation

Existing System:
The air handling units (AHU) serving large one zone spaces such as auditoriums, gymnasiums and cafeterias are often designed for peak occupancy conditions to supply 100% outside air to the space with all return air from space being exhausted. Most of the time these spaces are not fully occupied, which increase energy demand for heating and cooling of excessive amount of outside air.

Proposed System:
Under this proposal, Honeywell will install CO_2 sensors at large one zone rooms that are served by AHU. The CO_2 sensor will provide the control signal for the air handlers to optimize the quantity of fresh air that is required. This control strategy will reduce the space energy use.

Based on this fact, there is a reduced requirement for outside air to this space. The installation of a CO_2 sensor will read the levels of CO_2 in the space and ensure that only the required air is supplied to meet minimum outdoor air requirements. The amount of outside air is introduced and heated. These control systems will be utilized on the gymnasium air-handling units.

Proposed System:
Under this proposal, Honeywell will install CO_2 sensors to control the amount of outside air entering this space based on demand. For a large area such as this which has erratic occupancy patterns, you are introducing large quantities of outside air into the space when it is not needed. For a majority of time, this area is used on occasion or empty.

Based on this fact, there is a reduced requirement for outside air to this space. The installation of a CO_2 sensor will read the levels of CO_2 in the space and ensure that only the required air is supplied to meet minimum outdoor air requirements. The amount of outside air is introduced and heated.

School	Areas Served	No. of Units
Voorhees HS	Gym	2
Voorhees HS	Auditorium	1
North Hunterdon HS	Auditorium	2
North Hunterdon HS	Cafeteria	1
North Hunterdon HS	Boys Gym	4

Energy Savings Methodology and Results

The savings approach is based upon reducing the amount of energy that needs to pre-heat the outside air. The savings are generally calculated as:

Existing Heating BTU & Cost per BTU	= Metered Data from Existing meter readings
Cost of Existing Heating	= Average Site Data $/CCF or $/Gallon
Reduction in Heating BTU	= Reduction in Outside air cfm x 1.08 x Delta T x Hours the fan is =
Cost of Proposed Heating	Existing BTU x Cost per BTU
Energy Savings $	= Existing Heating Costs – Proposed Heating Costs

The baseline adjustment calculations are included with the energy calculations.

Changes in Infrastructure

None.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from reduced energy.
Waste Production	Any removed parts will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 3C
Chiller Replacement

Existing System:
The packaged air cooled chiller at the North Hunterdon HS roof that serving cafeteria B is old energy inefficient and annual cost for repairs will increase in the future.

Proposed System:
Honeywell is proposing to replace the existing chiller with new air-cooled energy efficient chiller that will provide reliable service for many years to come and will save operating costs not only for repairs but also use significantly less energy as well. The new chiller(s) will be sized to serve the existing cafeteria as well as the 1968 wing classrooms that currently have no cooling at this time.

Energy Savings Methodology and Results
The savings approach is based on the energy efficiency between the existing and new chillers. The savings are generally calculated as:

Sensible Load	=1.08 x Outdoor Air CFM x Delta T x Hours /12,000
Conduction Load	= UA x Hours x Delta T /12,000
Internal Load	= (Equipment Load + Personnel Load)/12,000
Total Load	= Sensible Load + Conduction Load + Internal Load
Savings	= Total Load x (Existing Equipment Eff. – New Equipment Eff.)

The baseline adjustment calculations are included with the energy calculations.

Changes in Infrastructure
None.

Customer Support and Coordination with Utilities
Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from reduced energy.
Waste Production	Any removed parts will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 4A

Convert Constant Volume Multi-Zone Units to VVT

Existing Conditions

The air handling units (AHUs) at Voorhees High School have Multi-Zone units serving larger areas. These units supply heating for each zone by varying the temperature of the supply air. The required supply air temperature for each zone is obtained by mixing a hot stream of air with a cold stream of air. This mixing is accomplished, when the room thermostat modulates the hot and cold deck dampers attached to a common shaft to maintain the temperature setting.

Energy is wasted in this type of system for the following reasons: (1) mixing the hot and cold air to obtain the desired supply air temperature is inefficient because the hot deck air has to be overheated, and (2) supplying a constant volume of air is wasteful because the fan energy does not decrease as the heating load decreases on the associated zones. A more efficient system can be obtained by converting the existing multi-zone unit to a variable volume terminal (VVT) system that eliminates the mixing penalty of the two air streams.

School	Area Served	Unit	No. of Zones
Voorhees HS	Library/Offices	AHU-1	5
Voorhees HS	Lockers/Corridor	AHU-2	3
Voorhees HS	Class Rooms	AHU-3	11
Voorhees HS	Class Rooms	AHU-4	8
Voorhees HS	Small Group Instruction	AHU-5	4
Voorhees HS	Auditorium	AHU-6	4
Voorhees HS	Music Rooms	AHU-7	8
Voorhees HS	Principal Offices	AHU-8	5
Voorhees HS	Faculty Offices	AHU-9	8
Voorhees HS	Industrial Arts	AHU-10	2
Voorhees HS	Art/Special Ed	AHU-11	8
Voorhees HS	Faculty Dining	AHU-13	2
Voorhees HS	Locker Rooms	AHU-15	2
Voorhees HS	Aux Gym /Team Rooms	AHU-17	5
Voorhees HS	Industrial Metal Shop	AHU-18	2

Proposed Solution

This ECM involves converting above mentioned multi-zone air handlers to VVT system. This energy conservation measure can be accomplished by splitting the existing dampers and installing operators to modulate the hot deck and cold deck dampers independently. A variable speed drive would be installed on the supply fan.

When zones require cooling, the hot deck damper is closed and the cold deck damper will modulate to maintain the zone temperature setting. When zones require heating, the cold deck damper is closed and the hot deck damper is modulated to maintain the zone temperature setting.

The amount of air the fan is required to move is less; and therefore, the fan does less work and uses less energy. The fan speed should be controlled by a variable frequency drive which will vary the speed of the fan and, therefore, the fan CFM according to the amount of supply air required in the spaces to meet the heating or cooling load.

Converting this constant volume mixing system to variable air volume system will save energy by lessening or eliminating mixing losses and reducing fan energy consumption. Corresponding modifications to the building automation system (BAS) will be installed to control this air handler and associated equipment. The points are described below.

This ECM will provide the following items for implementation:

- Standard efficiency motors shall be replaced with premium efficiency motors.
- New variable frequency drives will be installed on the supply air fan.
- Zone dampers will be de-linked.
- Installation of damper operators on additional dampers.
- Programming of the new control points to suit the control philosophy above.
- A duct pressure sensor installed about 2/3 of the way to the end of the longest duct run would control the air handler fan speed. The controls would use the damper position to satisfy the space temperature set point.

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. The following is an example of equipment being utilized. Honeywell and PRSD will determine final selections. MagneTek, Inc. - 26 Century Blvd. Suite 600 - Nashville, TN 37214 (800) - MAGNETEK Baldor Electric Corp. – 5711 R.S. Boreham Jr. St., PO Box 2400, Fort Smith, AR, 72901 – (501) 646-4711
Equipment Identification	Product cut sheets and specifications for generally used are available upon request. As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Coordination of the electrical tie-in will also be required.

Environmental Issues

Resource Use	Energy savings will result from reducing electrical usage by operating higher efficiency motors for the same horsepower output. The equipment uses no other resources.
Waste Production	This measure will produce waste by products. Old motors shall be disposed of in accordance with all federal, state and local codes.
Environmental Regulations	No environmental impact is expected.

ECM 5A
Building Envelope Improvements

Existing Conditions

Typically, many schools have problems associated with the design and construction of the buildings. Being older, both School buildings avoid some of the common failure associated with more modern construction. Plus, long-term stewardship of these structures has helped avoid most of the problems often associated with maintenance issues. But there are several significant building envelope retrofit opportunities, which will provide cost savings and comfort improvements to the building occupants.

For the most part, the windows at these schools are in fair condition and functioning. The installation of the windows appeared above average, but staff complained of consistent air leakage. Windows that have air conditioning units in them are prone to allow leakage. The units are left in all winter. The District may want to consider removing these units during the cold months.

The buildings that were surveyed are masonry in construction. So the areas of concern deal with the openings in the "skin" that are mostly "built-in" during the original construction, created during a "retrofit period" and/or have deteriorated.

Air leakage is defined as the "uncontrolled migration of conditioned air through the building envelope." Caused by pressure differences due to wind, chimney (or stack) effect, and mechanical systems, it has been shown to represent the single largest source of heat loss or gain through the building envelopes of nearly all types of buildings. Tests carried out by the National Research Council of Canada on high rise commercial and residential buildings, schools, supermarkets, and houses, have shown levels of 30 % to 50% of heat loss could be attributed to air leakage. Reports detailing this are available for perusal.

Beyond representing potential for energy savings, uncontrolled air leakage can affect thermal comfort of occupants, air quality through ingress of contaminants from the outside, and the imbalance of mechanical systems, and the structural integrity of the building envelope - through moisture migration. Control of air leakage involves the sealing of gaps, cracks and holes, using appropriate materials and systems, to create, if possible, a continuous plane of "air-tightness" to completely encompass the building envelope. Part of this process also incorporates the need to "decouple" floor-to-floor, and to "compartmentalize" components of the building in order to equalize pressure differences.

The buildings were inspected visually to identify location and severity of air leakage paths. Air leakage paths are detailed in the scope of work below. Floor plans will be used to mark locations of air sealing measures when completed.

Proposed System

Honeywell proposes the sealing of these openings through the use of weather-stripping, caulking, and foam sealing. This sealing will occur, as required, at the locations where the roof meets the wall structures and door openings. This will reduce the air leakage of the buildings, and improve the energy efficiency of the structures by tightening their integrity. Weather-stripping will be replaced at the doors where required, and window perimeters will be caulked adequately.

Benefits

The sealing of the school buildings will allow for more efficient operation of the buildings by reducing heating and cooling losses throughout the year. In addition, the draftiness of the buildings, along with hot and cold spots, will be reduced as a result of this measure. A reduction in air infiltration will also minimize potential concerns for dirt infiltration or indoor air quality.

Scope of Work:

The Scope of work t NHHS/VOORHEES HS may include but is not be limited to the following:

- Weather-strip doors
- Seal roof/wall intersections
- Seal penetrations in the boiler rooms
- Seal roof/wall intersections in the boiler room
- Install window weather strip
- Seal window perimeters with caulk
- Seal a/c units\
- Seal passive roof vents

Energy Savings Methodology and Results

The energy savings for this ECM are realized at the buildings HVAC equipment. The improved building envelope will limit conditioned air infiltration through openings in the building air barrier. Less infiltration means less heating required by the heating system.

Changes in Infrastructure

Building envelopes will be improved with little or no noticeable changes.

Customer Support and Coordination with Utilities

Minimal coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced HVAC energy usage and better occupant comfort.
Waste Production	Some existing caulking and weather-stripping will be removed and disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 6A
Computer Controllers

Existing Conditions

At present, there are a total of approximately eight hundred (800) computers in each of the Voorhees and North Hunterdon High Schools.

Desktop Computers: Energy waste is inherent in large PC networks. While most PCs have energy-saving settings such as stand-by hibernate, and shutdown, over 80% of users disable their low-power settings. Installation of a network-level control over the power settings of all Microsoft Windows-based PCs, from Windows 95 to XP solves this problem by giving Voorhees/North Hunterdon HS IT personnel control of these settings. Network managers can easily configure and maintain PC power settings across distributed networks, to automatically send PCs into low-power states as needed. A PC in a school setting wastes 100 to 400 kWh of energy a year by remaining on during unoccupied periods. Ideally, everyone would use the built-in energy saving function on their machine; however, as indicated above these existing energy-saving features are rarely enabled.

Proposed System

Desktop Computers: Honeywell proposes to install a centralized personal computer power management system to control all computers in each HS. The software by Verdiem called "Surveyor," enables control of the operation of computers in all of the schools. Surveyor delivers desktop computer energy management that does not interfere with user or IT needs. Surveyor keeps computers running when users need them, and accurately determines when computers are inactive so they can be powered down through network-wide power consumption and savings reports. Surveyor is a computer energy management solution that analyzes CPU, disk, keyboard, mouse, and application activity before taking power management actions. It is also a solution that is available for both Windows and Mac computers. Surveyor is the 'green' software solution for desktop and laptop computers.

School	Total
Voorhees High School	300
North Hunterdon High School	500
TOTAL	**800**

Honeywell

Following are the key features of Surveyor:

Intelligent Configuration Settings
- Definitions can be based on CPU, disk, keyboard, mouse and application activity
- Shutdown without the loss of user productivity

Flexible Scheduling
- Options to turn off the monitor, and standby, hibernate or shutdown the computer
- Schedule Wake-on-LAN, shutdown, or restart events for a single, daily, weekly, or monthly occurrence
- Schedule a temporary window where Surveyor will not enforce energy management policies

Compatibility Options
- Customize the deployment as well as update and control the client workstations
- Recognizes and accommodates to Deep Freeze maintenance schedules

Customized Inactivity Definitions
- Employ energy saving actions when CPU or disk activity falls below a defined level
- Prevent the workstation from employing power saving actions when a particular application is running

Enterprise Control
- Verdiem Core Console provides unified workstation management capabilities
- Workstation grouping makes managing large deployments easy
- Disable and override a workstation's operating system energy management settings

Savings Reports
- Generate enterprise power consumption and savings reports through Verdiem Core Console
- Detailed workstation utilization reporting allows you to see how much power you are saving based upon your regional electricity cost.
- Audit mode provides a baseline measure of the energy being consumed, making it easy to determine the true value of the savings generated when Surveyor's features are enabled.

Scope of Work

Honeywell proposes to purchase and install Surveyor by Verdiem for the network level control of the electric consumption of the computers in the schools. Surveyor is an easy-to-deploy software utility that addresses network energy waste, and reduces operating costs without impacting PC users. Surveyor measures, manages, and minimizes the energy consumed by the network's PC clients through one centralized interface. It provides IT departments with a powerful approach to automate energy-efficient "best practices" throughout their networks, while it adds new control and flexibility to traditional PC power management.

Honeywell will work with the District to install and rapidly deploy the Surveyor software on the PC network. This single day installation plan will address server and client installation, basic administrative configurations, logical power management profile groupings, and energy consumption reporting. Ongoing technical support and product revisions are also available, with an annual energy audit to ensure maximized energy savings.

Predominately, the benefit is the energy savings from the system. It also adds security to the PC network because the most secure PC is the one that is off. Additionally the software provides rudimentary asset inventory views, including last-logged-in user, IP address, machine names, hardware and processor type.

ECM 7A

Transformer Replacements

Existing Conditions

Where a building has the main electric power supplied at 480 V the distribution transformers are installed within power distribution system to provide step down power at 120-208 for domestic use. Typically, an electrical distribution system has some losses associated with the electrical system, and a considerable portion of these losses are associated with distribution transformers. A couple of transformers were humming rather loudly.

Systems Evaluation and Selection

Typical transformers are not designed to handle harmonic loads of today's modern facilities, and suffer significant losses as a result. Typically, conventional transformer losses, which are non-linear, increase by 2.7 times when feeding computer loads. The nonlinear load loss multiplier reflects this increase in heat loss, which decreases the net transformer efficiency. Also, unlike most substation transformers that are vented to the exterior, building transformers are ventilated within the building they are located, and their heat losses therefore add to the cooling load.

Based on preliminary site investigation conducted by our staff, we found several transformers that we propose to replace with energy efficient ones at a size matching the existing loads as indicated in the table below:

Location	Qty.	kVA	Primary	Secondary
Voorhees High School	6	25	480 Delta	208/120
Voorhees High School	1	37.5	480 Delta	208/120
Voorhees High School	13	50	480 Delta	208/120
Voorhees High School	3	75	480 Delta	208/120
Voorhees High School	1	37.5	480 Delta	208/120
Voorhees High School	1	150	480 Delta	208/120
North Hunterdon High School	9*	30	480 Delta	208/120
North Hunterdon High School	1	112.5	480 Delta	208/120
North Hunterdon High School	1	150	480 Delta	208/120

* *Indicates estimated value*

Proposed System*:*

The proposed transformers will be Power Smiths High Efficiency K-Star Harmonic Mitigating units. They are Energy-Star rated and meet the new TP1 Law requiring replacement of transformers of 600 volts or under.

Scope of Work:

1. Remove old transformer units
2. Install new E-saver-C3L-75-480-208/120 units
3. Dispose of old units properly

Per Transformer Unit:

- Shut off the main electric power to the transformer to be replaced.
- Disconnect the existing transformer and install replacement unit.
- Turn power back on.
- Inspect unit operation by performing electrical and harmonics testing.
- Dispose old transformers properly.

ECM 7B
Install Premium Efficient Motors

Existing Conditions

The current AHUs at Voorhees High are equipped with standard efficiency motors. Energy saving can be further achieved by installing new premium high efficiency motors.

Proposed Solution

Honeywell is recommending the retrofit of the existing AHUs from a multi-zone constant volume system to a VVT system. The existing AHUs will be retrofitted with variable speed drives. Energy savings can be further obtained by replacing the standard efficiency motors with premium efficiency motors. Honeywell has identified motors as candidates for replacement with premium efficiency equivalents.

Honeywell proposes the replacement of all above mentioned single speed standard efficiency motors with new premium efficiency motors, installing new couplings where applicable. The scope of work will be as follows:

- Remove and dispose of old standard efficiency motors.
- Inspect all couplings and replace as needed.
- Install new premium efficiency motors on the existing pumps.
- Align the couplings to EASA standards.

The motors that were identified in the building are listed as follows:

Bldg.	Equipment Description	Qty	Motor HP	Remarks
Voorhees HS	AHU-1	1	10	Library/Offices
Voorhees HS	AHU-2	1	3	Lockers/Corridor
Voorhees HS	AHU-3	1	15	Class Rooms
Voorhees HS	AHU-4	1	20	Class Rooms
Voorhees HS	AHU-5	1	15	Small Group Instruction
Voorhees HS	AHU-6	1	15	Auditorium
Voorhees HS	AHU-7	1	10	Music Rooms
Voorhees HS	AHU-8	1	3	Principal Offices
Voorhees HS	AHU-9	1	5	Faculty Offices
Voorhees HS	AHU-10	1	5	Industrial Arts
Voorhees HS	AHU-11	1	15	Art/Special Ed
Voorhees HS	AHU-13	1	7.5	Faculty Dining
Voorhees HS	AHU-15	1	10	Locker Rooms
Voorhees HS	AHU-17	1	20	Aux Gym /Team Rooms
Voorhees HS	AHU-18	1	5	Industrial Metal Shop

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. The following is an example of equipment being utilized. Honeywell and Voorhees/North Hunterdon HS Management will determine final selections. MagneTek, Inc. - 26 Century Blvd. Suite 600 - Nashville, TN 37214 (800) - MAGNETEK Baldor Electric Corp. – 5711 R.S. Boreham Jr. St., PO Box 2400, Fort Smith, AR, 72901 – (501) 646-4711

Equipment Information - *Continued*

Equipment Identification	Product cut sheets and specifications for generally used are available upon request. As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Changes in Infrastructure

New motors will be installed in place of the old motors. No expansion of the facilities will be necessary.

ECM 7C
Install Variable Frequency Drives on Pump Motors

Existing Conditions

The hot water circulating pumps at Voorhees High School are furnished with premium efficiency electric motors, but without Variable Frequency Drives (VFD). The water distribution system is pumped at the constant volume without controlling the water flow. This results in unnecessary excess of pumping power even with a decreased building load.

Proposed Solution

Honeywell proposes installing VFDs on the selected pump motors to provide more flow controllability and saving electric energy for unnecessary pumping volume. This will be important especially since the new boiler system will be controlled using a primary/secondary pumping system. The new VFDs will not only save electrical energy, but will help control building loop temperature especially during shoulder months when thermal loads are at a minimum.

The selected pumps are listed the below table:

Bldg.	Equipment Description	Qty	Motor HP	Remarks
Voorhees High School	HW Loop Pump	2	20	Install VFD

The scope of work will be as follows:

1. Install VFDs on the pumps
2. Install wiring and controls on the new VFDs.
3. Measure and verify the pre and post-retrofit voltage, amperage, and RPM.

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. The following is an example of equipment being utilized. Honeywell and Voorhees/North Hunterdon HS Management will determine final selections. MagneTek, Inc. - 26 Century Blvd. Suite 600 - Nashville, TN 37214 (800) - MAGNETEK Baldor Electric Corp. – 5711 R.S. Boreham Jr. St., PO Box 2400, Fort Smith, AR, 72901 – (501) 646-4711

Equipment Information - *Continued*

Equipment Identification	Product cut sheets and specifications for generally used are available upon request. As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Changes in Infrastructure

New VFDs will be installed on the wall near the pumps and disconnect. No expansion of the facilities will be necessary.

Honeywell

ECM 8A

Install Photovoltaic System

Honeywell recommends the installation of a Photovoltaic System for the Voorhees and North Hunterdon High Schools that will generate electric power from solar energy. Although the returns are not ideal, this system will be appropriate to this site, and will assist in promoting the "Green Power" image of the District and will be a model for future duplication.

Proposed System:

The capacity of this recommend solar field is based on the replacement of the existing roofs at both facilities. The associated cash flow for this energy plan includes the cost of replacing the area of roof that this system will be placed. If the roofs cannot be replaced, a solar solution is still a viable ECM, but the size of the array will need to be adjusted accordingly.

The proposed system is a nominal kW-dc system with a DC/AC converter as is listed in the following table:

School ID	Panel Size (W)	Solar System Power (kW)
Voorhees High School	210	433
North Hunterdon High School	210	377

Photovoltaic System

Solar cells are converters. They take the energy from sunlight and convert that energy into another form of energy, electricity. Solar cells convert sunlight to electricity without any moving parts, noise, pollution, radiation, or maintenance. The conversion of sunlight into electricity is made possible with the special properties of semi-conducting materials.

Semi-Conductors

Most solar cells are made from silicon, which is a "semi-conductor" or a "semi-metal," and has properties of both a metal and an insulator. Solar cells are made by joining two types of semi-conducting material: P-type and N-type. P-type semiconductors are manufactured to contain negative ions, and N-type semiconductors are manufactured to contain positive ions. The positive and negative ions within the semiconductor provide the environment necessary for an electrical current to move through a solar cell.

Sunlight Converted

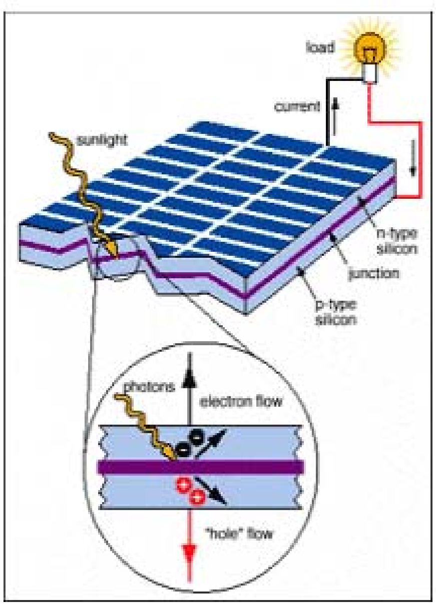
At the atomic level, light is made of a stream of pure energy particles, called "photons." This pure energy flows from the sun and shines on the solar cell. The photons actually penetrate into the silicon and randomly strike silicon atoms. When a photon strikes a silicon atom, it ionizes the atom, giving all its energy to an outer electron and allowing the outer electron to break free of the atom. The photon disappears from the universe and all its energy is now in the form of electron movement energy. It is the movement of electrons with energy that we call "electric current."

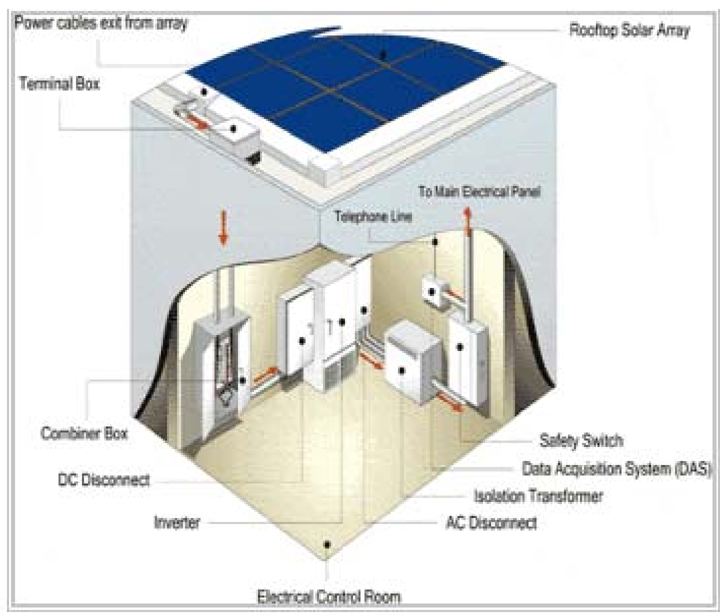
Sunlight to Electricity

A typical solar cell consists of a glass cover to seal the cell, an anti-reflective layer to maximize incoming sunlight, a front and back contact or electrode, and the semiconductor layers where the electrons begin and complete their voyages. The electric current stimulated by sunlight is collected on the front electrode and travels through a circuit back to the solar cell via the back electrode.

PV System Architecture

Solar cells interconnected with other system components that ultimately serve a specific electrical demand, or 'load'. PV systems can either be stand-alone, or grid-connected. The main difference between these two basic types of systems is that in the latter case, the PV system produces power in parallel with the electrical utility, and can feed power back into the utility grid if the onsite load does not use all of the PV system's output. The 433 kW and 377 kW systems proposed here is small enough where the school will consume all of the power generated by the cell.





Typical PV System

Electronic Information Kiosk

The electronic information kiosk brings the building to life for students, faculty, staff and parents. The kiosk terminals are user-driven via interactive touch screens, and can also be configured for tours and group presentations. The kiosk is a centralized source for information about the building, including:

- A tour of the building's earth-friendly construction materials.
- Continuous real-time display of the building's solar performance.
- An introduction to the unique day lighting design that maximizes the use of available sunlight.
- Building project overview and timeline.
- A solar quiz to test your knowledge.

Kiosk Screen

Energy production is of particular interest to building occupants and visitors.
The amount of energy the building produces is continuously monitored and displayed within the kiosk's real-time data display screen.
Current temperature and sunlight as well as monthly statistics are also available.
The kiosk's content will continue to expand to increase its value to students, faculty, staff and local community.

Scope of Work:
The following scope of work will be provided to achieve the projected savings:

Voorhees High School:

Photovoltaic System Specifications

- 2,065 EVERGREEN SOLAR 210W PV PANELS
- 37 SMA 56 INPUT PV COMBINERS
- 37 SMA DC DISCONNECT BREAKERS
- 37 SUNNY BOY 7000U INVERTERS

Miscellaneous Equipment and Services

- 24VDC WIRING-RHW (#8 AWG)
- CONDUIT-3" EMT
- CONDUIT-3/4" EMT 1350 LF
- 24VDC WIRING-RHW (300 MCM)
- CONDUIT-2" EMT
- 208V WIRING-THHN (#4 AWG)
- CONDUIT-2" EMT 300 LF
- UTILITY METERING
- MANUFACTURER START UP SERVICES

North Hunterdon HS:

Photovoltaic System Specifications

- 1,793 EVERGREEN SOLAR 210W PV PANELS
- 32 SMA 56 INPUT PV COMBINERS
- 32 SMA DC DISCONNECT BREAKERS
- 32 SUNNY BOY 7000U INVERTERS

Miscellaneous Equipment and Services

- 24VDC WIRING-RHW (#8 AWG)
- CONDUIT-3" EMT
- CONDUIT-3/4" EMT 1350 LF
- 24VDC WIRING-RHW (300 MCM)
- CONDUIT-2" EMT
- 208V WIRING-THHN (#4 AWG)
- CONDUIT-2" EMT 300 LF
- UTILITY METERING
- MANUFACTURER START UP SERVICES

Energy Savings Methodology and Results

Savings are based on energy conversion of the solar array and assume a 0.77 DC to AC conversion de-rate factor.

Changes in Infrastructure

The proposed solar array would reside on the bldg roof

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods. The School District and Honeywell will decide the exact location of solar system installation on the roof.

Environmental Issues

Resource Use	Renewable energy will be generated to supplement energy purchased from the electrical utility.
Waste Production	This measure will produce no waste by products.
Environmental Regulations	Aside from the environmental benefits from generating renewable energy no other environmental impact is expected.

ECM 8B
Wind Power

Existing Conditions:

Small wind electric systems could make a small contribution to the districts energy needs. The issue in the district is the amount of sustainable wind coupled with the wind velocity. The wind velocity is measured by NREL (DOE – National Renewable Energy Labortory) between 9.8 – 11.3 mph at higher elevations in Hunterdon County. The concern is that both schools are less then 1,000 ft elevation and this could be an issue with respect to wind velocity.

Proposed System:

Honeywell is recommending a small 10,000 Watt wind turbine array at both schools for educational purposes. Designed for urban and suburban settings, the small, quiet Architectural Wind™ system is installed on top of concrete tilt-up or pre-cast buildings – with little or no structural impact and no tall support tower required. The small wind-turbine system takes advantage of a building's aerodynamic properties to generate electricity. The wind accelerates as it flows up and over the building, resulting in 15% faster wind speed and more than a 50% increase in power.

TURBINE SPECIFICATIONS

No. of units - 10

- Weight: 130 lbs
- Height and width: 8.5'x 6'
- Number of blades: 5
- Rated power: 1000 W
- Start up wind speed: 2.2m/s (5 mph)
- Output voltage: 250 VDC
- Designed for installation on concrete tilt-up or pre-cast
- building construction
- Designed to withstand 120 mph winds
- Modular and Scalable Design
- Optional canopy for avian protection
- For commercial use only, not sold separately
- System includes standard UL approved equipment
- AC disconnect
- High voltage DC disconnect
- UL approved inverter

Energy Savings Methodology and Results

Savings are based on energy conversion of the wind turbine array and assume a 0.77 DC to AC conversion de-rate factor.

Power = k Cp 1/2 ϱAV3
Where:
P = Power output, kilowatts
Cp = Max power coefficient, ranging from 0.25 to 0.45, dimension less (theoretical maximum = 59)
ϱ = Air density, lb/ft3
A = Rotor swept area, ft2 or
π D2/4 (D is the rotor diameter in ft, π = 3.1416)
V = Wind speed, mph
k = 0.000133 A constant to yield power in kilowatts.

Changes in Infrastructure

The proposed solar array would reside on the bldg roof

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods. North Hunterdon Voorhees District and Honeywell will decide the exact location of solar system installation on the roof.

Environmental Issues

Resource Use	Renewable energy will be generated to supplement energy purchased from the electrical utility.
Waste Production	This measure will produce no waste by products.
Environmental Regulations	Aside from the environmental benefits from generating renewable energy no other environmental impact is expected.

ECM 8C
Geothermal

Existing Conditions

The advantages of geothermal energy are that once the initial investment is paid for, and energy is relatively free. And it's clean. There is little or no reliance on power from gas or electricity to provide heat, which is one of the main uses of energy in the home. The main need for electricity to run this system is for pumps to pump the water through the system. The advantages of geothermal energy are that it is inexpensive once the ground work is done and considered green energy. There are no emissions from the provision of heat for the building and water.

The disadvantages of geothermal energy are the initial expense and the amount of land required. The expense is costly to dig out the land and lay the pipes. This is one of the geothermal energy problems and why it is not widely used. Another of the disadvantages about geothermal energy is that it requires a fair sized piece of land to implement.

Proposed System:

The proposed system is closed loop system at both high schools. Honeywell has estimated it would take about 80 wells at each school to attain the required geothermal load to heat cool the buildings.

School ID	No. of Wells	Estimated System Output (Btu)
Voorhees High School	80	2,880,000
North Hunterdon High School	78	2,808,000

Energy Savings Methodology and Results

Savings are based on energy conversion fossil fuel/electric system to a geothermal system.

Heating Load	=	Heating Load Intensity x Building Area
Cooling Load	=	Building Area / Cooling Load Intensity
Target Load	=	Heating Load x HL Diversity Factor + Cooling Load * CL Diversity Factor
No. of Wells	=	Target Load / Estimated Well Output

Changes in Infrastructure

The proposed geothermal well field would reside on the school property

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for tie-in periods. North Hunterdon Voorhees District and Honeywell will decide the exact location of the well field.

Honeywell

Environmental Issues

Resource Use	Renewable energy will be generated to supplement energy purchased from the electrical utility.
Waste Production	This measure will produce no waste by products.
Environmental Regulations	Aside from the environmental benefits from generating renewable energy no other environmental impact is expected.

ECM 9A
Steam Trap Repair

Existing Conditions

Steam generated by the boilers in the North Hunterdon HS is used for space heating in various HVAC equipment located within the facility. Steam is distributed throughout the building by steam piping distribution systems. As the steam gives off its heat it condenses back to water. Therefore, at each of these end uses, the condensate must be trapped and sent back to the boiler. This helps prevent unnecessary losses. Steam traps throughout the building accomplish this recovery of the condensate. Traps are designed to drain only the condensate, and prevent live steam from entering the condensate return piping.

As the distribution system ages, the moving parts in the trap tend to get sluggish or fail altogether. This failure results in live steam entering the condensate return piping. The cumulative effect of this is to return the condensate above the flash point, resulting steam and hence valuable heating energy loss at the boiler. This loss of energy can be minimized by a thorough survey of the traps to identify leaking traps by use of infrared temperature sensing instruments.

Proposed System and Scope of Work

This ECM recommends retrofitting the traps per the following scope of work. The steam trap retrofit includes surveying all of the existing steam traps and engineering appropriate replacements. During construction, Honeywell will provide all materials, fittings, labor and supervision for the timely completion of the project. Schedule 80 fittings will be used to re-pipe steam traps only when necessary. All existing strainers, isolation valves, check valves, and fittings in good repair will be reused.

Thermostatic steam traps will be completely replaced with a new thermostatic trap bodies. F&T steam traps will include complete replacement with new steam traps manufactured by Barnes & Jones Inc or equal. Atmospheric vacuum breakers will be installed on the air handling unit coils where thermostatic traps are currently being used as release vacuum. .

A total of 45 steam traps were estimated for replacement in this program. Buildings and quantities included in this proposal are:

School ID	Total Steam Traps	Thermostatic Traps	F&T
North Hunterdon High School	447	370	77

Energy Savings Methodology and Results

All mechanical steam traps lose some live steam, either through normal cycling, leaking through a closed trap, or failing in the open position. Various sources have stated that the loss through a properly operational trap may exceed ten lbs/hour, while the failed steam trap population ranges between 20-50% at any given time.

We have estimated the steam losses based on a conservative figure of 5% failed, 5% leaking steam trap population. Failure rates are based on what has been found in similar schools elsewhere in and around New Jersey. In determining steam losses, the trap orifices and steam pressures have been grouped and averaged to create a simpler statistical basis.

Changes in Infrastructure

Existing steam traps will be repaired or replaced with new traps of similar size and type.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from reduced fuel energy usage and better occupant comfort.
Waste Production	Existing traps will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 10A
Kitchen Hood Controllers

Existing Conditions

The kitchens in the Voorhees and North Hunterdon High Schools currently utilize a constant volume kitchen exhaust hood system. This system operates at full load, even when there is no activity in the kitchen. It also requires operating the exhaust fan at full load. This not only wastes fan energy, but also the heating energy. When the hood is not utilized, an opportunity exists to reduce airflow, and consequently, conserves energy.

School ID	Kitchen Hood Exhaust	Total
Voorhees High School	2	2
North Hunterdon High School	1	1

Proposed System and Scope of Work

Honeywell recommends installing an automated DDC control system to control the hood exhaust fan, to ensure the optimal hood performance and to conserve energy. The control system will include the input/output processor, and keypad. Variable frequency drives will be mounted on the utility cabinet. The temperature sensor will be mounted in the exhaust duct and the optic sensor will be mounted inside the ends of the hood. The following schools are included in our proposal:

The generalized scope of work is as follows:

- Install a variable speed drive in a NEMA approved enclosure for the kitchen hood exhaust fan
- Reconfigure existing power wiring through the variable speed drives
- Provide a motion sensor and an optical sensor at the kitchen exhaust hood to determine use
- Provide variable speed drive control points for start/stop, speed and alarm
- Provide control logic and software to accomplish sequences and incorporate into DDC system
- Commission control components and sequences, and calibrate control loops

Energy Savings Methodology and Results

The savings approach is based upon reducing the amount of conditioned air that is being exhausted when there is no cooking taking place.

The savings are generally calculated as:

Existing Heating BTU & Cost per BTU	= Metered Data from Existing meter readings
Cost of Existing Heating	= Average Site Data $/CCF or $/Gallon
Reduction in Heating BTU	= Exhaust air cfm x 1.08 x Delta T x Hours the fan is off.
Cost of Proposed Heating	= Existing BTU x Cost per BTU
Energy Savings $	= Existing Heating Costs – Proposed Heating Costs

The baseline adjustment calculations are included with the energy calculations.

Changes in Infrastructure

There will be improvements in HVAC equipment and controls for not operating fans continuously.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from reduced energy.
Waste Production	Any removed parts will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 10B
Walk-In Freezer and Cooler Controllers

Existing Conditions
In many refrigeration walk-in freezers and coolers, the compressor is oversized and cycles on/off frequently. This compressor cycling results in higher energy consumption and may reduce the life of the compressor.

The quantity of freezers and coolers with locations are in the table below:

School ID	Walk-in Freezers	Walk-in Refrigerators	Total
Voorhees High School	1	1	2
North Hunterdon High School	1	1	2

Proposed Solution
Under this proposal, Honeywell will install a controller refrigeration sensor at above mentioned schools as made by Intellidyne, to reduce the compressor cycles of the kitchen walk-in coolers and freezer. The installation of this ECM will have no negative impact on system operation and freezing of food products. By reducing the cycling, the sensor will improve operating efficiency and reduce the electric consumption by nearly 10% to 20%.

Generally, in the event of a compressor failure for the kitchen walk-in freezer; an audible alarm will sound from the panel located outside of the freezer. When this alarm occurs, a bypass switch on the controller located at the condensing unit on the roof should be toggled to place the compressor under normal operation. Once the failure has been corrected, the bypass switch should be toggled back to its original position to resume the controller operation.

This control enhancement will save energy through the reduced compressor cycling in the kitchen walk-in coolers and freezer and will extend the operating life of the compressor. Consequently, the compressor will not have to be replaced as often.

Intellidyne Features

- 15 Year full replacement warranty
- Automatic restart on power failure
- Surge protection incorporated into circuitry
- Fully compatible with all energy management systems
- UL Listed
- NYSERDA Tested
- Maintenance Free

Intellidyne Benefits

- Patented process reduces air conditioning electric consumption typically 10% to 20%
- UL listed, "Energy Management Equipment"
- Increased savings without replacing or upgrading costly system components
- "State-of-the-art" microcomputer controller – LED indicators show operating modes
- Protects compressor against momentary power outages and short cycling
- Simple 15-minute installation by qualified installer
- No programming or follow-up visits required
- Maximum year-round efficiency
- Reduces maintenance and extends compressor life
- Fail-safe operation
- Guaranteed to save energy
- 15-year replacement warranty for breakdowns or defects

Intellidyne's patented process determines the cooling demand and thermal characteristics of the entire air conditioning system by analyzing the compressor's cycle pattern, and dynamically modifies that cycle pattern to provide the required amount of cooling in the most efficient manner. This is accomplished in real-time by delaying the start of the next compressor "on" cycle, by an amount determined by the cooling demand analysis. These new patterns also result in less frequent and more efficient compressor cycles.

Changes in Infrastructure

None

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from reduced energy.
Waste Production	Any removed parts will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 10C
Kitchen Pre Rinse Sprayer

Existing Conditions
The pre-rinse sprayers are used in both High School kitchens. These devices are utilized to wash the dishware of major food debris before being placed in the dishwasher.

Proposed System
Honeywell proposes to reduce domestic water heating and consumption by replacing standard flow kitchen sprayers with low flow equivalents. Newer nozzles on the market consume 1.42 gpm or less as compared to older models which consume up to 4.5 gpm. Replacing the existing spray nozzles will result in a reduction in water use along with fossil fuel energy savings due to more efficient hot water use.

Benefits
The low flow sprayer will enhance facility operations by reducing overall water usage. District staff will notice no reduction in operational capabilities as a result of implementing this measure.

Scope of Work:

The Scope of work may include but is not be limited to the following:

- Select sprayer to work with existing kitchen equipment
- Shut off water service to existing sprayer during installation
- Remove existing sprayer and install new.
- Establish water service back to kitchen unit

Energy Savings Methodology and Results
The energy savings for this ECM are realized due to savings in water usage and fossil fuel usage in making hot water.

Changes in Infrastructure

None.

Customer Support and Coordination with Utilities

Minimal coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced Domestic Hot Water Usage.
Waste Production	Old spray nozzles will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 11A
Demand Response

Overview
Honeywell proposes to utilize a registered Demand Response Curtailment Service Provider (CSP) to provide energy response services to the Voorhees/North Hunterdon High Schools. Through the CSP, the Voorhees/North Hunterdon High Schools will participate in the PJM Capacity Market Program and PJM Energy Efficiency Program. These programs are offered through the PJM Regional Transmission Organization (RTO), and Independent System Operator (ISO). The Capacity Market Program allows PJM customers the ability to respond to capacity emergencies when called upon by PJM, and the energy efficiency program pays PJM customers for implementing Energy Conservation measures (ECMs) that result in permanent load reductions during defined hours.

Proposed System
Honeywell proposes to work with a PJM Regional Transmission Organization (RTO), CSR to implement a Demand Response energy curtailment program which will generate revenue streams for the District. The PJM programs offer the District to the ability to respond to capacity emergencies when called upon by PJM, and benefit from permanent kW load reductions associated with implementing Energy Efficiency (EE) improvements. Honeywell's Demand Response agent acting as the CSP, will notify the district prior to potential events in order to advise and coordinate load curtailment participation in accordance with RTO program requirements, and will work with the District to benefit from EE Improvements. The PJM Markets are further described below.

PJM Capacity Market Program
Capacity represents the need to have adequate resources to ensure that the demand for electricity can be met times. For PJM, that means that a utility or other electricity supplier, load serving entity, is required to have the resources to meet its consumers' demand plus a reserve amount. Electricity suppliers, load serving entities, can meet that requirement by owning and operating generation capacity, by purchasing capacity from others or by obtaining capacity through PJMs capacity market auctions. PJM operates a capacity market, called the Reliability Pricing Model (RPM). It is designed to ensure that adequate resources are available to meet the demand for electricity at all times. In the RPM, those resources include not only generating stations, but also demand response actions and energy efficiency measures by consumers to reduce their demand for electricity.

PJM must keep the electric grid operating in balance by ensuring there is adequate generation of electricity to satisfy the demand for electricity at every location in the region both now and in the future. PJM's markets for energy and ancillary services help maintain the balance now while the PJM market for capacity aims to keep the system in balance in the future. Resources, even if they operate infrequently, must receive enough revenue to cover their costs. Payments for capacity provide a revenue stream to maintain and keep current resources operating and to develop new resources.

Investors need sufficient long-term price signals to encourage the maintenance and development of generation, transmission and demand-side resources. The RPM, based on making capacity commitments in advance of the energy need, creates a long-term price signal to attract needed investments for reliability in the PJM region.

The PJM Energy Efficiency Program

Energy efficiency measures consist of installing more efficient devices or implementing more efficient processes/systems that exceed then-current building codes or other relevant standards. An energy efficiency resource must achieve a permanent, continuous reduction in demand for electricity. Energy efficiency measures are fully implemented throughout the delivery year without any requirement of notice, dispatch, or operator intervention. A demand response resource can reduce its demand for electricity when instructed; this means PJM considers it a "dispatchable resource". A demand response resource can participate in the RPM market for as long as its ability to reduce its demand continues. A demand response resource must be willing to reduce demand for electricity up to 10 times each year when called for a reduction. In a year without any reduction calls, the demand response resource is required to demonstrate the ability to reduce demand for electricity during a test of reduction capability. Data will be submitted by the demand response resource to prove compliance with reductions from actual calls or reductions from capability tests. An energy efficiency resource is one that reduced their demand for electricity through an energy efficiency measure that does not require any additional action by the consumer.

Energy Savings Methodology and Results

The energy savings for this ECM are realized due to savings in electric usage during scheduled load shedding periods.

Changes in Infrastructure

None.

Customer Support and Coordination with Utilities

Minimal coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced Electric Usage during scheduled periods.
Waste Production	None.
Environmental Regulations	No environmental impact is expected.

ECM 12A
Water Conservation

Existing Conditions

Currently North Hunterdon High School purchases its water and sewer through the local municipal authority and is charged a fee for these services. Voorhees High School is serviced through a well system. The only cost associated with this type of system is the upkeep and maintenance of the wells and their ancillary equipment which is minimal.

Water usage models have been developed to project how water is used based on the operating hours, number of students, activities and other collected information. Data collected, interviews with the building occupants and experience have provided a calculated estimate for water saving opportunities. The majority of the water fixtures are old compare to the low flow technology that is available today.

Proposed System

Although flow technology is the same throughout, a variety of china configurations were encountered and are recommended for retrofit or replacement with like equipment.

North Hunterdon HS:

- All 3.5 gallon per flush (gpf) toilet china is recommended for replacement with new 1.28 gpf HET vitreous toilet china.
- All existing 1.6 gpf low-flow toilet china does not require replacement.
- All existing diaphragm type valves are recommended for replacement with 1.28 gpf piston type valves for toilets, and 1.0 gpf piston type valves (with set screw adjusted at 0.8 gpf) for urinals.
- Sensored valves are specified only where currently existing.
- All lavatory faucets are recommended for retrofit with new 0.5 gpm aerator flow controls
- All kitchen/lab style faucets are recommended for retrofit with 1.0 gpm laminar flow controls.
- All showerheads are recommended for replacement with new 1.5 gpm low-flow pressure compensating showerheads.
- Handheld units are specified where currently existing.

Scope of Work:

Toilets

High flow toilets will be replaced with new 1.6 gpf toilets. New 1.6 gpf china will be installed where appropriate and existing flushometers will be replaced or retrofit with 1.6 gpf flush valves. A typical toilet replacement with flush valve retrofit and maintenance upgrade includes the following major components:

- 1.6 gpf in kind china replacement
- New outlet seals and closet bolts if applicable
- New toilet seats with stainless steel hardware
- New (Sloan or equivalent) 1.6 gpf flush valves or retrofit kit
- Stop valve replacement anticipated for many toilet flush valves where required. If additional work is required due to faulty stop valves or isolation valves, it will be considered an extra cost.
- Flange and carrier replacement or repair work is not anticipated and is not included in this scope. Should such work be required, it will be considered an extra cost.

Urinals

- High flow urinals will be retrofit with new 1.0 gpf flush valve diaphragms. Urinal china will remain in place. A typical urinal flush valve retrofit and maintenance upgrade includes the following major components:
- New (Sloan or equivalent) 1.0 gpf flush valve retrofit kit
- Existing china is to remain in place
- Stop valve replacement anticipated for many toilet flush valves where required. If additional work is required due to faulty stop valves or isolation valves, it will be considered for an extra cost.
- Flange and carrier replacement or repair work is not anticipated and is not included in this scope. Should such work be required, it will be considered an extra cost

Bathroom Sinks

High flow sink faucets will be retrofit with new tamper resistant, 0.5 gpm, laminar faucet flow restrictors.

Energy Savings Methodology and Results

Domestic water savings depend on the volume of water used per toilet, urinal, or sink use, the number of people using the bathrooms, and the frequency of use. Existing and proposed domestic water consumption has been calculated based on demographic information supplied by facility personnel and the occupancy assumptions listed in the Appendix. Thermal energy savings for sinks are based on the following assumptions: the ratio of hot-to-cold water use, average hot and cold water temperatures, and boiler efficiency.

Calculation Methodology – Bathroom Fixture Retrofit:

Frequency of Use	=	Number of users x % year-round occupancy x fixture uses/day/person
Water Savings (gal/yr)	=	Frequency of Use x (Baseline – Estimated Flow Rate) (gpm or gpf per fixture) x days/year x % high-flow fixtures
Sink Energy Savings (MMbtu/yr)	=	Water Savings (gal/yr) x (T_{mixed} -T_{cold}) (°F) x (1 Btu/lb °F X 8.34 (lb/gal) x 1/boiler efficiency X 1 MMBtu/1,000,000Btu
Cost Savings ($/yr)	=	[Water Savings Toilets and Urinals + Water Savings Sinks] (kgal/yr) x [water rate + sewer rate] ($/kgal) + [(Sink Energy Savings (MMbtu/yr)] x Thermal Rate ($/MMbtu)]

Changes in Infrastructure

None.

Customer Support and Coordination with Utilities

Minimal coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Water savings will result from lower water flows through new fixtures.
Waste Production	Old fixtures will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 12B
Roof Replacements

Existing Conditions

The roofs installed at both North Hunterdon High School (partial sections) and Voorhees High School are beyond their useful and should be replaced, especially if the District is considering putting adding solar panels. The heat loss and heat gains occur due to low R-value of the existing roof insulation will be improved through the replacement with energy efficient roofing materials. Additionally the rate of infiltration that occurs due to the leakage on the roof around perimeters and equipment curbing is also a major cause of energy loss.

The upgrade will result in improved savings and comfort for those affected in the building. The District also wishes that these roofs be replaced Honeywell proposes the installation of new energy efficient, double-paned windows to reduce infiltration, infrared and conductive losses. Overall, through the implementation of this measure the school will reduce its heating fuel usage and air conditioning costs each year.

Proposed System

- North Hunterdon HS - Replace a total of approximately 160,000 SF of roof surface roof system consists of a smooth-surfaced built-up over ¾" of perlite coverboard over 2" polyisocyanurate insulation (or equal).
- Voorhees HS - Replace a total of approximately 130,000 SF of roof surface roof system consists of a smooth-surfaced built-up over ¾" of perlite coverboard over 2" polyisocyanurate insulation (or equal).

Energy Savings Methodology and Results

Following approach is used to determine savings for this specific measure:

Existing Roof Efficiency	= Existing U + Existing Infiltration Rate
Proposed Roof Efficiency	= Proposed U + Proposed Infiltration Rate
Energy Savings (Btu)	= UAdTproposed – UAdTexisting
Winter Savings(Therms)	= Energy Savings/Boiler Eff./100,000
Summer Savings (Tons Cooling)	= Energy Savings/12,000 Btu/Ton

Interface with Building:
The new roofs will be constructed to match existing, maintaining contours of the existing building.

Energy Savings Methodology and Results
The energy savings for this ECM are realized at the buildings' HVAC equipment. The improved building envelope will limit conditioned air infiltration through openings in the building air barrier. Less infiltration means less heating and cooling required by HVAC systems.

Changes in Infrastructure
Building envelopes will be improved with little or no noticeable changes.

Customer Support and Coordination with Utilities
Minimal coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced HVAC energy usage and better occupant comfort.
Waste Production	Existing roof materials will be removed and disposed of properly.
Environmental Regulations	No environmental impact is expected.

Financial Analysis
Section C

Financial Analysis - Overview

In the development of an Energy Savings Plan (ESP) in accordance with PL 2009, c.4, it is important to identify energy conservation measures (ECM's) that may be implemented now or at some point in the future. The law outlines the responsibility to identify the opportunities and then proceed forward based on the needs and requirements of the School District, while building a self funding comprehensive project. If an ECM is not identified as part of this ESP, it cannot be implemented as part of an Energy Savings Improvement Program (ESIP) without a board amended change to the ESP.

It is the intent of this financial analysis to identify ALL potential ECM's within the North Hunterdon - Voorhees Regional High School District as part of a comprehensive ESP. It does not mean that all the ECM's need to be or can be implemented at this time if the requirements of the legislation are not met. However, so long as the ECM is part of this plan, it may be implemented at a later date as additional funding becomes available or technology changes in order to provide an improved financial return.

Should the Board of Education adopt this ESP, the next step is to develop a priority list of ECM's complete with a financial return that meets the requirement of the law and satisfy's the energy and operational goals of your district.

A collaborative project development agreement (PDA) between Honeywell and the North Hunterdon - Voorhees Regional School District School will be developed to establish the minimum criteria for the project as well as outline a specific time line to implement the program.

The following spreadsheets are part of this financial overview.

- **Simple Payback** – This is an overview of the projects we identified by ECM with cost and savings identified per project. It is important to understand that economies can be achieved by combining projects; however for the purpose of clarity we have separated each.

- **Financial Cash Flow** – This is a 15 year cash flow with the costs, savings and financing for ALL the projects identified in this plan. As ECM's are prioritized, selected and projects are combined, this cash flow will change. However, the law requires that all savings must pay for costs, including financing.

North Hunterdon - Voorhees Regional School District
All Energy Plan ECM's Identified
With State AID

Honeywell

Energy Conservation Measures Considered									
ECM	Description	Total Cost	State Aid	PJM Revenue	SREC Revenue	Energy Savings	Operational Savings	Total Savings	Simple Payback
1A	Lighting Retrofit and Motion Sensors	251,350				33,669	$11,432	$45,101	7.69
1B	Vending Misers	11,600				6,758		$6,758	2.37
2A	New Burner Controllers	120,000				12,272		$12,272	13.49
2B	DHW Heater Replacements	50,000				1,028		$1,028	67.12
2C	AHU Replacements	430,000	$237,360			28,591	$6,000	$34,591	10.29
2D	Converting Heating System from Electric to Gas	3,000,000	$1,656,000			193,718		$193,718	12.82
2E	Non Chemical Water Treatment	90,000				1,149	$12,500	$13,649	9.10
2F	RTU Replacements	640,588	$353,604			41,556	$6,500	$48,056	11.04
3A	Building Management System Upgrades	325,000				75,101	$15,000	$90,101	4.98
3B	Demand Control Ventilation	100,000				21,343		$21,343	6.47
3C	Chiller Replacement	900,000	$496,800			3,968		$3,968	187.78
4A	Constant Volume Multi-Zone Units to VVT	325,000	$179,400			59,022	$6,500	$65,522	4.11
5A	Building Envelope Improvements	100,000				8,505	$8,000	$16,505	8.36
6A	Computer Controllers	16,000				20,926		$20,926	1.06
7A	Transformer Replacements	205,000				24,006		$24,006	11.78
7B	Install Premium Efficient Motors	77,600				2,459	$4,000	$6,459	16.58
7C	Variable Speed Drives on Pump Motors	29,000				3,778		$3,778	10.59
8A	Install Photovoltaic System	7,290,000			$574,933	148,316		$723,249	13.91
8B	Wind Power	480,000				4,744		$4,744	139.64
8C	Geothermal	7,876,187				220,577		$220,577	49.28
9A	Steam Trap Repair	44,700				13,242		$13,242	4.66
10A	Kitchen Hood Controllers	45,000				4,265		$4,265	14.56
10B	Walk-In Freezer Controllers	8,000				2,026		$2,026	5.45
10C	Kitchen Pre Rinse Sprayer	4,000				368		$368	14.98
10D	Kitchen Sink Pedal Valves	14,000				389		$389	49.73
11A	Demand Response	-		$70,560		70,560		$141,120	0.00
12A	Water Conservation	70,000				1,904		$1,904	37.76
12B	Roof Replacements	3,915,000	$2,161,080			10,862		$10,862	298.44
	Construction Cost	26,418,024							
	ESCO Fee	10,038,849							
	Total of All ECM's Considered	36,456,874							

Honeywell

North Hunterdon - Voorhees Regional School District
Recommended ECM's
Scenario A

Energy Conservation Measures Considered									
ECM	Description	Total Cost	State Aid	PJM Revenue	SREC Revenue	Energy Savings	Operational Savings	Total Savings	Simple Payback
1A	Lighting Retrofit and Motion Sensors	251,350				33,669	$11,432	$45,101	7.91
1B	Vending Misers	11,600				6,758		$6,758	2.44
2A	New Burner Controllers	120,000				12,272		$12,272	13.89
2B	DHW Heater Replacements	50,000				1,028		$1,028	69.07
2C	AHU Replacements	430,000	$244,240			28,591	$6,000	$34,591	10.59
2D	Converting Heating System from Electric to Gas	3,000,000	$1,704,000			193,718	$2,500	$196,218	13.03
2E	Non Chemical Water Treatment	90,000				1,149	$12,500	$13,649	9.36
2F	RTU Replacements	640,588	$363,854			41,556	$6,500	$48,056	11.36
3A	Building Management System Upgrades	325,000				75,101	$15,000	$90,101	5.12
3B	Demand Control Ventilation	100,000				21,343		$21,343	6.65
3C	Chiller Replacement	900,000	$511,200			22,119	$6,500	$28,619	26.79
4A	Constant Volume Multi-Zone Units to VVT	325,000	$184,600			59,022	$8,000	$67,022	4.13
5A	Building Envelope Improvements	100,000				8,505		$8,505	16.70
6A	Computer Controllers	16,000				20,926		$20,926	1.09
7A	Transformer Replacements	205,000				24,006		$24,006	12.13
7B	Install Premium Efficient Motors	77,600				2,459	$4,000	$6,459	17.06
7C	Variable Speed Drives on Pump Motors	29,000				3,778		$3,778	10.90
8A	Install Photovoltaic System	7,290,000			$574,933	148,316		$723,249	14.31
9A	Steam Trap Repair	44,700				13,242		$13,242	4.79
10A	Kitchen Hood Controllers	45,000				4,265		$4,265	14.98
10B	Walk-In Freezer Controllers	8,000				2,026		$2,026	5.61
10C	Kitchen Pre Rinse Sprayer	4,000				368		$368	15.42
10D	Kitchen Sink Pedal Valves	14,000				389		$389	51.17
11A	Demand Response	-		$70,560		70,560		$141,120	0.00
12B	Roof Replacements	3,915,000	$2,223,720			10,862		$10,862	307.09
	Construction Cost	17,991,837							
	ESCO Fee	7,556,572							
	Sub Total Project	**25,548,409**	5,231,614	70,560	574,933	806,026	72,432	1,523,951	13.33
	One Time Rebates(P4P)	**1,336,484**							
	Total	**$24,211,925**	5,231,614	70,560	574,933	806,026	72,432	$1,523,951	12.45

North Hunterdon - Voorhees Regional School Ditstrict
Scenario A

Honeywell

Cash Flow

Capital Cost	$24,828,736	Payments Annually, in arrears
State Aid	$5,084,244	
Financed Amount	$20,316,795	Savings will afford $19,283,587.53 in Capital Cost
Interest Rate	4.50%	
Term	15 years	
Annual Energy Escalation	3.00%	

Year Installation	Annual Energy Savings	Annual Operational Savings	Energy Rebate/PJM Solar Incentives/Revenue	Total Annual Savings/Revenue	Annual Project Costs	Guarantee/M&V Costs *	Potential Service Cost**	Annual Cash Flow
	$0	$0	$58,630	$58,630	$0	$0		$58,630
1	$806,026	$72,432	$1,398,855	$2,277,313	$1,865,065.42	$12,511	$27,850	$412,248
2	$830,207	$72,432	$1,172,562	$2,075,201	$1,865,065.42	$12,761	$28,686	$210,135
3	$855,113	$70,259	$645,493	$1,570,865	$1,865,065.42	$13,016	$29,546	($294,200)
4	$880,766	$68,151	$645,493	$1,594,411	$1,865,065.42	$13,277	$30,432	($270,655)
5	$907,189	$66,107	$645,493	$1,618,789	$1,865,065.42	$13,542	$31,345	($246,276)
6	$934,405	$59,496	$645,493	$1,639,394	$1,865,065.42	$13,813	$32,286	($225,671)
7	$962,437	$53,546	$645,493	$1,661,477	$1,865,065.42	$14,089	$33,254	($203,589)
8	$991,310	$48,192	$645,493	$1,684,995	$1,865,065.42	$14,371	$34,252	($180,070)
9	$1,021,050	$43,373	$645,493	$1,709,915	$1,865,065.42	$14,659	$35,280	($155,150)
10	$1,051,681	$39,035	$645,493	$1,736,209	$1,865,065.42	$14,952	$36,338	($128,856)
11	$1,083,232	$27,325	$645,493	$1,756,049	$1,865,065.42	$15,251	$37,428	($109,016)
12	$1,115,728	$19,127	$645,493	$1,780,349	$1,865,065.42	$15,556	$38,551	($84,717)
13	$1,149,200	$13,389	$645,493	$1,808,082	$1,865,065.42	$15,867	$39,707	($56,983)
14	$1,183,676	$9,372	$645,493	$1,838,542	$1,865,065.42	$16,184	$40,899	($26,524)
15	$1,219,187	$6,561	$645,493	$1,871,240	$1,865,065.42	$16,508	$42,126	$6,175
Totals	$14,991,208	$668,798	$11,021,456	$26,681,462	$27,975,981.29	$216,358	$517,980	($1,294,519)

* indicates optional and not included in final cash flow
** indicates optional may require public bid, not included in final cash flow

North Hunterdon - Voorhees Regional School District
Recommended ECM's
Scenario B

Honeywell

Energy Conservation Measures Considered									
ECM	Description	Total Cost	State Aid	PJM Revenue	SREC Revenue	Energy Savings	Operational Savings	Total Savings	Simple Payback
1A	Lighting Retrofit and Motion Sensors	$251,350				$33,669	$11,432	$45,101	7.91
1B	Vending Misers	$11,600				$6,758		$6,758	2.44
2A	New Burner Controllers	$120,000				$12,272		$12,272	13.89
2B	DHW Heater Replacements	$50,000				$1,028		$1,028	69.07
2C	AHU Replacements	$430,000				$28,591	$6,000	$34,591	17.65
2D	Converting Heating System from Electric to Gas	$3,000,000				$193,718	$2,500	$196,218	21.71
2E	Non Chemical Water Treatment	$90,000				$1,149	$12,500	$13,649	9.36
2F	RTU Replacements	$640,588				$41,556	$6,500	$48,056	18.93
3A	Building Management System Upgrades	$325,000				$75,101	$15,000	$90,101	5.12
3B	Demand Control Ventilation	$100,000				$21,343		$21,343	6.65
3C	Chiller Replacement	$900,000				$22,119	$6,500	$28,619	44.66
4A	Constant Volume Multi-Zone Units to VVT	$325,000				$59,022	$8,000	$67,022	6.89
5A	Building Envelope Improvements	$100,000				$8,505		$8,505	16.70
6A	Computer Controllers	$16,000				$20,926		$20,926	1.09
7A	Transformer Replacements	$205,000				$24,006		$24,006	12.13
7B	Install Premium Efficient Motors	$77,600				$2,459	$4,000	$6,459	17.06
7C	Variable Speed Drives on Pump Motors	$29,000				$3,778		$3,778	10.90
9A	Steam Trap Repair	$44,700				$13,242		$13,242	4.79
10A	Kitchen Hood Controllers	$45,000				$4,265		$4,265	14.98
10B	Walk-In Freezer Controllers	$8,000				$2,026		$2,026	5.61
10C	Kitchen Pre Rinse Sprayer	$4,000				$368		$368	15.42
11A	Demand Response	$0		$70,560		$0		$70,560	0.00
	Construction Cost	$6,772,837							
	ESCO Fee	$2,844,592							
	Sub Total Project	**$9,617,429**	$0	$70,560	$0	$575,900	$72,432	$718,892	13.38
	One Time Rebates(P4P)	**$1,336,484**							
	Total	**$8,280,945**		$70,560	$0	$575,900	$72,432	$718,892	11.52

North Hunterdon - Voorhees Regional School District
Recommended ECM's
Scenario B
With State Aid

Honeywell

Energy Conservation Measures Considered									
ECM	Description	Total Cost	State Aid	PJM Revenue	SREC Revenue	Energy Savings	Operational Savings	Total Savings	Simple Payback
1A	Lighting Retrofit and Motion Sensors	251,350	$0			33,669	$11,432	$45,101	7.91
1B	Vending Misers	11,600				6,758		$6,758	2.44
2A	New Burner Controllers	120,000				12,272		$12,272	13.89
2B	DHW Heater Replacements	50,000				1,028		$1,028	69.07
2C	AHU Replacements	430,000	$244,240			28,591	$6,000	$34,591	10.59
2D	Converting Heating System from Electric to Gas	3,000,000	$1,704,000			193,718		$193,718	13.19
2E	Non Chemical Water Treatment	90,000				1,149	$12,500	$13,649	9.36
2F	RTU Replacements	640,588	$363,854			41,556	$6,500	$48,056	11.36
3A	Building Management System Upgrades	325,000				75,101	$15,000	$90,101	5.12
3B	Demand Control Ventilation	100,000				21,343		$21,343	6.65
3C	Chiller Replacement	900,000	$511,200			22,119	$6,500	$28,619	26.79
4A	Constant Volume Multi-Zone Units to VVT	325,000	$184,600			59,022	$8,000	$67,022	4.13
5A	Building Envelope Improvements	100,000				8,505		$8,505	16.70
6A	Computer Controllers	16,000				20,926		$20,926	1.09
7A	Transformer Replacements	205,000				24,006		$24,006	12.13
7B	Install Premium Efficient Motors	77,600				2,459	$4,000	$6,459	17.06
7C	Variable Speed Drives on Pump Motors	29,000				3,778		$3,778	10.90
9A	Steam Trap Repair	44,700				13,242		$13,242	4.79
10A	Kitchen Hood Controllers	45,000				4,265		$4,265	14.98
10B	Walk-In Freezer Controllers	8,000				2,026		$2,026	5.61
10C	Kitchen Pre Rinse Sprayer	4,000				368		$368	15.42
11A	Demand Response	-		$70,560		70,560		$141,120	0.00
	Construction Cost	6,772,837							
	Esco fee	2,844,592							
	Sub Total Project	**9,617,429**	3,007,894	70,560	-	646,460	69,932	786,952	8.40
	One Time Rebates(P4P)	**1,336,484**							
	Total	**$8,280,945**	3,007,894	70,560	-	646,460	69,932	$786,952	6.70

North Hunterdon - Voorhees Regional School District
Scenario B
No State Aid

Honeywell

Cash Flow

Capital Cost	$9,617,429	Payments Annually, in arrears
Interest Rate	4.50%	
Term	15 years	
Annual Energy Escalation	3.00%	

Year Installation	Annual Energy Savings	Annual Operational Savings	Energy Rebate/PJM Solar Incentives/Revenue	Total Annual Savings/Revenue	Annual Project Costs	Guarantee/M&V Costs *	Potential Service Cost**	Annual Cash Flow
	$0	$0	$56,053	$56,053	$0	$0		$56,053
1	$575,900	$72,432	$823,922	$1,472,254	$882,872.24	$12,511	$27,850	$589,382
2	$593,177	$72,432	$597,629	$1,263,238	$882,872.24	$12,761	$28,686	$380,366
3	$610,972	$70,259	$70,560	$751,791	$882,872.24	$13,016	$29,546	($131,081)
4	$629,301	$68,151	$70,560	$768,013	$882,872.24	$13,277	$30,432	($114,859)
5	$648,181	$66,107	$70,560	$784,847	$882,872.24	$13,542	$31,345	($98,025)
6	$667,626	$59,496	$70,560	$797,682	$882,872.24	$13,813	$32,286	($85,190)
7	$687,655	$53,546	$70,560	$811,761	$882,872.24	$14,089	$33,254	($71,111)
8	$708,284	$48,192	$70,560	$827,036	$882,872.24	$14,371	$34,252	($55,836)
9	$729,533	$43,373	$70,560	$843,466	$882,872.24	$14,659	$35,280	($39,407)
10	$751,419	$39,035	$70,560	$861,014	$882,872.24	$14,952	$36,338	($21,858)
11	$773,961	$27,325	$70,560	$871,846	$882,872.24	$15,251	$37,428	($11,026)
12	$797,180	$19,127	$70,560	$886,868	$882,872.24	$15,556	$38,551	$3,995
13	$821,096	$13,389	$70,560	$905,045	$882,872.24	$15,867	$39,707	$22,173
14	$845,729	$9,372	$70,560	$925,661	$882,872.24	$16,184	$40,899	$42,789
15	$871,100	$6,561	$70,560	$948,221	$882,872.24	$16,508	$42,126	$65,349
Totals	$10,711,115	$668,798	$2,394,884	$13,774,796	$13,243,083.56	$216,358	$517,980	$531,713

* indicates optional and not included in final cash flow
** indicates optional may require public bid, not included in final cash flow

North Hunterdon - Voorhees Regional School District
Recommended ECM's
Scenario C

Honeywell

Energy Conservation Measures Considered								
ECM	Description	Total Cost	PJM Revenue	SREC Revenue	Energy Savings	Operational Savings	Total Savings	Simple Payback
1A	Lighting Retrofit and Motion Sensors	$251,350			$33,669	$11,432	$45,101	7.91
1B	Vending Misers	$11,600			$6,758		$6,758	2.44
2A	New Burner Controllers	$120,000			$12,272		$12,272	13.89
2B	DHW Heater Replacements	$50,000			$1,028		$1,028	69.07
2C	AHU Replacements	$430,000			$28,591	$6,000	$34,591	17.65
2E	Non Chemical Water Treatment	$90,000			$1,149	$12,500	$13,649	9.36
2F	RTU Replacements	$640,588			$41,556	$6,500	$48,056	18.93
3A	Building Management System Upgrades	$325,000			$75,101	$15,000	$90,101	5.12
3B	Demand Control Ventilation	$100,000			$21,343		$21,343	6.65
3C	Chiller Replacement	$300,000			$3,968	$6,500	$10,468	40.69
4A	Constant Volume Multi-Zone Units to VVT	$325,000			$59,022	$8,000	$67,022	6.89
5A	Building Envelope Improvements	$100,000			$8,505		$8,505	16.70
6A	Computer Controllers	$16,000			$20,926		$20,926	1.09
7A	Transformer Replacements	$205,000			$24,006		$24,006	12.13
7B	Install Premium Efficient Motors	$77,600			$2,459	$4,000	$6,459	17.06
7C	Variable Speed Drives on Pump Motors	$29,000			$3,778		$3,778	10.90
9A	Steam Trap Repair	$44,700			$13,242		$13,242	4.79
10A	Kitchen Hood Controllers	$45,000			$4,265		$4,265	14.98
10B	Walk-In Freezer Controllers	$8,000			$2,026		$2,026	5.61
10C	Kitchen Pre Rinse Sprayer	$4,000			$368		$368	15.42
11A	Demand Response	$0	$70,560		$0		$70,560	0.00
	Construction Cost	$3,172,837						
	ESCO fee	$1,332,592						
	Sub Total Project	**$4,505,429**	$70,560	$0	$364,031	$69,932	$504,523	8.93
	One Time Rebates(P4P)	**$1,135,772**						
	Total	**$3,369,657**	$70,560	$0	$364,031	$69,932	$504,523	6.68

North Hunterdon - Voorhees Regional School District
Scenario C
Cash Flow

Honeywell

Capital Cost	**$4,505,429**		**Payments Annually, in arrears**					
Interest Rate	**4.50%**							
Term	**15 years**							
Annual Energy Escalation	**3.00%**							
Year Installation	**Annual Energy Savings**	**Annual Operational Savings**	**Energy Rebate/PJM Solar Incentives/Revenue**	**Total Annual Savings/Revenue**	**Annual Project Costs**	**Guarantee/M&V Costs ***	**Potential Service Cost****	**Annual Cash Flow**
	$0	$0	$56,053	$56,053	$0	$0		**$56,053**
1	$364,031	$69,932	$703,806	$1,137,769	$413,594.75	$12,511	$21,450	**$724,174**
2	$374,952	$69,932	$517,033	$961,917	$413,594.75	$12,761	$22,094	**$548,322**
3	$386,200	$67,834	$70,560	$524,595	$413,594.75	$13,016	$22,756	**$111,000**
4	$397,787	$65,799	$70,560	$534,146	$413,594.75	$13,277	$23,439	**$120,551**
5	$409,720	$63,825	$70,560	$544,105	$413,594.75	$13,542	$24,142	**$130,510**
6	$422,012	$57,443	$70,560	$550,014	$413,594.75	$13,813	$24,866	**$136,419**
7	$434,672	$51,698	$70,560	$556,930	$413,594.75	$14,089	$25,612	**$143,336**
8	$447,712	$46,528	$70,560	$564,801	$413,594.75	$14,371	$26,381	**$151,206**
9	$461,144	$41,876	$70,560	$573,579	$413,594.75	$14,659	$27,172	**$159,984**
10	$474,978	$37,688	$70,560	$583,226	$413,594.75	$14,952	$27,987	**$169,631**
11	$489,227	$26,382	$70,560	$586,169	$413,594.75	$15,251	$28,827	**$172,574**
12	$503,904	$18,467	$70,560	$592,931	$413,594.75	$15,556	$29,692	**$179,336**
13	$519,021	$12,927	$70,560	$602,508	$413,594.75	$15,867	$30,583	**$188,913**
14	$534,592	$9,049	$70,560	$614,201	$413,594.75	$16,184	$31,500	**$200,606**
15	$550,630	$6,334	$70,560	$627,524	$413,594.75	$16,508	$32,445	**$213,929**
Totals	$6,770,581	$645,714	$2,194,172	$9,610,467	$6,203,921.25	$216,358	$398,947	**$3,406,546**

* indicates optional and not included in final cash flow
** indicates optional may require public bid, not included in final cash flow

Energy Calculations
Section D

GHG Summary

Honeywell

ECM No.	ECM Description	Electric Savings kWh	Natural Gas Savings Therms	GHG Tons CO2	Equivalent Cars/yr	Equivalent Forested Acres/yr
1A	Lighting Retrofit and Motion Sensors	233,355	(1,828)	127	22.3	13.4
1B	Vending Misers	42,755		25	4.4	2.7
2A	New Burner Controllers		10,577	62	10.8	6.5
2B	DHW Heater Replacements		790	5	0.8	0.5
2C	AHU Replacements	153,013	2,290	104	18.2	10.9
2D	Converting Heating System from Electric to	1,542,504	(55,456)	589	102.8	62.0
2E	Non Chemical Water Treatment	7,341		4	0.8	0.5
2F	RTU Replacements	221,304	4,073	155	27.0	16.3
3A	Building Management System Upgrades	327,758	19,892	310	54.2	32.7
3B	Demand Control Ventilation	8,775	16,218	100	17.5	10.5
3C	Chiller Replacement	24,872		15	2.6	1.5
4A	Constant Volume Multi-Zone Units to VVT	277,050	12,027	234	40.9	24.7
5A	Building Envelope Improvements		7,017	41	7.2	4.3
6A	Computer Controllers	132,088		78	13.7	8.2
7A	Transformer Replacements	152,300		90	15.7	9.5
7B	Install Premium Efficient Motors	15,708		9	1.6	1.0
7C	Variable Speed Drives on Pump Motors	24,132		14	2.5	1.5
8A	Install Photovoltaic System	939,058		556	97.1	58.5
8B	Wind Power	30,014		18	3.1	1.9
8C	Geothermal	785,263	80,786	937	163.7	98.7
9A	Steam Trap Repair		11,798	69	12.1	7.3
10A	Kitchen Hood Controllers	20,415	857	17	3.0	1.8
10B	Walk-In Freezer Controllers	12,813		8	1.3	0.8
10C	Kitchen Pre Rinse Sprayer		302	2	0.3	0.2
10D	Kitchen Sink Pedal Valves		329	2	0.3	0.2
11A	Demand Response	446,239		264	46.1	27.8
12A	Water Conservation		1,696	10	1.7	1.0
12B	Roof Replacements		8,381	49	8.6	5.2
	TOTALS	**5,396,756**	**119,750**	**3,895**	**680.3**	**410.0**

Exhibit G5-1A.1
North Hunterdon Voorhees Regional High School District
ECM -1A Lighting

				Sensor Savings Calculations								
				Saved	Unblended	Estimated	O&M Savings	Total kWh	Total	Derate	Total kWh	Total
BUILDING	kW	kWh	Dollars	kWh	kWh Rate	Savings		Savings	$ Savings		Savings	$ Savings
North Hunterdon High School	43.3	81,975	$13,080	20,494	$0.137	$2,809	$0	102,469	$ 15,888.52	2%	100,419	$15,571
Voorhees High School	51.6	108,519	$16,987	27,130	$0.139	$3,764	$0	135,649	$ 20,751.39	2%	132,936	$20,336
Total KW Saved	**94.9**	**190,494.0**	**$30,067**	**47,623.5**		**$6,573**	**$0**	**238,117.5**	**$36,640**		**233,355.2**	**$35,907**

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	233,355	kwh/yr	0.00059190	Tons/kwh	138.1	Tons CO2/yr	24.126	14.5
Natural Gas	-	mmbtu/yr	0.05850000	Tons/mmBtu	0.0	Tons CO2/yr	-	0.0
Totals					**138.1**		**24.126**	**14.5**

Exhibit G5-1A.2
North Hunterdon Voorhees Regional High School District
ECM -1A Lighting
Building Line-By-Lines

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Lamps	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Proposed Replacement Solution	Prop. Qty of Lamps	Prop. Watts
15	North Hunterdon H.S.	010	028	2X4 recessed troffers/T12 Lamps/Magnetic Ballasts	87	3654	3.65	2,400	8,770	Replace T12 Lamps with T8 Lamps & Replace Magnetic Ballast with Electronic	87	2349
16	North Hunterdon H.S.	010	026	2X4 recessed troffers/T12 Lamps/Magnetic Ballasts	148	6216	6.22	2,400	14,918	Replace T12 Lamps with T8 Lamps & Replace Magnetic Ballast with Electronic	148	3996
17	North Hunterdon H.S.	010	128	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	88	2376	2.38	2,400	5,702	NONE PROPOSED	88	2376
18	North Hunterdon H.S.	010	127	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	84	2268	2.27	2,400	5,443	NONE PROPOSED	84	2268
19	North Hunterdon H.S.	010	126	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
20	North Hunterdon H.S.	010	126	25W Triple Tube Compact Fluorescent	1	29	0.03	2,400	70	NONE PROPOSED	1	29
21	North Hunterdon H.S.	010	Boys Gym	400W MH	28	12824	12.82	2,400	30,778	6-Lamp Fluorescent Highbay	168	4536
22	North Hunterdon H.S.	010	Wrestling Gym	400W MH	12	5496	5.50	2,400	13,190	6-Lamp Fluorescent Highbay	72	1944
23	North Hunterdon H.S.	010	Girls Gym	400W MH	18	8244	8.24	2,400	19,786	6-Lamp Fluorescent Highbay	108	2916
24	North Hunterdon H.S.	010	Auditorium Women's Dressing Room	40W Incandescent Bulb	83	3320	3.32	2,400	7,968	13W CFL	83	1079
25	North Hunterdon H.S.	010	110	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
26	North Hunterdon H.S.	010	114	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
27	North Hunterdon H.S.	010	113	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
28	North Hunterdon H.S.	010	111	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
29	North Hunterdon H.S.	010	129	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	96	2592	2.59	2,400	6,221	NONE PROPOSED	96	2592
30	North Hunterdon H.S.	010	132	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
31	North Hunterdon H.S.	010	S153	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
32	North Hunterdon H.S.	010	S154	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
33	North Hunterdon H.S.	010	S155	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
34	North Hunterdon H.S.	010	S156	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
35	North Hunterdon H.S.	010	Janitors Closet	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	6	162	0.16	500	81	NONE PROPOSED	6	162
36	North Hunterdon H.S.	010	112	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
37	North Hunterdon H.S.	010	Auditorium Men's Dressing Room	40W Incandescent Bulb	70	2800	2.80	2,400	6,720	13W CFL	70	910
38	North Hunterdon H.S.	010	S152	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	33	891	0.89	2,400	2,138	NONE PROPOSED	33	891
39	North Hunterdon H.S.	010	S151	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	54	1458	1.46	2,400	3,499	NONE PROPOSED	54	1458
40	North Hunterdon H.S.	010	S150	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	54	1458	1.46	2,400	3,499	NONE PROPOSED	54	1458
41	North Hunterdon H.S.	010	Athletics Office	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	54	1458	1.46	2,400	3,499	NONE PROPOSED	54	1458
42	North Hunterdon H.S.	010	Library	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	268	7236	7.24	2,400	17,366	NONE PROPOSED	268	7236
43	North Hunterdon H.S.	010	123	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
44	North Hunterdon H.S.	010	124	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	84	2268	2.27	2,400	5,443	NONE PROPOSED	84	2268
45	North Hunterdon H.S.	010	125	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	139	3753	3.75	2,400	9,007	NONE PROPOSED	139	3753
46	North Hunterdon H.S.	010	WR-A	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
47	North Hunterdon H.S.	010	WR-B	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	45	1215	1.22	2,400	2,916	NONE PROPOSED	45	1215
48	North Hunterdon H.S.	010	130	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	185	4995	5.00	2,400	11,988	NONE PROPOSED	185	4995
49	North Hunterdon H.S.	010	Auditorium Storage	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	8	216	0.22	500	108	NONE PROPOSED	8	216
50	North Hunterdon H.S.	010	Auditorium Back Stage	25W Triple Tube Compact Fluorescent	4	116	0.12	2,400	278	NONE PROPOSED	4	116
51	North Hunterdon H.S.	010	Auditorium Back Stage	400W MH	4	1832	1.83	2,400	4,397	6-Lamp Fluorescent Highbay	24	648
52	North Hunterdon H.S.	010	S151A	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	15	405	0.41	2,400	972	NONE PROPOSED	15	405
53	North Hunterdon H.S.	010	S152A	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	15	405	0.41	2,400	972	NONE PROPOSED	15	405
54	North Hunterdon H.S.	010	Three Station Gym	High Bay CFL Fixtures	536	22512	22.51	2,400	54,029	6-Lamp Fluorescent Highbay	402	10854
55	North Hunterdon H.S.	010	Three Station Gym	400W MH Flood Lights	2	916	0.92	2,400	2,198	Remove fixtures, not necessary after conversion to fluorescent highbay	0	0
56	North Hunterdon H.S.	010	Three Station Gym Storage Area 1	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	6	162	0.16	2,400	389	NONE PROPOSED	6	162
57	North Hunterdon H.S.	010	Three Station Gym Storage Area 2	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	6	162	0.16	2,400	389	NONE PROPOSED	6	162
58	North Hunterdon H.S.	010	Three Station Gym Storage Area 3	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	6	162	0.16	2,400	389	NONE PROPOSED	6	162
59	North Hunterdon H.S.	010	Three Station Gym Storage Area 4	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	6	162	0.16	2,400	389	NONE PROPOSED	6	162
60	North Hunterdon H.S.	010	Attendance Office	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	86	2322	2.32	2,400	5,573	NONE PROPOSED	86	2322
61	North Hunterdon H.S.	010	117	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	39	1053	1.05	2,400	2,527	NONE PROPOSED	39	1053
62	North Hunterdon H.S.	010	Faculty Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	6	162	0.16	2,400	389	NONE PROPOSED	6	162
63	North Hunterdon H.S.	010	Principles Office	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	6	252	0.25	2,400	605	Replace T12 Lamps with T8 Lamps & Replace Magnetic Ballast with Electronic	6	162
64	North Hunterdon H.S.	010	Boiler Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
65	North Hunterdon H.S.	010	001	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
66	North Hunterdon H.S.	010	003	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
67	North Hunterdon H.S.	010	001	BIAX recessed troffers	18	702	0.70	2,400	1,685	Replace BIAX with T8 w/ electronic ballast	18	486
68	North Hunterdon H.S.	010	003	BIAX recessed troffers	18	702	0.70	2,400	1,685	Replace BIAX with T8 w/ electronic ballast	18	486
69	North Hunterdon H.S.	010	125A	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	12	324	0.32	2,400	778	NONE PROPOSED	12	324
70	North Hunterdon H.S.	010	125A	60W Incandescent Bulb	1	60	0.06	2,400	144	Replace with 13W CFL	1	13
71	North Hunterdon H.S.	010	126	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	100	2700	2.70	2,400	6,480	NONE PROPOSED	100	2700
72	North Hunterdon H.S.	010	126	60W Incandescent Bulb	1	60	0.06	2,400	144	Replace with 13W CFL	1	13
73	North Hunterdon H.S.	010	126	25W CFL	2	50	0.05	2,400	120	Replace with 13W CFL	2	26
74	North Hunterdon H.S.	010	Boys Gym Locker Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	81	2187	2.19	2,400	5,249	NONE PROPOSED	81	2187
75	North Hunterdon H.S.	010	Boys Gym Locker Room	60W Incandescent Bulb	1	60	0.06	2,400	144	Replace with 13W CFL	1	13
76	North Hunterdon H.S.	010	Janitors Closet	150W Incandescent	1	150	0.15	500	75	Replace with 25W CFL	1	25
77	North Hunterdon H.S.	010	Storage Closet	Single Lamp T12/Magnetic Ballasts	2	84	0.08	500	42	Replace T12 Lamps with T8 Lamps & Replace Magnetic Ballast with Electronic	2	54
78	North Hunterdon H.S.	010	Storage Closet	Single Lamp T12/Magnetic Ballasts	2	84	0.08	500	42	Replace T12 Lamps with T8 Lamps & Replace Magnetic Ballast with Electronic	2	54
79	North Hunterdon H.S.	010	Trainers Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	26	702	0.70	2,400	1,685	NONE PROPOSED	26	702
80	North Hunterdon H.S.	010	Weight Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	54	1458	1.46	2,400	3,499	NONE PROPOSED	54	1458
81	North Hunterdon H.S.	010	Weight Room Office	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	6	162	0.16	2,400	389	NONE PROPOSED	6	162
82	North Hunterdon H.S.	010	Three Station Gym Officials Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	6	162	0.16	2,400	389	NONE PROPOSED	6	162
83	North Hunterdon H.S.	010	Womens Locker Room	2X4 troffers/T8 Lamps/Magnetic Ballasts	16	432	0.43	2,400	1,037	NONE PROPOSED	16	432
84	North Hunterdon H.S.	010	Womens Locker Room	25W CFL	3	75	0.08	2,400	180	NONE PROPOSED	3	75
85	North Hunterdon H.S.	010	Ticket Booth	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	2	54	0.05	2,400	130	NONE PROPOSED	2	54
86	North Hunterdon H.S.	010	Janitors Closet	2X4 troffers/T8 Lamps/Magnetic Ballasts	2	54	0.05	500	27	NONE PROPOSED	2	54
87	North Hunterdon H.S.	010	Mens Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	6	162	0.16	2,400	389	NONE PROPOSED	6	162
88	North Hunterdon H.S.	010	Womens Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
89	North Hunterdon H.S.	010	Concession Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
90	North Hunterdon H.S.	010	Janitors Closet	60W Incandescent Bulb	1	60	0.06	500	30	Replace with 13W CFL	1	13
91	North Hunterdon H.S.	010	Nurse	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	28	756	0.76	2,400	1,814	NONE PROPOSED	28	756
92	North Hunterdon H.S.	010	Speech Specialist Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	18	486	0.49	2,400	1,166	NONE PROPOSED	18	486
93	North Hunterdon H.S.	010	Storage 2	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	2	54	0.05	500	27	NONE PROPOSED	2	54
94	North Hunterdon H.S.	010	134	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
95	North Hunterdon H.S.	010	Coaches Lounge	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	83	2241	2.24	2,400	5,378	NONE PROPOSED	83	2241
96	North Hunterdon H.S.	010	Coaches Lounge	25W CFL	2	50	0.05	2,400	120	NONE PROPOSED	2	50
97	North Hunterdon H.S.	010	Storage Area	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	2	54	0.05	500	27	NONE PROPOSED	2	54
98	North Hunterdon H.S.	010	Janitors Closet	Single T8 Lamp Fixture/Magnetic Ballasts	1	27	0.03	500	14	NONE PROPOSED	1	27
99	North Hunterdon H.S.	010	Mens Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	7	189	0.19	2,400	454	NONE PROPOSED	7	189
100	North Hunterdon H.S.	010	Guidance	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	66	1782	1.78	2,400	4,277	NONE PROPOSED	66	1782
101	North Hunterdon H.S.	010	108	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
102	North Hunterdon H.S.	010	109	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
103	North Hunterdon H.S.	010	106	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
104	North Hunterdon H.S.	010	103	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	48	1296	1.30	2,400	3,110	NONE PROPOSED	48	1296
105	North Hunterdon H.S.	010	Closet	Single T8 Lamp Fixture/Magnetic Ballasts	1	27	0.03	500	14	NONE PROPOSED	1	27

Exhibit G5-1A.2
North Hunterdon Voorhees Regional High School District
ECM -1A Lighting
Building Line-By-Lines

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Lamp	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Proposed Replacement Solution	Prop. Qty of Lamps	Prop. Watts
106	North Hunterdon H.S.	010	Faculty Dining	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	49	1323	1.32	2,400	3,175	NONE PROPOSED	49	1323
107	North Hunterdon H.S.	010	IT Dept.	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	26	702	0.70	2,400	1,685	NONE PROPOSED	26	702
108	North Hunterdon H.S.	010	Cafe B	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	326	8802	8.80	2,400	21,125	NONE PROPOSED	326	8802
109	North Hunterdon H.S.	010	Cafe B	50W CFL	10	500	0.50	2,400	1,200	NONE PROPOSED	10	500
110	North Hunterdon H.S.	010	Cafe A	2X4 recessed troffers/T8 Lamps/Electronic Ballasts	75	2025	2.03	2,400	4,860	NONE PROPOSED	75	2025
111	North Hunterdon H.S.	010	Cafe A	50W CFL	25	1250	1.25	2,400	3,000	NONE PROPOSED	25	1250
112	North Hunterdon H.S.	010	Maintenance Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	54	1458	1.46	2,400	3,499	NONE PROPOSED	54	1458
113	North Hunterdon H.S.	010	Maintenance Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	4	168	0.17	2,400	403	NONE PROPOSED	4	168
114	North Hunterdon H.S.	010	Maintenance Room	60W Incandescent Bulb	1	60	0.06	2,400	144	NONE PROPOSED	1	60
115	North Hunterdon H.S.	010	Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
116	North Hunterdon H.S.	010	Storage	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	2	54	0.05	500	27	NONE PROPOSED	2	54
117	North Hunterdon H.S.	010	Storage	25W CFL	1	25	0.03	500	13	NONE PROPOSED	1	25
118	North Hunterdon H.S.	010	Bathroom	60W Incandescent Bulb	1	27	0.03	2,400	65	Replace with 25W CFL	1	25
119	North Hunterdon H.S.	010	Locker Room 1	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	28	756	0.76	2,400	1,814	NONE PROPOSED	28	756
120	North Hunterdon H.S.	010	Locker Room 1	25W CFL	2	50	0.05	2,400	120	NONE PROPOSED	2	50
121	North Hunterdon H.S.	010	Locker Room 1	60W Incandescent Bulb	1	60	0.06	2,400	144	Replace with 13W CFL	1	13
122	North Hunterdon H.S.	010	Locker Room 2	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	28	756	0.76	2,400	1,814	NONE PROPOSED	28	756
123	North Hunterdon H.S.	010	Locker Room 2	25W CFL	2	54	0.05	2,400	130	NONE PROPOSED	2	50
124	North Hunterdon H.S.	010	Locker Room 2	60W Incandescent Bulb	1	60	0.06	2,400	144	Replace with 13W CFL	1	13
125	North Hunterdon H.S.	010	Storage	60W Incandescent Bulb	1	60	0.06	500	30	Replace with 13W CFL	1	13
126	North Hunterdon H.S.	010	Storage	60W Incandescent Bulb	1	60	0.06	500	30	Replace with 13W CFL	1	13
127	North Hunterdon H.S.	010	Team Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
128	North Hunterdon H.S.	010	Wrestling Room Storage Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
129	North Hunterdon H.S.	010	First Floor Hallway	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	620	16740	16.74	3,640	60,934	NONE PROPOSED	620	16740
130	North Hunterdon H.S.	010	First Floor Hallway Display Lighting	150W Incandescent	16	2400	2.40	3,640	8,736	Replace with 25W CFL	16	400
131	North Hunterdon H.S.	010	First Floor Hallway Display Lighting	400W MH	5	2290	2.29	3,640	8,336	NONE PROPOSED	5	2290
132	North Hunterdon H.S.	010	Wrestling Room Storage Room	2X4 troffers/T12 Lamps/Magnetic Ballasts	2	84	0.08	2,400	202	Replace T12 Lamps with T8 Lamps & Replace Magnetic Ballast with Electronic	2	54
133	North Hunterdon H.S.	010	First Floor Hallway Display Lighting	25W CFL	22	550	0.55	3,640	2,002	NONE PROPOSED	22	550
134	North Hunterdon H.S.	010	Boiler Room	2X4 troffers/T8 Lamps/Electronic Ballasts	16	432	0.43	2,400	1,037	NONE PROPOSED	16	432
135	North Hunterdon H.S.	010	Auditorium	400W Metal Halide Recessed Downlights	16	7328	7.33	500	3,664	NONE PROPOSED	16	7328
136	North Hunterdon H.S.	010	Auditorium	500W Quartz Halogen Recessed Downlights	20	10000	10.00	500	5,000	NONE PROPOSED	20	10000
137	North Hunterdon H.S.	010	Auditorium	100W Incandescent Recessed Downlights	23	2300	2.30	500	1,150	NONE PROPOSED	23	2300
138	North Hunterdon H.S.	010	Auditorium	32W Metal Halide Recessed Downlights	22	880	0.88	500	440	NONE PROPOSED	22	880
139	North Hunterdon H.S.	020	244	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
140	North Hunterdon H.S.	020	245	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	27	729	0.73	2,400	1,750	NONE PROPOSED	27	729
141	North Hunterdon H.S.	020	243	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	27	729	0.73	2,400	1,750	NONE PROPOSED	27	729
142	North Hunterdon H.S.	020	242	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
143	North Hunterdon H.S.	020	241	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
144	North Hunterdon H.S.	020	240	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	28	756	0.76	2,400	1,814	NONE PROPOSED	28	756
145	North Hunterdon H.S.	020	Storage 4	60W Incandescent Bulb	1	60	0.06	500	30	NONE PROPOSED	1	60
146	North Hunterdon H.S.	020	Storage 6	60W Incandescent Bulb	1	60	0.06	500	30	NONE PROPOSED	1	60
147	North Hunterdon H.S.	020	Mens Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
148	North Hunterdon H.S.	020	Combined Facutly Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
149	North Hunterdon H.S.	020	Combined Facutly Room	100W Incandescent Bulb	2	200	0.20	2,400	480	NONE PROPOSED	2	200
150	North Hunterdon H.S.	020	239A	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	9	243	0.24	2,400	583	NONE PROPOSED	9	243
151	North Hunterdon H.S.	020	239	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	12	324	0.32	2,400	778	NONE PROPOSED	12	324
152	North Hunterdon H.S.	020	238	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
153	North Hunterdon H.S.	020	237	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
154	North Hunterdon H.S.	020	237	60W Incandescent Bulb	1	60	0.06	2,400	144	NONE PROPOSED	1	60
155	North Hunterdon H.S.	020	236	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
156	North Hunterdon H.S.	020	Storage	100W Incandescent Bulb	2	200	0.20	500	100	NONE PROPOSED	2	200
157	North Hunterdon H.S.	020	Janitors Closet 7	25W CFL	1	25	0.03	2,400	60	NONE PROPOSED	1	25
158	North Hunterdon H.S.	020	235	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	27	729	0.73	2,400	1,750	NONE PROPOSED	27	729
159	North Hunterdon H.S.	020	234	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	45	1215	1.22	2,400	2,916	NONE PROPOSED	45	1215
160	North Hunterdon H.S.	020	S259	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
161	North Hunterdon H.S.	020	232	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	64	1728	1.73	2,400	4,147	NONE PROPOSED	64	1728
162	North Hunterdon H.S.	020	Mens Faculty Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
163	North Hunterdon H.S.	020	Womens Faculty Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
164	North Hunterdon H.S.	020	S253	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	28	756	0.76	2,400	1,814	NONE PROPOSED	28	756
165	North Hunterdon H.S.	020	Electrical Room	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
166	North Hunterdon H.S.	020	S254	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	28	756	0.76	2,400	1,814	NONE PROPOSED	28	756
167	North Hunterdon H.S.	020	S252	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
168	North Hunterdon H.S.	020	S251	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
169	North Hunterdon H.S.	020	S250A	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
170	North Hunterdon H.S.	020	S250	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
171	North Hunterdon H.S.	020	Chemical Storage	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	12	324	0.32	500	162	NONE PROPOSED	12	324
172	North Hunterdon H.S.	020	231	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	60	1620	1.62	2,400	3,888	NONE PROPOSED	60	1620
173	North Hunterdon H.S.	020	229A&B	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	16	432	0.43	2,400	1,037	NONE PROPOSED	16	432
174	North Hunterdon H.S.	020	229	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	54	1458	1.46	2,400	3,499	NONE PROPOSED	54	1458
175	North Hunterdon H.S.	020	228	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	38	1026	1.03	2,400	2,462	NONE PROPOSED	38	1026
176	North Hunterdon H.S.	020	Hallway Display Lights	25W CFL	8	200	0.20	3,640	728	NONE PROPOSED	8	200
177	North Hunterdon H.S.	020	Hallway Display Lights	Single Lamp T8 Fixture/Electronic Ballast	2	54	0.05	3,640	197	NONE PROPOSED	2	54
178	North Hunterdon H.S.	020	230A	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	12	324	0.32	2,400	778	NONE PROPOSED	12	324
179	North Hunterdon H.S.	020	230	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	64	1728	1.73	2,400	4,147	NONE PROPOSED	64	1728
180	North Hunterdon H.S.	020	Mens Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	2	54	0.05	2,400	130	NONE PROPOSED	2	54
181	North Hunterdon H.S.	020	Janitors Closet	100W Incandescent Bulb	1	100	0.10	500	50	Replace with 25W CFL	1	25
182	North Hunterdon H.S.	020	Storage	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	2	54	0.05	500	27	NONE PROPOSED	2	54
183	North Hunterdon H.S.	020	227	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	40	1080	1.08	2,400	2,592	NONE PROPOSED	40	1080
184	North Hunterdon H.S.	020	227	BIAX recessed troffers	20	780	0.78	2,400	1,872	Replace BIAX with T8 w/ electronic ballast	20	540
185	North Hunterdon H.S.	020	226	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
186	North Hunterdon H.S.	020	226	60W Incandescent Bulb	1	60	0.06	2,400	144	Replace with 25W CFL	1	25
187	North Hunterdon H.S.	020	225	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	48	1296	1.30	2,400	3,110	NONE PROPOSED	48	1296
188	North Hunterdon H.S.	020	224	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
189	North Hunterdon H.S.	020	223	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	42	1134	1.13	2,400	2,722	NONE PROPOSED	42	1134
190	North Hunterdon H.S.	020	222	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
191	North Hunterdon H.S.	020	221	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
192	North Hunterdon H.S.	020	Storage	60W Incandescent Bulb	2	120	0.12	500	60	Replace with 25W CFL	2	50
193	North Hunterdon H.S.	020	Womens Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	3	81	0.08	2,400	194	NONE PROPOSED	3	81
194	North Hunterdon H.S.	020	220	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
195	North Hunterdon H.S.	020	219	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
196	North Hunterdon H.S.	020	218	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810

Exhibit G5-1A.2
North Hunterdon Voorhees Regional High School District
ECM -1A Lighting
Building Line-By-Lines

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Lamp	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Proposed Replacement Solution	Prop. Qty of Lamps	Prop. Watts
197	North Hunterdon H.S.	020	217	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
198	North Hunterdon H.S.	020	216	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
199	North Hunterdon H.S.	020	215	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	10	270	0.27	2,400	648	NONE PROPOSED	10	270
200	North Hunterdon H.S.	020	214	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
201	North Hunterdon H.S.	020	213	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
202	North Hunterdon H.S.	020	212	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
203	North Hunterdon H.S.	020	211	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
204	North Hunterdon H.S.	020	210	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	42	1134	1.13	2,400	2,722	NONE PROPOSED	42	1134
205	North Hunterdon H.S.	020	209	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
206	North Hunterdon H.S.	020	208	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
207	North Hunterdon H.S.	020	207	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
208	North Hunterdon H.S.	020	206	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	12	324	0.32	2,400	778	NONE PROPOSED	12	324
209	North Hunterdon H.S.	020	205	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
210	North Hunterdon H.S.	020	204	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
211	North Hunterdon H.S.	020	203	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	14	378	0.38	2,400	907	NONE PROPOSED	14	378
212	North Hunterdon H.S.	020	202	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	10	270	0.27	2,400	648	NONE PROPOSED	10	270
213	North Hunterdon H.S.	020	201	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
214	North Hunterdon H.S.	020	200	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
215	North Hunterdon H.S.	020	Lab Office	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	10	270	0.27	2,400	648	NONE PROPOSED	10	270
216	North Hunterdon H.S.	020	Mens Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	9	243	0.24	2,400	583	NONE PROPOSED	9	243
217	North Hunterdon H.S.	020	Womens Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	9	243	0.24	2,400	583	NONE PROPOSED	9	243
218	North Hunterdon H.S.	020	Janitors Closet	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	4	108	0.11	500	54	NONE PROPOSED	4	108
219	North Hunterdon H.S.	020	Book Room	25W CFL	2	50	0.05	500	25	NONE PROPOSED	2	50
220	North Hunterdon H.S.	020	Lab Prep	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	10	270	0.27	2,400	648	NONE PROPOSED	10	270
221	North Hunterdon H.S.	020	Lab Office	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	2	54	0.05	2,400	130	NONE PROPOSED	2	54
222	North Hunterdon H.S.	020	Hallway Lights	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	280	7560	7.56	3,640	27,518	NONE PROPOSED	280	7560
223	North Hunterdon H.S.	020	Hallway Display Lights	25W CFL	2	50	0.05	3,640	182	NONE PROPOSED	2	50
224	North Hunterdon H.S.	020	Mens Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	3	81	0.08	2,400	194	NONE PROPOSED	3	81
225	North Hunterdon H.S.	020	Womens Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	3	81	0.08	2,400	194	NONE PROPOSED	3	81
226	North Hunterdon H.S.	020	Mens Bathroom	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
227	North Hunterdon H.S.	-	Elevator	2X2 & 2X4 recessed troffers/T8 Lamps/Electronic Ballasts	3	81	0.08	2,400	194	NONE PROPOSED	3	81
228	North Hunterdon H.S.	-	Exterior Lighting	70W Metal Halide Bollard Lighting	10	950	0.95	2,400	2,280	NONE PROPOSED	10	950
229	North Hunterdon H.S.	-	Exterior Lighting	70W Metal Halide Grounds Lighting	10	950	0.95	2,400	2,280	NONE PROPOSED	10	950
230	North Hunterdon H.S.	-	Exterior Lighting	150W High Pressure Sodium Parking Lot Lighting	3	567	0.57	2,400	1,361	NONE PROPOSED	3	567
231	North Hunterdon H.S.	-	Exterior Lighting	400W Metal Halide Flag Pole/Sign Lighting	2	916	0.92	2,400	2,198	NONE PROPOSED	2	916
232	North Hunterdon H.S.	-	Exterior Lighting	42W CFL Building Mounted Light Fixtures	22	924	0.92	2,400	2,218	NONE PROPOSED	22	924
233	North Hunterdon H.S.	-	Exterior Lighting	50W Metal Halide Building Mounted Light Fixtures	8	576	0.58	2,400	1,382	NONE PROPOSED	8	576
234	North Hunterdon H.S.	-	Exterior Lighting	400W Metal Halide Light Poles	46	21068	21.07	2,400	50,563	NONE PROPOSED	46	21068
235	North Hunterdon H.S.	-	Exterior Lighting	150W Incandescent Building Mounted Light Fixtures	8	1200	1.20	2,400	2,880	Replace with 25W CFL	8	200
236	North Hunterdon H.S.	-	Maitenance Garage	8 Foot T-12 Pendant Mounted Fixtures/Magnetic Ballast	26	2912	2.91	2,400	6,989	Replace 8 foot T12 Lamps with (2) 4 foot T8 Lamps & Replace Magnetic Ballast with Electronic	52	1404
237	North Hunterdon H.S.	-	Maitenance Garage	4 Foot T-12 Pendant Mounted Fixtures/Magnetic Ballast	4	168	0.17	2,400	403	Replace T12 Lamps with T8 Lamps & Replace Magnetic Ballast with Electronic	4	108
238	North Hunterdon H.S.	000	Regional Office	2X2 & 2X4 recessed troffers/T12 Lamps/Magnetic Ballasts	44	1848	1.85	2,400	4,435	Replace T12 Lamps with T8 Lamps & Replace Magnetic Ballast with Electronic	44	1188
239	North Hunterdon H.S.	000	Regional Office	T5HO Pendant Mounted Fixtures	27	1701	1.70	2,400	4,082	NONE PROPOSED	27	1701
240	North Hunterdon H.S.	010	Regional Office	2X2 & 2X4 recessed troffers/T12 Lamps/Magnetic Ballasts	204	8568	8.57	2,400	20,563	Replace T12 Lamps with T8 Lamps & Replace Magnetic Ballast with Electronic	204	5508
241	North Hunterdon H.S.	010	Regional Office	60W Incandescent Bulb	1	60	0.06	2,400	144	Replace with 13W CFL	1	13
242	North Hunterdon H.S.	-	Facilities/Technology Office	2X4 troffers/T12 Lamps/Magnetic Ballasts	30	1260	1.26	2,401	3,025	Replace T12 Lamps with T8 Lamps & Replace Magnetic Ballast with Electronic	30	810
243	Voorhees H.S.	010	Hallway	Various Fixtures/T8 Lamps/ Electronic Ballasts	664	17928	17.93	2,401	43,045	NONE PROPOSED	664	17928
244	Voorhees H.S.	010	Hallway	250W Metal Halide Fixtures	4	1152	1.15	2,402	2,767	NONE PROPOSED	4	1152
245	Voorhees H.S.	010	Hallway	300W Incandescent	44	13200	13.20	2,401	31,693	Replace with 65W CFL	44	2860
246	Voorhees H.S.	010	102 New Café	Various Fixtures/T8 Lamps/ Electronic Ballasts	134	3618	3.62	2,400	8,683	NONE PROPOSED	134	3618
247	Voorhees H.S.	010	102 New Café	300W Incandescent	12	3600	3.60	2,400	8,640	Replace with 65W CFL	25	1625
248	Voorhees H.S.	010	112	Various Fixtures/T8 Lamps/ Electronic Ballasts	238	6426	6.43	2,400	15,422	NONE PROPOSED	238	6426
249	Voorhees H.S.	010	112	2X4 troffers/T12 Lamps/Magnetic Ballasts	8	336	0.34	2,400	806	Replace T12 Lamps with T8 Lamps & Replace Magnetic Ballast with Electronic	8	216
250	Voorhees H.S.	010	112	150W Incandescent	9	1350	1.35	2,400	3,240	Replace with 25W CFL	9	225
251	Voorhees H.S.	010	Auditorium	Various Fixtures/T8 Lamps/ Electronic Ballasts	80	2160	2.16	2,400	5,184	NONE PROPOSED	80	2160
252	Voorhees H.S.	010	Auditorium	250W Metal Halide Fixtures	30	8640	8.64	2,400	20,736	NONE PROPOSED	30	8640
253	Voorhees H.S.	010	Auditorium	150W Incandescent	24	3600	3.60	2,400	8,640	Replace with 25W CFL	24	600
254	Voorhees H.S.	010	120	Various Fixtures/T8 Lamps/ Electronic Ballasts	16	432	0.43	2,400	1,037	NONE PROPOSED	16	432
255	Voorhees H.S.	010	Admin. Office	Various Fixtures/T8 Lamps/ Electronic Ballasts	156	4212	4.21	2,400	10,109	NONE PROPOSED	156	4212
256	Voorhees H.S.	010	Lavoratory (1) (Near Lockers)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
257	Voorhees H.S.	010	Closet (Near Lockers)	Various Fixtures/T8 Lamps/ Electronic Ballasts	2	54	0.05	500	27	NONE PROPOSED	2	54
258	Voorhees H.S.	010	Lavoratory (2) (Near Lockers)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
259	Voorhees H.S.	010	130	Various Fixtures/T8 Lamps/ Electronic Ballasts	12	324	0.32	2,400	778	NONE PROPOSED	12	324
260	Voorhees H.S.	010	131 Nurse	Various Fixtures/T8 Lamps/ Electronic Ballasts	46	1242	1.24	2,400	2,981	NONE PROPOSED	46	1242
261	Voorhees H.S.	010	132 Guidance	Various Fixtures/T8 Lamps/ Electronic Ballasts	174	4698	4.70	2,400	11,275	NONE PROPOSED	174	4698
262	Voorhees H.S.	010	135 Teachers Lounge	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
263	Voorhees H.S.	010	136	Various Fixtures/T8 Lamps/ Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
264	Voorhees H.S.	010	137	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
265	Voorhees H.S.	010	160	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
266	Voorhees H.S.	010	161	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
267	Voorhees H.S.	010	162	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
268	Voorhees H.S.	010	163	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
269	Voorhees H.S.	010	A10 Exit (?)	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
270	Voorhees H.S.	010	164	Various Fixtures/T8 Lamps/ Electronic Ballasts	42	1134	1.13	2,400	2,722	NONE PROPOSED	42	1134
271	Voorhees H.S.	010	166	Various Fixtures/T8 Lamps/ Electronic Ballasts	52	1404	1.40	2,400	3,370	NONE PROPOSED	52	1404
272	Voorhees H.S.	010	166A	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
273	Voorhees H.S.	010	166D	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
274	Voorhees H.S.	010	New Kitchen	Various Fixtures/T8 Lamps/ Electronic Ballasts	40	1080	1.08	2,400	2,592	NONE PROPOSED	40	1080
275	Voorhees H.S.	010	New Kitchen - Storage	Various Fixtures/T8 Lamps/ Electronic Ballasts	10	270	0.27	500	135	NONE PROPOSED	10	270
276	Voorhees H.S.	010	B3 (?)	Various Fixtures/T8 Lamps/ Electronic Ballasts	2	54	0.05	2,400	130	NONE PROPOSED	2	54
277	Voorhees H.S.	010	167	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
278	Voorhees H.S.	010	168	Various Fixtures/T8 Lamps/ Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
279	Voorhees H.S.	010	169	Various Fixtures/T8 Lamps/ Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
280	Voorhees H.S.	010	170	Various Fixtures/T8 Lamps/ Electronic Ballasts	50	1350	1.35	2,400	3,240	NONE PROPOSED	50	1350
281	Voorhees H.S.	010	New Science Room (1)	Various Fixtures/T8 Lamps/ Electronic Ballasts	42	1134	1.13	2,400	2,722	NONE PROPOSED	42	1134
282	Voorhees H.S.	010	New Science Room (2)	Various Fixtures/T8 Lamps/ Electronic Ballasts	42	1134	1.13	2,400	2,722	NONE PROPOSED	42	1134
283	Voorhees H.S.	010	Science Teachers Office	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
284	Voorhees H.S.	010	Science Room Closet	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	500	108	NONE PROPOSED	8	216
285	Voorhees H.S.	010	Cafeteria	Various Fixtures/T8 Lamps/ Electronic Ballasts	132	3564	3.56	2,400	8,554	NONE PROPOSED	132	3564
286	Voorhees H.S.	010	Dish Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	10	270	0.27	2,400	648	NONE PROPOSED	10	270
287	Voorhees H.S.	010	Attendance Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	10	270	0.27	2,400	648	NONE PROPOSED	10	270

Exhibit G5-1A.2
North Hunterdon Voorhees Regional High School District
ECM -1A Lighting
Building Line-By-Lines

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Lamp	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Proposed Replacement Solution	Prop. Qty of Lamps	Prop. Watts
288	Voorhees H.S.	010	Cafeteria - Lavoratory (1)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
289	Voorhees H.S.	010	Cafeteria - Lavoratory (2)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
290	Voorhees H.S.	010	Kitchen	Various Fixtures/T8 Lamps/ Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
291	Voorhees H.S.	010	Kitchen - Office 140A	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
292	Voorhees H.S.	010	Kitchen - Storage	Various Fixtures/T8 Lamps/ Electronic Ballasts	10	270	0.27	2,400	648	NONE PROPOSED	10	270
293	Voorhees H.S.	010	Kitchen - Serving Line	Various Fixtures/T8 Lamps/ Electronic Ballasts	76	2052	2.05	2,400	4,925	NONE PROPOSED	76	2052
294	Voorhees H.S.	010	142A Comm. Foods	Various Fixtures/T8 Lamps/ Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
295	Voorhees H.S.	010	141 Cove	Various Fixtures/T8 Lamps/ Electronic Ballasts	60	1620	1.62	2,400	3,888	NONE PROPOSED	60	1620
296	Voorhees H.S.	010	Boiler Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
297	Voorhees H.S.	010	Boiler Room Closet	Various Fixtures/T8 Lamps/ Electronic Ballasts		0	0.00	2,400	0	NONE PROPOSED	0	0
298	Voorhees H.S.	010	B&G Office	Various Fixtures/T8 Lamps/ Electronic Ballasts	26	702	0.70	2,400	1,685	NONE PROPOSED	26	702
299	Voorhees H.S.	010	B&G Office - Storage	Various Fixtures/T8 Lamps/ Electronic Ballasts	16	432	0.43	2,400	1,037	NONE PROPOSED	16	432
300	Voorhees H.S.	010	Male Lavoratory (Near B&G Office)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
301	Voorhees H.S.	010	Female Lavoratory (Near B&G Office)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
302	Voorhees H.S.	010	Cust. Break Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	36	972	0.97	500	486	NONE PROPOSED	36	972
303	Voorhees H.S.	010	New Weight Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	104	2808	2.81	2,400	6,739	NONE PROPOSED	104	2808
304	Voorhees H.S.	010	New Weight Room Storage	Various Fixtures/T8 Lamps/ Electronic Ballasts	2	54	0.05	2,400	130	NONE PROPOSED	2	54
305	Voorhees H.S.	010	Team Room	400W MH	7	3206	3.21	2,400	7,694	6-Lamp Fluorescent Highbay	42	1134
306	Voorhees H.S.	010	Team Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	6	162	0.16	2,400	389	NONE PROPOSED	6	162
307	Voorhees H.S.	010	Team Room Changing Area	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
308	Voorhees H.S.	010	Team Room Changing Area	150W Incandescent	1	150	0.15	2,400	360	Replace with 25W CFL	1	25
309	Voorhees H.S.	010	P.E.	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
310	Voorhees H.S.	010	AD	Various Fixtures/T8 Lamps/ Electronic Ballasts	12	324	0.32	2,400	778	NONE PROPOSED	12	324
311	Voorhees H.S.	010	153	Various Fixtures/8' T12 Lamps/ Magnetic Ballasts	16	1880	1.88	2,400	4,512	Replace 8 foot T12 Lamps with (2) 4 foot T8 Lamps & Replace Magnetic Ballast with Electronic	32	864
312	Voorhees H.S.	010	153	150W Incandescent Bulbs	4	600	0.60	2,400	1,440	Replace with 25W CFL	4	100
313	Voorhees H.S.	010	153	Various Fixtures/T8 Lamps/ Electronic Ballasts	2	54	0.05	2,400	130	NONE PROPOSED	2	54
314	Voorhees H.S.	010	Wrestling/Team Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
315	Voorhees H.S.	010	Wrestling/Team Room	400W MH	12	5496	5.50	2,400	13,190	6-Lamp Fluorescent Highbay	72	1944
316	Voorhees H.S.	010	Coach Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
317	Voorhees H.S.	010	Trainer Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
318	Voorhees H.S.	010	Coach Room (Next to Trainer Room)	Various Fixtures/T8 Lamps/ Electronic Ballasts	10	270	0.27	2,400	648	NONE PROPOSED	10	270
319	Voorhees H.S.	010	Equipment Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	16	432	0.43	2,400	1,037	NONE PROPOSED	16	432
320	Voorhees H.S.	010	Locker Room Hallway	Various Fixtures/T8 Lamps/ Electronic Ballasts	6	162	0.16	2,400	389	NONE PROPOSED	6	162
321	Voorhees H.S.	010	Girl's Locker Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	38	1026	1.03	2,400	2,462	NONE PROPOSED	38	1026
322	Voorhees H.S.	010	Girl's Locker Room	60W Incandescent Bulb	1	60	0.06	2,400	144	Replace with 13W CFL	1	13
323	Voorhees H.S.	010	Boy's Locker Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	64	1728	1.73	2,400	4,147	NONE PROPOSED	64	1728
324	Voorhees H.S.	010	Boy's Locker Room	60W Incandescent	1	60	0.06	2,400	144	Replace with 13W CFL	1	13
325	Voorhees H.S.	010	Phonebooth	60W Incandescent	1	60	0.06	2,400	144	Replace with 13W CFL	1	13
326	Voorhees H.S.	020	Hallway	Various Fixtures/T8 Lamps/ Electronic Ballasts	332	8964	8.96	2,402	21,532	NONE PROPOSED	332	8964
327	Voorhees H.S.	020	210	Various Fixtures/T8 Lamps/ Electronic Ballasts	124	3348	3.35	2,400	8,035	NONE PROPOSED	124	3348
328	Voorhees H.S.	020	213/214	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
329	Voorhees H.S.	020	215	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
330	Voorhees H.S.	020	216	Various Fixtures/T8 Lamps/ Electronic Ballasts	15	405	0.41	2,400	972	NONE PROPOSED	15	405
331	Voorhees H.S.	020	218	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
332	Voorhees H.S.	020	220	Various Fixtures/T8 Lamps/ Electronic Ballasts	80	2160	2.16	2,400	5,184	NONE PROPOSED	80	2160
333	Voorhees H.S.	020	221	Various Fixtures/T8 Lamps/ Electronic Ballasts	80	2160	2.16	2,400	5,184	NONE PROPOSED	80	2160
334	Voorhees H.S.	020	222	Various Fixtures/T8 Lamps/ Electronic Ballasts	80	2160	2.16	2,400	5,184	NONE PROPOSED	80	2160
335	Voorhees H.S.	020	223	Various Fixtures/T8 Lamps/ Electronic Ballasts	80	2160	2.16	2,400	5,184	NONE PROPOSED	80	2160
336	Voorhees H.S.	020	224	Various Fixtures/T8 Lamps/ Electronic Ballasts	10	270	0.27	2,400	648	NONE PROPOSED	10	270
337	Voorhees H.S.	020	225	Various Fixtures/T8 Lamps/ Electronic Ballasts	10	270	0.27	2,400	648	NONE PROPOSED	10	270
338	Voorhees H.S.	020	226	Various Fixtures/T8 Lamps/ Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
339	Voorhees H.S.	020	227	Various Fixtures/T8 Lamps/ Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
340	Voorhees H.S.	020	Lavoratory (1)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
341	Voorhees H.S.	020	Lavoratory (2)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
342	Voorhees H.S.	020	230	Various Fixtures/T8 Lamps/ Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
343	Voorhees H.S.	020	231	Various Fixtures/T8 Lamps/ Electronic Ballasts		0	0.00	2,400	0	NONE PROPOSED	0	0
344	Voorhees H.S.	020	232A/232B	Various Fixtures/T8 Lamps/ Electronic Ballasts	10	270	0.27	2,400	648	NONE PROPOSED	10	270
345	Voorhees H.S.	020	233	Various Fixtures/T8 Lamps/ Electronic Ballasts	10	270	0.27	2,400	648	NONE PROPOSED	10	270
346	Voorhees H.S.	020	234	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
347	Voorhees H.S.	020	Library	Various Fixtures/T8 Lamps/ Electronic Ballasts	288	7776	7.78	2,400	18,662	NONE PROPOSED	288	7776
348	Voorhees H.S.	020	240	Various Fixtures/T8 Lamps/ Electronic Ballasts	134	3618	3.62	2,400	8,683	NONE PROPOSED	134	3618
349	Voorhees H.S.	020	240A	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
350	Voorhees H.S.	020	Photo	Various Fixtures/T8 Lamps/ Electronic Ballasts	16	432	0.43	500	216	NONE PROPOSED	16	432
351	Voorhees H.S.	020	Photo	150W Incandescent Bulbs	6	900	0.90	500	450	NONE PROPOSED	6	900
352	Voorhees H.S.	020	241	Various Fixtures/T8 Lamps/ Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
353	Voorhees H.S.	020	242B	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
354	Voorhees H.S.	020	Net.	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
355	Voorhees H.S.	020	Teacher Work Room 243-244	Various Fixtures/T8 Lamps/ Electronic Ballasts	110	2970	2.97	2,400	7,128	NONE PROPOSED	110	2970
356	Voorhees H.S.	020	Teacher Work Room Lavoratory	Unacccessable	0	0	0.00	2,400	0	Unacccessable	0	0
357	Voorhees H.S.	020	Storage	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	500	108	NONE PROPOSED	8	216
358	Voorhees H.S.	020	205 Maint. Mechanical	Various Fixtures/T8 Lamps/ Electronic Ballasts	83	2241	2.24	500	1,121	NONE PROPOSED	83	2241
359	Voorhees H.S.	020	245	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
360	Voorhees H.S.	020	246	Various Fixtures/T8 Lamps/ Electronic Ballasts	120	3240	3.24	2,400	7,776	NONE PROPOSED	120	3240
361	Voorhees H.S.	020	247	Various Fixtures/T8 Lamps/ Electronic Ballasts	55	1485	1.49	2,400	3,564	NONE PROPOSED	55	1485
362	Voorhees H.S.	020	Mechanical	Various Fixtures/T8 Lamps/ Electronic Ballasts	10	270	0.27	500	135	NONE PROPOSED	10	270
363	Voorhees H.S.	020	Elec. Mechanical	Various Fixtures/T8 Lamps/ Electronic Ballasts	10	270	0.27	500	135	NONE PROPOSED	10	270
364	Voorhees H.S.	020	250	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
365	Voorhees H.S.	020	Custodian	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	500	54	NONE PROPOSED	4	108
366	Voorhees H.S.	020	Lavoratory (1)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
367	Voorhees H.S.	020	Lavoratory (2)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
368	Voorhees H.S.	020	Snack Bar	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	500	54	NONE PROPOSED	4	108
369	Voorhees H.S.	020	255	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
370	Voorhees H.S.	020	256	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
371	Voorhees H.S.	020	257	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
372	Voorhees H.S.	020	258	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
373	Voorhees H.S.	020	258A	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
374	Voorhees H.S.	020	259	Various Fixtures/T8 Lamps/ Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
375	Voorhees H.S.	020	260	Various Fixtures/T8 Lamps/ Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
376	Voorhees H.S.	020	Lavoratory (1)	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
377	Voorhees H.S.	020	Lavoratory (2)	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
378	Voorhees H.S.	020	Storage	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	500	108	NONE PROPOSED	8	216

Exhibit G5-1A.2
North Hunterdon Voorhees Regional High School District
ECM -1A Lighting
Building Line-By-Lines

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Lamps	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Proposed Replacement Solution	Prop. Qty of Lamps	Prop. Watts
379	Voorhees H.S.	020	261	Various Fixtures/T8 Lamps/ Electronic Ballasts	12	324	0.32	2,400	778	NONE PROPOSED	12	324
380	Voorhees H.S.	020	262	Various Fixtures/T8 Lamps/ Electronic Ballasts	24	648	0.65	2,400	1,555	NONE PROPOSED	24	648
381	Voorhees H.S.	020	263	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
382	Voorhees H.S.	020	Main Gym	400W MH	41	18778	18.78	2,400	45,067	6-Lamp Fluorescent Highbay	246	6642
383	Voorhees H.S.	020	Main Gym Storage	Various Fixtures/T8 Lamps/ Electronic Ballasts	16	432	0.43	500	216	NONE PROPOSED	16	432
384	Voorhees H.S.	020	Main Gym Exit	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	2,400	259	NONE PROPOSED	4	108
385	Voorhees H.S.	020	P.E. Office	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
386	Voorhees H.S.	020	Girl's Locker Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	52	1404	1.40	2,400	3,370	NONE PROPOSED	52	1404
387	Voorhees H.S.	020	Girl's Locker Room Shower	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
388	Voorhees H.S.	020	Boy's Locker Room	Various Fixtures/T8 Lamps/ Electronic Ballasts	60	1620	1.62	2,400	3,888	NONE PROPOSED	60	1620
389	Voorhees H.S.	020	Boy's Locker Room Shower	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
390	Voorhees H.S.	020	New Gym	400W MH	20	9160	9.16	2,400	21,984	6-Lamp Fluorescent Highbay	120	3240
391	Voorhees H.S.	020	New Gym Storage Area	150W Incandescent	4	600	0.60	500	300	Replace with 25W CFL	4	100
392	Voorhees H.S.	030	Office	Various Fixtures/T8 Lamps/ Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
393	Voorhees H.S.	030	Hallway	Various Fixtures/T8 Lamps/ Electronic Ballasts	215	5805	5.81	2,401	13,938	NONE PROPOSED	215	5805
394	Voorhees H.S.	030	311	Various Fixtures/T8 Lamps/ Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
395	Voorhees H.S.	030	312	Various Fixtures/T8 Lamps/ Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
396	Voorhees H.S.	030	313	Various Fixtures/T8 Lamps/ Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
397	Voorhees H.S.	030	314	Various Fixtures/T8 Lamps/ Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
398	Voorhees H.S.	030	315	Various Fixtures/T8 Lamps/ Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
399	Voorhees H.S.	030	316	Various Fixtures/T8 Lamps/ Electronic Ballasts	60	1620	1.62	2,400	3,888	NONE PROPOSED	60	1620
400	Voorhees H.S.	030	Storage	Various Fixtures/T8 Lamps/ Electronic Ballasts	16	432	0.43	500	216	NONE PROPOSED	16	432
401	Voorhees H.S.	030	317	Various Fixtures/T8 Lamps/ Electronic Ballasts	30	810	0.81	2,400	1,944	NONE PROPOSED	30	810
402	Voorhees H.S.	030	Cust.	Various Fixtures/T8 Lamps/ Electronic Ballasts	4	108	0.11	500	54	NONE PROPOSED	4	108
403	Voorhees H.S.	030	318	Various Fixtures/T8 Lamps/ Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
404	Voorhees H.S.	030	Storage	Various Fixtures/T8 Lamps/ Electronic Ballasts	16	432	0.43	500	216	NONE PROPOSED	16	432
405	Voorhees H.S.	030	Lavoratory (1)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
406	Voorhees H.S.	030	Lavoratory (2)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
407	Voorhees H.S.	030	Mechanical	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
408	Voorhees H.S.	030	319	Various Fixtures/T8 Lamps/ Electronic Ballasts	15	405	0.41	2,400	972	NONE PROPOSED	15	405
409	Voorhees H.S.	030	319	Various Fixtures/T12 Lamps/Magnetic Ballasts	2	84	0.08	2,400	202	Replace T12 Lamps with T8 Lamps & Replace Magnetic Ballast with Electronic	2	54
410	Voorhees H.S.	030	320	Various Fixtures/T8 Lamps/ Electronic Ballasts	40	1080	1.08	2,400	2,592	NONE PROPOSED	40	1080
411	Voorhees H.S.	030	321	Various Fixtures/T8 Lamps/ Electronic Ballasts	40	1080	1.08	2,400	2,592	NONE PROPOSED	40	1080
412	Voorhees H.S.	030	322	Various Fixtures/T8 Lamps/ Electronic Ballasts	48	1296	1.30	2,400	3,110	NONE PROPOSED	48	1296
413	Voorhees H.S.	030	323	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
414	Voorhees H.S.	030	324	Various Fixtures/T8 Lamps/ Electronic Ballasts	12	324	0.32	2,400	778	NONE PROPOSED	12	324
415	Voorhees H.S.	030	325	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
416	Voorhees H.S.	030	326	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
417	Voorhees H.S.	030	330	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
418	Voorhees H.S.	030	331	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
419	Voorhees H.S.	030	332	Various Fixtures/T8 Lamps/ Electronic Ballasts	6	162	0.16	2,400	389	NONE PROPOSED	6	162
420	Voorhees H.S.	030	Lavoratory (1)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
421	Voorhees H.S.	030	Lavoratory (2)	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
422	Voorhees H.S.	030	Mechanical	Various Fixtures/T8 Lamps/ Electronic Ballasts	40	1080	1.08	2,400	2,592	NONE PROPOSED	40	1080
423	Voorhees H.S.	030	333	Various Fixtures/T8 Lamps/ Electronic Ballasts	38	1026	1.03	2,400	2,462	NONE PROPOSED	38	1026
424	Voorhees H.S.	030	Storage	Various Fixtures/T8 Lamps/ Electronic Ballasts	6	162	0.16	500	81	NONE PROPOSED	6	162
425	Voorhees H.S.	030	334	Various Fixtures/T8 Lamps/ Electronic Ballasts	36	972	0.97	2,400	2,333	NONE PROPOSED	36	972
426	Voorhees H.S.	030	Storage	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	500	432	NONE PROPOSED	32	864
427	Voorhees H.S.	030	335	Various Fixtures/T8 Lamps/ Electronic Ballasts	38	1026	1.03	2,400	2,462	NONE PROPOSED	38	1026
428	Voorhees H.S.	030	336	Various Fixtures/T8 Lamps/ Electronic Ballasts	40	1080	1.08	2,400	2,592	NONE PROPOSED	40	1080
429	Voorhees H.S.	030	337	Various Fixtures/T8 Lamps/ Electronic Ballasts	40	1080	1.08	2,400	2,592	NONE PROPOSED	40	1080
430	Voorhees H.S.	030	338	Various Fixtures/T8 Lamps/ Electronic Ballasts	20	540	0.54	2,400	1,296	NONE PROPOSED	20	540
431	Voorhees H.S.	030	340	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
432	Voorhees H.S.	030	341	Various Fixtures/T8 Lamps/ Electronic Ballasts	32	864	0.86	2,400	2,074	NONE PROPOSED	32	864
433	Voorhees H.S.	030	342	Various Fixtures/T8 Lamps/ Electronic Ballasts	28	756	0.76	2,400	1,814	NONE PROPOSED	28	756
434	Voorhees H.S.	030	343	Various Fixtures/T8 Lamps/ Electronic Ballasts	28	756	0.76	2,400	1,814	NONE PROPOSED	28	756
435	Voorhees H.S.	030	344	Various Fixtures/T8 Lamps/ Electronic Ballasts	8	216	0.22	2,400	518	NONE PROPOSED	8	216
436	Voorhees H.S.	-	Exterior Lighting	250W Pole Mounted Fixtures	17	4896	4.90	2,401	11,755	NONE PROPOSED	17	4896
437	Voorhees H.S.	-	Exterior Lighting	400W Ground Fixtures	10	4580	4.58	2,402	11,001	NONE PROPOSED	10	4580
438	Voorhees H.S.	-	Exterior Lighting	1000W Parking Lot Fixtures	16	18080	18.08	2,403	43,446	NONE PROPOSED	16	18080
439	Voorhees H.S.	-	Exterior Lighting	300W Incandescent Canopy Mounted Fixtures	37	11100	11.10	4,380	48,618	Replace with 65W CFL	37	2405
440	Voorhees H.S.	-	Maitenance Garage	Various Fixtures/T8 Lamps/ Electronic Ballasts	42	1134	1.13	2,400	2,722	NONE PROPOSED	42	1134
441	Voorhees H.S.	-	Maitenance Garage	Various Fixtures/8' T12 Lamps/ Magnetic Ballasts	6	675	0.68	2,400	1,620	Replace 8 foot T12 Lamps with (2) 4 foot T8 Lamps & Replace Magnetic Ballast with Electronic	12	324
442	Voorhees H.S.	-	Maitenance Garage	Various Fixtures/T8 Lamps/ Electronic Ballasts	9	243	0.24	2,400	583	NONE PROPOSED	9	243
					14,874		602.84		1,449,256		15,509	

Exhibit G5-1B.1
North Hunterdon Voorhees Regional High School District
ECM - 1B Vending Miser

	North Hunterdon High School	Voorhess HS		Totals
Energy Costs (per kwh)	0.15956	0.15653		
Facility Occupied Hours per Week	60	60		
Number of Cold Drink Vending Machines	11	11		**22**
Number of Uncooled Snack Machines	3	4		**7**
Power Req. of Cold Drink Machine (Watts)	400	400		
Power Req. of Snack Machine (Watts)	80	80		
Savings Analysis				
	Before	Before		
Cold Drink Machines	kWh	kWh		
	38,438	38,438		
	After	After		
	kWh	kWh		
	17,847	17,847		
	Before	Before		
Snack Machines	kWh	kWh		
	2,097	2,097		
	After	After		
	kWh	kWh		
	749	999		
Cost per kWh	$0.160	$0.157		
Project Summary				
Kwh Savings	21,939	21,689		**43,628**
$$ Savings	$3,501	$3,395		**$6,896**
De-Rate	2%	2%		
Savings Kwh	21,500	21,255		**42,755**
Savings $$	$3,430	$3,327		**$6,758**

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions	
Electricity	42755.26546	kwh/yr	0.0005919	Tons/kwh	25.30684163	Tons CO2/yr
Natural Gas	0	mmbtu/yr	0.0585	Tons/mmBtu	0	Tons CO2/yr
Totals					25.30684163	

Exhibit G5-1A.2
North Hunterdon Voorhees Regional High School District
ECM 1A - Lighting and Lighting Controls
Heating Penalty Calculations

		(A)		(B)	(C)	(D)						
	Total Savings from Lighting (kWh)	**Heating season (Weeks)**	**% Heating Season**	**Fraction of Heat to be Made-up**	**Annual Equivalent of Lighting kWh saved in Therms**	**Assume Seasonal Heating Efficiency conservatively at**	**Cost per therm**	**Extra Heat Required =(AxBxC)/D**	**Heating Penalty**	**De-rate**	**Extra Heat Required**	**Heating Penalty**
North Hunterdon High School	102,469	24	46%	40%	3,498	78%	1.122	828	$929	5%	787	$883
Voorheess High School	135,649	24	46%	40%	4,631	78%	1.302	1,096	$1,427	5%	1,041	$1,355
								1,924	$2,356		1,828	$2,238

Notes:

A = Heating Season = 1 – Fraction of the Year Representing the Cooling Season Liberal estimate of the heating season, as there are times during the year when the building is neither heated nor cooled.
B = Fraction of the Lighting Reduction that Has to Be Made Up by Heating A portion of the lighting heat is released at night plus interior zones will have limited heating loads. This is estimated at 50%.
C = Annual therm Equivalent of Lighting Saved Lighting reduction in kWh multiplied by 3,414 British Thermal Units (BTU).
D = Seasonal Heating Efficiency Estimate of basic efficiency of heating system. Heating system efficiency can vary from about 65-95%, depending on the type, use and technology.

Extra Heat Required (BTU) = A x B x C ÷ D

Greenhouse Gas Emissions (GHGs)

Fuel	**Savings**	**Units**	**Carbon Emission Factor**	**Units**	**Emissions**		**Equivalent Cars/yr**	**Equivalent Forested Acres/yr**
Electricity		kwh/yr	0.0005919	Tons/kwh	0	Tons CO2/yr	-	-
Natural Gas	(182.79)	mmbtu/yr	0.0585	Tons/mmBtu	(10.69)	Tons CO2/yr	(1.87)	(1.13)
Totals					(10.69)		(1.87)	(1.13)

Exhibit G5-2.1
North Hunterdon Voorhees Regional High School District
Existing Boiler Efficiency

ESTIMATED OVERALL BOILER EFFICIENCY

ASSUMPTIONS / DATA

		North Hunterdon High School 1950	North Hunterdon High School 1957	Voorhees HS
BOILER TYPE		Steam	Steam	Hot Water
COMBUSTION EFFICIENCY	%	80	80	80
LOSSES DUE TO BLOWDOWN	% OF MCR	5	5	0
LOSSES DUE TO RADIATION	% OF MCR	2	2	1
% MAKEUP WATER	%	2.5	2.5	0.1
MAKEUP T.D.S.	PPM	80	80	80
BLOWDOWN T.D.S.	PPM	3500	3500	3500
ENERGY INPUT TO BOILER(S)	MMBTU/YR	5,341	5,341	7,553
FEEDWATER TEMPERATURE	DEG F	205	205	140
MCR OF BOILER(s)	MMBTU/HR	3.3488	6.695	8.3688
CONDENSATE RETURN TEMPERATURE	DEG F	200	200	200
MAKEUP WATER TEMPERATURE	DEG F	60	60	60
HOURS/YR BOILER OPERATION	HRS/YR	5268	5268	5268
BLOWDOWN TEMPERATURE	DEG F	230	230	180
HEAT REQUIRED TO RAISE A LB OF STEAM	BTU/LB	980	980	980
BOILER LOAD FACTOR	% LOAD FACTOR	50	50	50
LOSSES FROM BLOW DOWN	LBS/LB STEAM	0.0571	0.0571	0.0023
NET HEAT CONTENT IN BLOWDOWN	BTU/LB	170	170	120
BLOWDOWN LOSS AS % OF MCR	%	0.7930	0.7930	0.0224
LOSSES DUE TO BLOWDOWN AT AVERAGE LOAD	%	1.5860	1.5860	0.0448
LOSSES DUE TO RADIATION	%	5.5	5.5	3.5
OVERALL BOILER EFFICIENCY		73%	73%	76%

NOTES:

T.D.S. = TOTAL DISSOLVED SOLIDS; MCR = MAXIMUM CONTINUOUS RATING
HOURS/YR = See BMS Calc; 1 Dtherm = 1 MMBTU
Utility baseline reduced 15% in the "Energy Input to Boilers" to account for DHW and Science Lab load.
BOILER LOAD FACTOR
BOILER LOAD FACTOR = (TOTAL ENERGY TO BOILERS IN MMBTU/YR * BOILER COMBUSTION EFFICIENCY) /
LOSSES FROM BLOWDOWN
PRESENT BLOWDOWN RATE = (% OF MAKEUP WATER * MAKEUP WATER T.D.S.) / BLOWDOWN T.D.S.
NET HEAT CONTENT IN BLOWDOWN = HEAT CONTENT OF BLOWDOWN - HEAT CONTENT OF MAKEUP WATER

NET HEAT CONTENT OF BLOWDOWN = TEMPERATURE OF BLOWDOWN - TEMPERATURE OF MAKEUP WATER
BLOWDOWN LOSS AS % OF MCR = ((MCR OF BOILER IN MMBTU/HR * BOILER COMBUSTION EFFICIENCY) /
LOSSES DUE TO BLOWDOWN = BLOWDOWN LOSS AS % OF MCR / LOAD FACTOR
RADIATION LOSSES
LOSSES DUE TO RADIATION = (% RADIATION AT MCR / LOAD FACTOR) + 1.5%
OVERALL BOILER EFFICIENCY
OVERALL BOILER EFFICIENCY = COMBUSTION EFFICIENCY - % BLOWDOWN LOSSES - % RADIATION LOSSES

Exhibit G5-2.2
North Hunterdon Voorhees Regional High School District
Proposed Boiler Efficiency

ESTIMATED OVERALL BOILER EFFICIENCY

ASSUMPTIONS / DATA

		North Hunterdon HS	North Hunterdon HS	Voorhees HS
BOILER TYPE		Steam	Steam	Hot Water
COMBUSTION EFFICIENCY	%	80	80	80
LOSSES DUE TO BLOWDOWN	% OF MCR	5	5	0
LOSSES DUE TO RADIATION	% OF MCR	2	2	1
% MAKEUP WATER	%	2.5	2.5	0.1
MAKEUP T.D.S.	PPM	80	80	80
BLOWDOWN T.D.S.	PPM	3500	3500	3500
ENERGY INPUT TO BOILER(S)	MMBTU/YR	5,341	5,341	7,553
FEEDWATER TEMPERATURE	DEG F	205	205	140
MCR OF BOILER(s)	MMBTU/HR	3.3488	6.695	8.3688
CONDENSATE RETURN TEMPERATURE	DEG F	200	200	120
MAKEUP WATER TEMPERATURE	DEG F	60	60	60
HOURS/YR BOILER OPERATION	HRS/YR	5268	5268	5268
BLOWDOWN TEMPERATURE	DEG F	230	230	290
HEAT REQUIRED TO RAISE A LB OF STEAM	BTU/LB	980	980	980
BOILER LOAD FACTOR	% LOAD FACTOR	50	50	50
LOSSES FROM BLOW DOWN	LBS/LB STEAM	5.714%	5.714%	0.229%
NET HEAT CONTENT IN BLOWDOWN	BTU/LB	170	170	230
BLOWDOWN LOSS AS % OF MCR	%	0.79	0.79	0.04
LOSSES DUE TO BLOWDOWN AT AVERAGE LOAD	%	1.59	1.59	0.09
LOSSES DUE TO RADIATION	%	5.5	5.5	3.5
OVERALL BOILER EFFICIENCY		73%	73%	76%

NOTES:

T.D.S. = TOTAL DISSOLVED SOLIDS; MCR = MAXIMUM CONTINUOUS RATING
HOURS/YR = See BMS Calc; 1 Dtherm = 1 MMBTU
Utility baseline reduced 15% in the "Energy Input to Boilers" to account for DHW and Science Lab load.
BOILER LOAD FACTOR
BOILER LOAD FACTOR = (TOTAL ENERGY TO BOILERS IN MMBTU/YR * BOILER COMBUSTION EFFICIENCY) /
LOSSES FROM BLOWDOWN
PRESENT BLOWDOWN RATE = (% OF MAKEUP WATER * MAKEUP WATER T.D.S.) / BLOWDOWN T.D.S.
NET HEAT CONTENT IN BLOWDOWN = HEAT CONTENT OF BLOWDOWN - HEAT CONTENT OF MAKEUP WATER
NET HEAT CONTENT OF BLOWDOWN = TEMPERATURE OF BLOWDOWN - TEMPERATURE OF MAKEUP WATER
BLOWDOWN LOSS AS % OF MCR = ((MCR OF BOILER IN MMBTU/HR * BOILER COMBUSTION EFFICIENCY) /
LOSSES DUE TO BLOWDOWN = BLOWDOWN LOSS AS % OF MCR / LOAD FACTOR
RADIATION LOSSES
LOSSES DUE TO RADIATION = (% RADIATION AT MCR / LOAD FACTOR) + 1.5%
OVERALL BOILER EFFICIENCY
OVERALL BOILER EFFICIENCY = COMBUSTION EFFICIENCY - % BLOWDOWN LOSSES - % RADIATION LOSSES

Exhibit G5-2A.1
North Hunterdon Voorhees Regional High School District
ECM 2A Control Links Boiler Burner Controller Savings Summary
Savings Summary

Savings Calculation	North Hunterdon High School	Voorhees HS		Total	
Number of Units	5	3		8	
Current Boiler Efficiency	73%	73%			Overall Thermal Efficiency
Projected Burner/Boiler Efficiency Savings					
Removal of Linkage Wear	1.50%	1.50%			
Improved Combustion	2.00%	2.00%			
Increased Turndown	1.50%	1.50%			
Total Efficiency Savings	5.00%	5.00%			
Annual Boiler Fuel Use	106,039	74,431			Therms/Yr
Adjusted Boiler Usage	136,773	36,716			Interactive Summary (Therms)
Boiler Fuel Cost	$1.12	$1.30			$/Therm
Annual Energy Savings	8,777	2,356		11,133	((% Change in Boiler Efficiency) / (Old Overall Thermal Efficiency in % + % Change in Efficiency)) * Adjusted Boiler Fuel Use
Annual Energy Savings	$9,851	$3,067		$12,918	
De-Rate	0.05	0.05			
Annual Energy Savings	8,338	2,238		10,577	
Annual Energy Savings	$9,359	$2,913		$12,272	

Notes:
Upgrade of boiler controls will improve boiler efficiency by improving the air/fuel ratio over the entire firing range of the boiler.
Improving the air/fuel ratio will increase overall boiler combustion efficiency.
To achieve these savings, a new control system will be added to each boiler - the Control Links system.
Experience and testing of this equipment indicates that this system will improve overall boiler efficiency by 2% to 8%.
Note that the boiler efficiency discussed here is the overall boiler thermal efficiency, not just its combustion efficiency. The value of this number will be much lower than for combustion efficiency alone as it includes losses from radiation, blowdown, and other related losses. The value for annual boiler fuel has been adjusted for the effect of other ECMs.

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	0	kwh/yr	0.0005919	Tons/kwh	0	Tons CO2/yr	0	0
Natural Gas	834	mmbtu/yr	0.0585	Tons/mmBtu	48.8	Tons CO2/yr	8.5	5.1
#2 Fuel Oil	224	mmbtu/yr	0.01119	Tons/gal	2.5	Tons CO2/yr	0.4	0.3
Totals					51.3		9.0	5.4

Exhibit G5-2B.1
North Hunterdon Voorhees Regional High School District
ECM 2B- DHW Heater Upgrade

Savings Calculation

		Voorhees HS		Total		
No. of Units		1		1		
Current Boiler Efficiency		76%			%	Overall Thermal Efficiency
Proposed Boiler Effiiciency		85%			%	Overall Thermal Efficiency
Improvement in Boiler Efficiency		9%			%	New Boiler Efficiency
Annual Boiler Fuel Use		8,270			Therms/Yr	
Adjusted Boiler Usage		8,270			Therms/Yr	Baseline therms less savings from other ECMs
Boiler Fuel Cost		1.302			$/Therm	
Annual Energy Savings		831		831	Therms/Yr	((% Change in Boiler Efficiency) / (Old Overall Thermal Efficiency in % + % Change in Efficiency)) * Adjusted Boiler Fuel Use
Annual Energy Savings $$		$1,082		$1,082		
De-Rate		5%				
Annual Energy Savings		790		790		
Annual Energy Savings $$		$1,028		$1,028		

Notes:
Replacing the existing boiler with a new, high efficiency unit will reduce operating costs at this location.
Improving the air/fuel ratio will increase overall boiler combustion efficiency.
New Boiler will be Natural Gas
Note that the boiler efficiency discussed here is the overall boiler thermal efficiency, not just its combustion efficiency. The value of this number will be much lower than for combustion efficiency alone as it includes losses from radiation, blowdown, and other related losses. The value for annual boiler fuel has been adjusted for the effect of other ECMs.

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity		kwh/yr	0.0005919	Tons/kwh	-	Tons CO2/yr	-	-
Natural Gas		mmbtu/yr	0.0585000	Tons/mmBtu	-	Tons CO2/yr	-	-
#2 Fuel Oil	79	mmbtu/yr	0.0111900	Tons/gal	0.88	Tons CO2/yr	0.15	0.09
Totals					0.88		0.15	0.09

Exhibit G2-2C.1
North Hunterdon Voorhees Regional High School District
ECM 2C - AHU Replacements

Summary Table

		Voorhees	North Hunterdon HS			Total	
A	AHU Heating Capacity	1,105,460	787,000				Btu/hr
B	Current AHU Efficiency =	70	70				
C	New AHU Efficiency =	81	81				
D	Hours of Operation per Year	3,600	3,600				
E	Hours of Operation per Heating Season	2,875	2,875				
F	Annual AHU Fuel Use	53,525	38,106				Therms, kWh NHHS
G	Fuel Cost	1.30	1.12				
H	Annual Energy Savings	9,507	(7,097)				(C -B)/C x F/Boiler Eff. / Kwh NHHS
I	Annual Cost Savings	12,374	(7,966)				H x G
J	Motor HP	65	7.5				
K	Motor kWh	174,564	20,142				J x .746 x D
L	Motor Load Factor	0.80	0.80				
M	Existing Motor Eff.	0.82	0.82				
N	New Motor Eff.	0.92	0.92				
O	Savings kWh	4,007	152,128			**156,135**	[(N - M)/ N] x K x L
P	Electric Cost	$0.16	$0.16				
	Savings kWh $$	$627	$24,273			**$24,901**	O x P
	Savings Therms	9,507	(7,097)			**2,410**	
	Savings Therms $$	$12,374	-$7,966			**$4,409**	
	De-Rate Gas	5%	5%				
	De-Rate Electric	2%	2%				
	Savings kWh	3,927	149,086			**153,013**	
	Savings kWh $$	$615	$23,788			**$24,402**	
	Savings Therms	9,032	(6,742)			**2,290**	
	Therms	$11,756	(7,567)			**$4,188**	

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	153,013	kwh/yr	0.0006	Tons/kwh	90.568256	Tons CO2/yr	15.8	9.5
Natural Gas	(757)	mmbtu/yr	0.0585	Tons/mmBtu	-44.268547	Tons CO2/yr	-7.7	-4.7
#2 Fuel Oil	903	mmbtu/yr	0.0112	Tons/gal	10.106744	Tons CO2/yr	1.8	1.1
Totals					56.406453		9.9	5.9

Exhibit G5-2B.2
North Hunterdon Voorhees Regional High School District
ECM 2 - Convert Electric to Hot Water Heating System

Existing Equipment:

Existing Equipment

Item	Qty.	$/kWh	Diversity Factor	Unit kW	Diversified kW	EFLH	Total kWh	kW cost	kWh cost
North Hunterdon HS	1	$0.16	50%	2,190	1,095	1,438	1,573,984	10,042	251,141
Total	**1**				**1,095**		**1,573,984**	**10,042**	**251,141**

New High Efficiency Gas HW Heater:

New Equipment

Item	Qty.	Efficiency	BTU/hr Output	EFLH	$/Therm		Total MBTU	Total Therms	Cost
North Hunterdon HS	1	92%	5,370,432,520	1438	1.122		5,837,426,652	58,374	$65,517
Total	1						5,837,426,652	58,374	$65,517

Savings Summary:

Savings	$261,183
Kwh savings	1,573,984
Therms	(58,374)
Therms	-$65,517
Derate Gas	5%
De-Rate Electric	2%
Savings	$255,959
Kwh savings	1,542,504
Therms	(55,456)
Therms	-$62,241

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	1,542,504	kwh/yr	0.000592	Tons/kwh	913	Tons CO2/yr	159	96
Natural Gas	(5,546)	mmbtu/yr	0.058500	Tons/mmBtu	(324)	Tons CO2/yr	(57)	(34)
Totals					589		103	62

Exhibit G4-1.1
North Hunterdon Voorhees Regional High School District
Baseline Adjustment - North Hunterdon HS 1968 Wing Cooling

Energy cost increase associated with increased cooling

# of Classrooms		164	
Students per Classroom		30	
Staff per Classroom		1	
Total CFM Air Flow		76,250	cu.ft/min
Estimated % Unit Vent Failure		100%	As per Audit by Branch
Adjusted Unit Vent CFM		76,250	cu.ft/min
Cost of fuel		$ 1.12	per therm
Heating efficiency		73%	
Cooling efficiency		0.65	kW/ton
BTU/ton		12,000	
Cost of electricity		$ 0.16	per kWh
Discharge air temperature from units		55	deg F

Mid-pts	DB (F)	Total Occ. Hours	Heating Load Therms	Heating Load Cost	Cooling Load Tons	Cooling Load kWh	Cooling Load Cost	Total additional Energy Cost
97.5	95 to 100	1			292	190	$ 30	$ 30
92.5	90 to 95	18			257	3,011	$ 480	$ 480
87.5	85 to 90	34			223	4,929	$ 786	$ 786
82.5	80 to 85	162			189	19,872	$ 3,171	$ 3,171
77.5	75 to 80	287			154	28,804	$ 4,596	$ 4,596
72.5	70 to 75	297			120	23,184	$ 3,699	$ 3,699
67.5	65 to 70	330			86	18,372	$ 2,931	$ 2,931
62.5	60 to 65	412			51	13,767	$ 2,197	$ 2,197
57.5	55 to 60	146			17	1,627	$ 260	$ 260
52.5	50 to 55	119	-	$ -				$ -
47.5	45 to 50	129	-	$ -				$ -
42.5	40 to 45	189	-	$ -				$ -
37.5	35 to 40	347	-	$ -				$ -
32.5	30 to 35	333	-	$ -				$ -
27.5	25 to 30	289	-	$ -				$ -
22.5	20 to 25	177	-	$ -				$ -
17.5	15 to 20	175	-	$ -				$ -
12.5	10 to 15	68	-	$ -				$ -
7.5	5 to 10	38	-	$ -				$ -
2.5	0 to 5	16	-	$ -				$ -
-2.5	-5 to 0	5	-	$ -				$ -
-7.5	-10 to -5	0	-	$ -				$ -
		3,570	-	$ -	1,390	113,756	$ 18,151	$ 18,151

Exhibit G5-2E.1
North Hunterdon Voorhees Regional High School District
ECM 2E - Non - Chemical Water Treatment

	School		Voorhees HS		Total	
A1	Electric Rate		0.157			
A2	Fuel Rate		1.302			
B	Assumed Average fouling factor		0.0010			Fouling Factor mils
C	Assumed Average fouling factor with no treatment		0.0011			Fouling Factor Over the Cooling Season 5, 10, 15, 20 mils
E	Average extra power required for system w/Non-Chem WT		0.0520			Table 1
F	Average extra power required for Non-Treatment system		0.0622			Table 1
G	Current Tonnage		500			Chiller Data
H	kw/Ton		0.65			Chiller Data
I	Hours of Operation		2,260			27 wks x 7 days/wk x 12 hr/day
J	kWh/yr		734,370			G x H x I
K	Cooling Savings Electric (kWh)		7,491		**7,491**	J x (F - E)
L	Cost Savings Electric $$		$1,173		**$1,173**	K x A1
M	Current Gas Usage		0			Therms
	De-Rate Electric		2%			
	De-Rate Thermal		5%			
	Cooling Savings Electric (kWh)		7,341		**7,341**	
	Cost Savings Electric $$		$1,149		**$1,149**	

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	7,341	kwh/yr	0.0005919	Tons/kwh	4.345	Tons CO2/yr	0.7590	0.4574
Natural Gas		mmbtu/yr	0.0585	Tons/mmBtu	-	Tons CO2/yr	-	-
#2 Fuel Oil		mmbtu/yr	0.01119	Tons/gal	-	Tons CO2/yr	-	-
Totals					4.345		0.7590	0.4574

Exhibit G2-2F.1
North Hunterdon Voorhees Regional High School District
ECM 2F - Roof Top Unit Replacements

Summary Table

	NHHS				Total
Savings kWh	225,820				**225,820**
Savings kWh $$	$ 36,031				**$ 36,031**
Savings Therms	4,288				**4,288**
Savings Therms $$	$ 6,574				**$ 6,574**
De-Rate Gas	5%				
De-Rate Electric	2%				
Savings kWh	221,304				**221,304**
Savings kWh $$	$ 35,311				**$ 35,311**
Savings Therms	4,073				**4,073**
Therms	$ 6,245				**$ 6,245**

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	221,304	kwh/yr	0.00059190	Tons/kwh	131.0	Tons CO2/yr	22.880	13.8
Natural Gas	407.35	mmbtu/yr	0.05850000	Tons/mmBtu	23.8	Tons CO2/yr	4.162	2.5
#2 Fuel Oil	-	mmbtu/yr	0.01119000	Tons/gal	0.0	Tons CO2/yr	-	0.0
Totals					**154.8**		**27.043**	**16.3**

	Roof Top Unit Replacements	Tons Cooling		Heating Capacity BTU		Total Air	Outside Air	Return Air	
1	**RTU - 33 Auditorium**	25.6		370,000		11,025	2,000	9,025	
2	**RTU - 34 Auditorium**	25.6		370,000		11,025	2,000	9,025	
3	**Auditorium - AH-2**	7.9				3,000	1,150	1,850	
4	**HVAC-1 (1968 Wing)**	13.0		246,000		4,000	-	4,000	
5	**RTU Cond Unit 1**	1.5							
6	**RTU Cond Unit 2**	24.0							
7	**RTU Cond Unit 4**	1.5							
8	**RTU - 30**	12.0		200,000		4,800			
9	**RTU - 35**	12.0		200,000		4,800			
10	**RTU - 36**	12.0		200,000		4,800			
11	**RTU - 37**	12.0		200,000		4,800			
12	**RTU - 38**	12.0		200,000		4,800			
13	**RTU - 39**	12.0		200,000		4,800			
14	**RTU - 40**	12.0		200,000		4,800			

-

Btu

Total Tons 183 Tons 2,386,000 Btu
$/kWh $ 0.1596

O.A. Temp. Range deg F	Avg. Temp. deg F	Tons (Note 2)	Hrs/yr (Note 1)	Ton-Hrs/yr (Note 3)	Existing EER	Proposed EER	Existing RTP kwh	New RTP kwh	Energy savings KWH svg. (Note 6)	Cost Savings
110-114	112	183	0	0	7	12	0	0	0	$ -
105-109	107	183	0	0	7	12.1	0	0	0	$ -
100-104	102	183	0	0	7	12.1	0	0	0	$ -
95-99	97	183	5	915	7	12.1	1,569	908	661	$ 106
90-94	92	183	28	5,125	7	12.1	8,785	5,082	3,703	$ 591
85-89	87	158	170	26,910	7	12.1	46,131	26,687	19,444	$ 3,102
80-84	82	134	363	48,482	7	12.1	83,112	48,081	35,031	$ 5,589
75-79	77	109	664	72,260	7	12.1	123,875	71,663	52,212	$ 8,331
70-74	72	84	820	68,956	7	12.1	118,210	68,386	49,824	$ 7,950
65-69	67	59	941	55,857	7	12.1	95,755	55,396	40,360	$ 6,440
60-64	62	35	783	27,112	7	12.1	46,478	26,888	19,590	$ 3,126
55-59	57	10	699	6,915	7	12.1	11,855	6,858	4,997	$ 797
			4,473	**312,533**			**535,770**	**309,950**	**225,820**	**$ 36,031**

NOTES
1. Weather bin data with temperatures and hours/year is for New Jersey
2. Total tonnage replaced is 60, peak at 92 degrees and zero at 55 degrees
3. Cooling ton-hours = Tons x Hours/year for each temperature bin.
4. New RTU energy consumption= ton-hrs/year x
6. KWH saved = KWH used by existing RTU- KWH used by the new RTU
7. Cooling KWH are caculated by subtracting the monthly base electric load from monthly total KWH.
Monthly base electric load is estimated as the average KWH for the winter months of December through March.

Gas Savings

Current RTU Efficiency = 78 %
New RTU Efficiency = 81 %
Annual RTU Fuel Use 68,602 Therms
RTU Fuel Cost = $1.53 $/Therm
Annual Energy Savings = ((New RTU Efficency in % - Old RTU Efficiency in %) / (New RTU Efficency in %)) * Annual RTU Fuel Use
Annual Energy Savings = 2,541 Therms/yr
Annual Cost Savings = Annual Energy Savings in MMBtu/yr * $/MMBtu
Annual Cost Savings = $3,895 Per Year

Exhibit G5-3A.1
North Hunterdon Voorhees Regional High School District
ECM 3A - Building Management System Upgrades
Unoccupied Set Back Controls

	Motor Savings				
		Voorhees HS		**Total**	
A	Total Hp	233.5			
B	kW	174.2			A x .746
C	hr/day	8.0			
D	days/year	300.0			
F	Load Factor	0.8			
E	kwh	334,446.7			B x C x D x E
	$kwh	0.157			
	kwh	334,446.7		334,446.7	
	kWh $$	$52,352		$52,352	
	De-Rate	2%			
	kwh	327,757.8		327,757.8	
	kWh $$	$51,305		$51,305	

Thermal Savings

	Current	Proposed
Occupied Space Temperature	70.0	70.0
Unoccup. Space Temperature	68.0	55.0

NIGHT SETBACK SAVINGS CALCULATIONS:

	Description	Current Boiler Usage	Adjusted Baseline (includes interactive ECM affects)	Adjusted Boiler Load for Space Heating	Existing heating deg-hrs	Proposed heating deg-hrs	Energy Savings	Energy Savings	Energy Rate	Energy Savings	De-Rate	Energy Savings	Energy Savings
		Therms/yr	Therms/yr	Therms/yr	F	F	%	Therms/yr	$/Therm	$		Therms/yr	$
1.0	North Hunterdon HS	117,821.0	136,772.5	136,772.5	134,594.1	106,485.4	10%	12,302.9	1.122	13,808.2	5%	11,687.8	13,117.8
	Voorhees HS	82,700.8	36,716.3	36,716.3	134,594.1	106,485.4	10%	8,635.7	1.302	11,239.8	5%	8,203.9	10,677.8
	TOTAL	200,521.8	173,488.8	173,488.8				20,938.6		25,048.1		19,891.7	23,795.7

Savings Calculation for Night Setback Control sequence
ASHRAE TMY-2 Weather Data

Current Operating Schedule

Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg.	M.C. Enthalpy Btu/lb	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hou	Unocc. Bin Hou
Heating									
55 to 60	57.5	52.7	21.8	290.0	202.0	250.0	742.0	405.4	276.6
50 to 55	52.5	47.8	19.1	262.0	212.0	236.0	710.0	397.8	256.6
45 to 50	47.5	43.6	16.9	289.0	262.0	228.0	779.0	438.7	279.7
40 to 45	42.5	39.4	15.0	261.0	198.0	251.0	710.0	396.9	257.4
35 to 40	37.5	34.5	12.8	301.0	235.0	248.0	784.0	433.4	288.2
30 to 35	32.5	29.7	10.8	248.0	191.0	243.0	682.0	382.7	246.0
25 to 30	27.5	24.9	8.9	162.0	83.0	121.0	366.0	188.5	145.9
20 to 25	22.5	20.2	7.2	93.0	43.0	72.0	208.0	106.2	83.6
15 to 20	17.5	15.3	5.5	87.0	26.0	76.0	189.0	93.9	78.2
10 to 15	12.5	10.9	4.1	52.0	6.0	12.0	70.0	24.2	37.6
5 to 10	7.5	5.5	2.4	19.0	1.0	2.0	22.0	6.2	13.0
0 to 5	2.5	1.5	1.3	6.0	0.0	0.0	6.0	1.2	3.9
-5 to 0	(2.5)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-10 to -5	(7.5)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total				2,070.0	1,459.0	1,739.0	5,268.0	2,875.2	1,966.7
									4,841.9

Proposed Operating Schedule

Amb. Temp Bin deg. F	Occup. Indoor te	Unocc. Indoor	Occup. heating	Unocc. heating De	Total heating	Occup.Bin Hours	Unocc. Bin Hour	Occup. Ind	Unocc. Ind	Occup. heati	Unocc. heatin	Total heating
Heating												
55 to 60	70.0	68.0	5,067.6	2,904.8	7,972.4	304.1	437.9	70.0	55.0	3,800.7	1,094.9	4,895.6
50 to 55	70.0	68.0	6,961.6	3,977.2	10,938.9	298.4	411.6	70.0	55.0	5,221.2	1,029.1	6,250.3
45 to 50	70.0	68.0	9,870.7	5,733.8	15,604.6	329.0	450.0	70.0	55.0	7,403.0	3,374.8	10,777.9
40 to 45	70.0	68.0	10,914.3	6,562.6	17,476.9	297.7	412.3	70.0	55.0	8,185.7	5,154.2	13,339.9
35 to 40	70.0	68.0	14,084.1	8,790.1	22,874.2	325.0	459.0	70.0	55.0	10,563.1	8,032.2	18,595.3
30 to 35	70.0	68.0	14,351.5	8,732.8	23,084.3	287.0	395.0	70.0	55.0	10,763.6	8,886.8	19,650.4
25 to 30	70.0	68.0	8,012.4	5,907.6	13,920.1	141.4	224.6	70.0	55.0	6,009.3	6,176.6	12,185.9
20 to 25	70.0	68.0	5,046.1	3,805.8	8,851.9	79.7	128.3	70.0	55.0	3,784.5	4,170.6	7,955.1
15 to 20	70.0	68.0	4,930.0	3,947.1	8,877.1	70.4	118.6	70.0	55.0	3,697.5	4,446.4	8,143.9
10 to 15	70.0	68.0	1,394.2	2,087.1	3,481.3	18.2	51.8	70.0	55.0	1,045.6	2,202.1	3,247.8
5 to 10	70.0	68.0	385.3	787.4	1,172.7	4.6	17.4	70.0	55.0	289.0	825.4	1,114.3
0 to 5	70.0	68.0	83.2	256.6	339.9	0.9	5.1	70.0	55.0	62.4	266.5	328.9
-5 to 0	70.0	68.0	0.0	0.0	0.0	0.0	0.0	70.0	55.0	0.0	0.0	0.0
-10 to -5	70.0	68.0	0.0	0.0	0.0	0.0	0.0	70.0	55.0	0.0	0.0	0.0
Total			81,100.9	53,493.2	134,594.1	2,156.4	3,111.6	980.0	770.0	60,825.7	45,659.7	106,485.4

NOTES:
Night Setback Savings Formulas:
Energy Savings(%) = (Current Heating deg-hrs-Proposed Heating Deg-Hrs)/Current Heating Deg-hrs x 100 x recovery factor
Total Energy Savings = Energy Savings During Setback(%) x Current heating fuel consumption(Therms/yr) x Heating Fuel Cost($/therm)
Please see interactive savings table for break-down of adjusted baseline.
Current heating Therms/yr was derived from fuel utility bills.
The new heating fuel consumption is derived by deducting savings from all other ECMs from the baseline consumption

Greenhouse Gas Emissions (GHGs)								
Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	327,757.8	kwh/yr	0.0	Tons/kwh	194.0	Tons CO2/yr	33.9	20.4
Natural Gas	1,168.8	mmbtu/yr	0.1	Tons/mmBtu	68.4	Tons CO2/yr	11.9	7.2
#2 Fuel Oil	820.4	mmbtu/yr	0.0	Tons/gal	9.2	Tons CO2/yr	1.6	1.0
Totals					271.6		47.4	28.6

Exhibit G5-3B.1
North Hunterdon Voorhees Regional High School District
ECM 3B - Install CO2 Sensors in Air Handling Units
Savings Summary

School ID	Savings kWh	$/kWh	kWh $$	Therms	Calculated Savings $/therms	Therms $$	De-Rate	kWh	kWh $$	De-Rate	Therms	Therms $$
North Hunterdon HS	6,542	$ 0.160	$1,044	6,807	$ 1.122	$7,640	2%	6,411	$1,023	5%	6,467	$7,258
Voorhees	2,412	$ 0.157	$378	10,264	$ 1.302	$13,359	2%	2,364	$370	5%	9,751	$12,691
Total	**8,954**		**$1,421**	**17,072**		**$21,000**		**8,775**	**$1,393**		**16,218**	**$19,950**

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	8,775	kwh/yr	0.000592	Tons/kwh	5.2	Tons CO2/yr	0.9	0.5
Natural Gas	1,622	mmbtu/yr	0.058500	Tons/mmBtu	94.9	Tons CO2/yr	16.6	10.0
Totals					**100.1**		**17.5**	**10.5**

Exhibit G5-3B.1
North Hunterdon Voorhees Regional High School District
ECM 3B - Install CO2 Sensors in Air Handling Units
Savings Summary

General Information	
Building	**North Hunterdon HS**
System(s)	
Total CFM	39,680
OA CFM, Baseline Minimum	13,094
OA CFM, Proposed Minimum	10,476
Area Served	49,600
Space Temp	72
Space RH	55%
Space Enthalpy	27.4

Cooling/Heating System Info		
Cooling Equip Type	WCS	
Cooling Full Load KW/Ton		1.25
Cooling IPLV		0.75
Heating System:	Hot Water	
Heating Efficiency		73%
OAT for Cooling		60
OAT for Heating		55

Occupancy Profiles (% Max Occupancy)			
Time Period	**Hrs**	**Typical Day**	
		Occupied	**UnOcc.**
5 AM - 7 AM	2	0%	100%
7 AM - 9 AM	2	20%	80%
9 AM - 11 AM	2	90%	10%
11 AM - 2 PM	3	100%	0%
2 PM - 5 PM	3	90%	10%
5 PM - 9 PM	4	50%	50%
9 PM - 11 PM	2	20%	80%
11 PM - 5 AM	6	0%	100%
	24		
		Weekday	**Off Peak**
Blended Average		46%	50%
Peak Day		85%	85%

Calculation Formulas	
Ventilation Lo	CFM of OA * 4.5 * (Enthalpy of OA - Enthalpy at Room (
Ventilation Lo	CFM of OA * 1.1 * (Temp of OA - Room Temp) / 1000
Max Kw:	Cool Tons * Full Load kW/ton
Peak & Off Pe	Cool Tons * IPLV * Hours
MMBTU:	Heating MBH * Hours / 1000 / Efficiency

64.58706119 Grains

Operating Hour Profile (Academic)				**Baseline Energy Estimate**							**Proposed Energy Estimate**						
Dry Bulb Temperature Bins (Hrs/Yr)				entilation Quantity (% FL OA CF		Ventilation Load (Tons or MBH)		Annual Energy			entilation Quantity (% FL OA CF		Ventilation Load (Tons/MBH		Annual Energy		
		Annual		Annual		Annual					Annual		Annual				
OAT	Enthalpy	Occupied	Unoccupied	Occupied	Unoccupied	Occupied	Unoccupied	Max kW	kWh	Therms	Occupied	Unoccupied	Occupied	Unoccupied	Max kW	kWh	Therms
93	40.9	17	4	100%	100%	66	66	83	1,002	-	80%	80%	53	53	66	802	-
91	40.6	25	6	100%	100%	65	65	81	1,492	-	85%	80%	55	52	69	1,253	-
89	39.7	38	9	100%	100%	61	61	76	2,122	-	80%	80%	48	48	61	1,697	-
87	37.6	56	14	100%	100%	50	50	63	2,635	-	80%	80%	40	40	50	2,108	-
85	37.3	70	20	100%	100%	49	49	61	3,293	-	80%	80%	39	39	49	2,635	-
83	35	89	29	100%	100%	37	37	47	3,324	-	80%	80%	30	30	37	2,659	-
81	35	106	41	100%	100%	37	37	47	4,142	-	80%	80%	30	30	37	3,314	-
79	34	104	50	100%	100%	33	33	41	3,771	-	80%	80%	26	26	33	3,017	-
77	31.8	116	67	100%	100%	22	22	27	2,986	-	80%	80%	17	17	22	2,389	-
75	31.7	127	99	100%	100%	21	21	27	3,600	-	80%	80%	17	17	21	2,880	-
73	30.7	135	137	100%	100%	16	16	20	3,342	-	80%	80%	13	13	16	2,674	-
71	30.9	136	151	100%	100%	17	17	22	3,738	-	80%	80%	14	14	17	2,991	-
69	29.4	124	159	100%	100%	10	10	12	2,121	-	80%	80%	8	8	10	1,697	-
67	27.8	122	176	100%	100%	2	2	3	478	-	80%	80%	2	2	2	382	-
65	26.9	115	180	100%	100%	(2)	(2)	(3)	(504)	-	80%	80%	(2)	(2)	(2)	(403)	-
63	26.1	124	187	100%	100%	(6)	(6)	(8)	(1,449)	-	80%	80%	(5)	(5)	(6)	(1,159)	-
61	24.5	118	175	100%	100%	(14)	(14)	(18)	(3,084)	-	80%	80%	(11)	(11)	(14)	(2,467)	-
59	23.3	111	171	100%	100%	-	-	-	-	-	80%	80%	-	-	-	-	-
57	22.8	113	175	100%	100%	-	-	-	-	-	80%	80%	-	-	-	-	-
55	21.3	112	173	100%	100%	-	-	-	-	-	80%	80%	-	-	-	-	-
53	20.4	110	161	100%	100%	274	274	-	-	1,017	80%	80%	219	219	-	-	814
51	19.6	111	169	100%	100%	302	302	-	-	1,162	80%	80%	242	242	-	-	930
49	18.8	107	152	100%	100%	331	331	-	-	1,175	80%	80%	265	265	-	-	940
47	18.5	110	160	100%	100%	360	360	-	-	1,335	80%	80%	288	288	-	-	1,068
45	17.4	113	161	100%	100%	389	389	-	-	1,460	80%	80%	311	311	-	-	1,168
43	15.7	111	166	100%	100%	418	418	-	-	1,583	80%	80%	334	334	-	-	1,266
41	15.6	119	175	100%	100%	447	447	-	-	1,800	80%	80%	357	357	-	-	1,440
39	14.1	124	169	100%	100%	475	475	-	-	1,910	80%	80%	380	380	-	-	1,528
37	13.8	126	186	100%	100%	504	504	-	-	2,161	80%	80%	403	403	-	-	1,729
35		118	190	100%	100%	533	533	-	-	2,252	80%	80%	426	426	-	-	1,802
33		110	195	100%	100%	562	562	-	-	2,353	80%	80%	449	449	-	-	1,882
31		99	169	100%	100%	591	591	-	-	2,168	80%	80%	472	472	-	-	1,735
29		78	142	100%	100%	619	619	-	-	1,868	80%	80%	495	495	-	-	1,494
27		66	123	100%	100%	648	648	-	-	1,677	80%	80%	519	519	-	-	1,341
25		60	114	100%	100%	677	677	-	-	1,617	80%	80%	542	542	-	-	1,294
23		50	91	100%	100%	706	706	-	-	1,365	80%	80%	565	565	-	-	1,092
21		44	81	100%	100%	735	735	-	-	1,251	80%	80%	588	588	-	-	1,001
19		34	71	100%	100%	763	763	-	-	1,099	80%	80%	611	611	-	-	879
17		28	62	100%	100%	792	792	-	-	976	80%	80%	634	634	-	-	781
15		20	51	100%	100%	821	821	-	-	797	80%	80%	657	657	-	-	638
13		16	45	100%	100%	850	850	-	-	712	80%	80%	680	680	-	-	570
11		13	38	100%	100%	879	879	-	-	613	80%	80%	703	703	-	-	491
9		8	28	100%	100%	907	907	-	-	451	80%	80%	726	726	-	-	360
7		6	23	100%	100%	936	936	-	-	369	80%	80%	749	749	-	-	295
5		4	18	100%	100%	965	965	-	-	282	80%	80%	772	772	-	-	226
3		2	13	100%	100%	994	994	-	-	199	80%	80%	795	795	-	-	159
1		1	10	100%	100%	1,023	1,023	-	-	160	80%	80%	818	818	-	-	128
-1		1	6	100%	100%	1,051	1,051	-	-	88	80%	80%	841	841	-	-	70
-3		0	5	100%	100%	1,080	1,080	-	-	80	80%	80%	864	864	-	-	64
-5		0	4	100%	100%	1,109	1,109	-	-	56	80%	80%	887	887	-	-	45
-7		0	2														
Total	**8,744**	**3,743**	**5,001**						**33,009**	**34,037**						**26,467**	**27,230**

Savings Summary							
Energy Summer (kWh/yr)	Electrical Savings Demand (kW) Summer Peak	Summer Average		Gas (therms/yr)	Fuel Oil Savings (gal/yr)	Coal Savings (tons/yr)	Steam Savings (MMBtu/yr)
6,542	12	12		6,807			

	Qty	Est CFM each
Auditorium	2	10000
Cafeteria	1	10000
Boys Gym	4	2420
Total	7	39680
Estimated HP	37.5	
Fan Load Factor	0.8	
Boiler Efficiency	73%	

Exhibit G5-3B.1
North Hunterdon Voorhees Regional High School District
ECM 3B - Install CO2 Sensors in Air Handling Units
Savings Summary

General Information	
Building	**Voorhees HS Gym**
System(s)	
Total CFM	46,000
OA CFM, Baseline Minimum	15,180
OA CFM, Proposed Minimum	12,144
Area Served	10,761
Space Temp	72
Space RH	55%
Space Enthalpy	27.4

Cooling/Heating System Info		
Cooling Equip Type	None	
Cooling Full Load KW/Ton		0.00
Cooling IPLV		0.00
Heating System:	Hot Water	
Heating Efficiency		73%
OAT for Cooling		60
OAT for Heating		55

Occupancy Profiles (% Max Occupancy)			
Time Period	**Hrs**	**Typical Day**	
		Occupied	**UnOcc.**
5 AM - 7 AM	2	0%	100%
7 AM - 9 AM	2	20%	80%
9 AM - 11 AM	2	90%	10%
11 AM - 2 PM	3	100%	0%
2 PM - 5 PM	3	90%	10%
5 PM - 9 PM	4	50%	50%
9 PM - 11 PM	2	20%	80%
11 PM - 5 AM	6	0%	100%
	24		
		Weekday	**Off Peak**
Blended Average		46%	50%
Peak Day		85%	85%

Calculation Formulas	
Ventilation Lo	CFM of OA * 4.5 * (Enthalpy of OA - Enthalpy at Room (
Ventilation Lo	CFM of OA * 1.1 * (Temp of OA - Room Temp) / 1000
Max Kw:	Cool Tons * Full Load kW/ton
Peak & Off Pe	Cool Tons * IPLV * Hours
MMBTU:	Heating MBH * Hours / 1000 / Efficiency

64.58706119 Grains

Operating Hour Profile (Academic)				**Baseline Energy Estimate**							**Proposed Energy Estimate**						
Dry Bulb Temperature Bins (Hrs/Yr)				ntilation Quantity (% FL OA CF		Ventilation Load (Tons or MBH)		Annual Energy			ntilation Quantity (% FL OA CF		Ventilation Load (Tons/MBH		Annual Energy		
		Annual		Annual		Annual					Annual		Annual				
OAT	Enthalpy	Occupied	Unoccupied	Occupied	Unoccupied	Occupied	Unoccupied	Max kW	kWh	Therms	Occupied	Unoccupied	Occupied	Unoccupied	Max kW	kWh	Therms
93	40.9	17	4	100%	100%	77	77	-	-	-	80%	80%	62	62	-	-	-
91	40.6	25	6	100%	100%	75	75	-	-	-	80%	80%	60	60	-	-	-
89	39.7	38	9	100%	100%	70	70	-	-	-	80%	80%	56	56	-	-	-
87	37.6	56	14	100%	100%	58	58	-	-	-	80%	80%	47	47	-	-	-
85	37.3	70	20	100%	100%	57	57	-	-	-	80%	80%	45	45	-	-	-
83	35	89	29	100%	100%	43	43	-	-	-	80%	80%	35	35	-	-	-
81	35	106	41	100%	100%	43	43	-	-	-	80%	80%	35	35	-	-	-
79	34	104	50	100%	100%	38	38	-	-	-	80%	80%	30	30	-	-	-
77	31.8	116	67	100%	100%	25	25	-	-	-	80%	80%	20	20	-	-	-
75	31.7	127	99	100%	100%	25	25	-	-	-	80%	80%	20	20	-	-	-
73	30.7	135	137	100%	100%	19	19	-	-	-	80%	80%	15	15	-	-	-
71	30.9	136	151	100%	100%	20	20	-	-	-	80%	80%	16	16	-	-	-
69	29.4	124	159	100%	100%	12	12	-	-	-	80%	80%	9	9	-	-	-
67	27.8	122	176	100%	100%	2	2	-	-	-	80%	80%	2	2	-	-	-
65	26.9	115	180	100%	100%	(3)	(3)	-	-	-	80%	80%	(2)	(2)	-	-	-
63	26.1	124	187	100%	100%	(7)	(7)	-	-	-	80%	80%	(6)	(6)	-	-	-
61	24.5	118	175	100%	100%	(16)	(16)	-	-	-	80%	80%	(13)	(13)	-	-	-
59	23.3	111	171	100%	100%	-	-	-	-	-	80%	80%	-	-	-	-	-
57	22.8	113	175	100%	100%	-	-	-	-	-	80%	80%	-	-	-	-	-
55	21.3	112	173	100%	100%	-	-	-	-	-	80%	80%	-	-	-	-	-
53	20.4	110	161	100%	100%	317	317	-	-	1,179	80%	80%	254	254	-	-	943
51	19.6	111	169	100%	100%	351	351	-	-	1,347	80%	80%	281	281	-	-	1,078
49	18.8	107	152	100%	100%	384	384	-	-	1,363	80%	80%	307	307	-	-	1,090
47	18.5	110	160	100%	100%	417	417	-	-	1,548	80%	80%	334	334	-	-	1,238
45	17.4	113	161	100%	100%	451	451	-	-	1,693	80%	80%	361	361	-	-	1,354
43	15.7	111	166	100%	100%	484	484	-	-	1,835	80%	80%	387	387	-	-	1,468
41	15.6	119	175	100%	100%	518	518	-	-	2,086	80%	80%	414	414	-	-	1,669
39	14.1	124	169	100%	100%	551	551	-	-	2,214	80%	80%	441	441	-	-	1,771
37	13.8	126	186	100%	100%	584	584	-	-	2,506	80%	80%	468	468	-	-	2,004
35		118	190	100%	100%	618	618	-	-	2,611	80%	80%	494	494	-	-	2,089
33		110	195	100%	100%	651	651	-	-	2,728	80%	80%	521	521	-	-	2,182
31		99	169	100%	100%	685	685	-	-	2,514	80%	80%	548	548	-	-	2,011
29		78	142	100%	100%	718	718	-	-	2,165	80%	80%	574	574	-	-	1,732
27		66	123	100%	100%	751	751	-	-	1,944	80%	80%	601	601	-	-	1,555
25		60	114	100%	100%	785	785	-	-	1,875	80%	80%	628	628	-	-	1,500
23		50	91	100%	100%	818	818	-	-	1,582	80%	80%	655	655	-	-	1,266
21		44	81	100%	100%	852	852	-	-	1,451	80%	80%	681	681	-	-	1,160
19		34	71	100%	100%	885	885	-	-	1,274	80%	80%	708	708	-	-	1,020
17		28	62	100%	100%	918	918	-	-	1,131	80%	80%	735	735	-	-	905
15		20	51	100%	100%	952	952	-	-	924	80%	80%	761	761	-	-	739
13		16	45	100%	100%	985	985	-	-	826	80%	80%	788	788	-	-	660
11		13	38	100%	100%	1,019	1,019	-	-	711	80%	80%	815	815	-	-	569
9		8	28	100%	100%	1,052	1,052	-	-	522	80%	80%	842	842	-	-	418
7		6	23	100%	100%	1,085	1,085	-	-	427	80%	80%	868	868	-	-	342
5		4	18	100%	100%	1,119	1,119	-	-	327	80%	80%	895	895	-	-	261
3		2	13	100%	100%	1,152	1,152	-	-	231	80%	80%	922	922	-	-	185
1		1	10	100%	100%	1,186	1,186	-	-	185	80%	80%	948	948	-	-	148
-1		1	6	100%	100%	1,219	1,219	-	-	102	80%	80%	975	975	-	-	82
-3		0	5	100%	100%	1,252	1,252	-	-	93	80%	80%	1,002	1,002	-	-	74
-5		0	4	100%	100%	1,286	1,286	-	-	65	80%	80%	1,029	1,029	-	-	52
-7		0	2														
Total	**8,744**	**3,743**	**5,001**						**-**	**39,459**						**-**	**31,567**

Savings Summary						
	Electrical Savings					
Energy	Demand (kW)					
Summer (kWh/yr)	Summer Peak	Summer Average	Gas (therms/yr)	Fuel Oil Savings (gal/yr)	Coal Savings (tons/yr)	Steam Savings (MMBtu/yr)
-	-	-	7,892			

	Qty	Est CFM each
Gym	2	16000
Auditorium	1	14000
Total	3	46000
Estimated HP	30	
Fan Load Factor	0.8	
Boiler Efficiency	76%	

Exhibit G5-3C.1
North Hunterdon Voorhees Regional High School District
ECM 3B - Chiller Replacement
Savings Summary

School ID	Savings kWh	$/kWh	kWh $$	De-Rate	kWh	kWh $$
North Hunterdon HS	25,379	$ 0.160	$4,049	2%	24,872	$3,968
Total	**25,379**		**$4,049**		**24,872**	**$3,968**

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	24,872	kwh/yr	0.000592	Tons/kwh	14.7	Tons CO2/yr	2.6	1.5
Natural Gas	-	mmbtu/yr	0.058500	Tons/mmBtu	0.0	Tons CO2/yr	-	0.0
#2 Fuel Oil	-	mmbtu/yr	0.011190	Tons/gal	0.0	Tons CO2/yr	-	0.0
Totals					**14.7**		**2.6**	**1.5**

Variable			Value	Units	Symbol
Indoor Temperature			72	°F	C
UA			1,283	btu/hr*°F	G
Vent. Airflow			8,000	cfm	
Existing Cooling Efficiency			1.5	kW/ton	D
Proposed Cooling Efficiency			0.65	kW/ton	F
Internal Equipment Load			19,209	Btu/hr	M
Number of Students			200		
Internal Personnel Load			50,000	Btu/hr	N

Bin Weather OA Temp A	Total Hrs B	Indoor Temp (°F) C	Delta T (F) E	UA (BTU/ hr/ F) G	Conduction Load (ton-hrs) H	Ventilation Load (ton-hrs) J	Internal Load (ton-hrs) K	Total Load (ton-hrs) L
			=C - A		=G*B*E /12,000	=1.08* Outdoor Air CFM *E*B /12,000	=M + N /12,000	=(H+J+K)
97	3	72	25.0	1,282.5	8.0	0.5	12.4	20.9
95	11	72	23.0	1,282.5	27.0	1.6	45.3	74.0
93	14	72	21.0	1,282.5	31.4	1.9	57.7	91.0
91	57	72	19.0	1,282.5	115.7	7.0	234.8	357.6
89	58	72	17.0	1,282.5	105.4	6.4	238.9	350.7
87	73	72	15.0	1,282.5	117.0	7.1	300.7	424.9
85	88	72	13.0	1,282.5	122.3	7.4	362.5	492.2
83	104	72	11.0	1,282.5	122.3	7.4	428.4	558.1
81	149	72	9.0	1,282.5	143.3	8.7	613.8	765.8
79	147	72	7.0	1,282.5	110.0	6.7	605.6	722.2
77	110	72	5.0	1,282.5	58.8	3.6	453.2	515.5
75	211	72	3.0	1,282.5	67.7	4.1	869.2	941.0
73	352	72	1.0	1,282.5	37.6	2.3	1,450.1	1,490.0
71	246	72	(1.0)	1,282.5	-	-	1,013.4	1,013.4
69	270	72	(3.0)	1,282.5	-	-	1,112.3	1,112.3
67	283	72	(5.0)	1,282.5	-	-	1,165.8	1,165.8
65	332	72	(7.0)	1,282.5	-	-	1,367.7	1,367.7
63	301	72	(9.0)	1,282.5	-	-	1,240.0	1,240.0
61	339	72	(11.0)	1,282.5	-	-	1,396.5	1,396.5
	3148							14,099.7

	Existing	Proposed	Savings	
Thermal Energy	14,099.7	14,099.7	-	ton-hrs
Equip, Efficiency	1.2	0.65	---	kW/ton
Reduced Load Efficiency	1.3			Current equipment is oversized
Consumption	34,544.2	9,164.8	25,379.4	kWh

Notes:
Internal equipment load based on 1.5 watts per square foot of building space
Internal personnel load based on 250 btu/hr per occupant
Both internal loads are added based on five days per week occupation
Bin hours from binmaker pro for typical year.

			Areas (sq ft)			U Values			Conduction Load	Scheduled Air Handlers					
Area	Gross Wall Area (sq ft)	Window Glass % of Walls	Walls (sq ft)	Window and Door Glass (sq ft)	Roof (sq ft)	Walls	Windows	Roof	UA (BTU/ hroF)	Motor Hp	Mechanical Outdoor Air (CFM)	Floor Area (sq ft)	Floor Heights (ft)	Leakage Rate (ACH)	Leakage Amount (CFM)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
			= B*(1-C)	= B*C					^=I*F+H*E+D*G	From equipment schedules.				Based on "average" construction	=M*K*L*/ [60 min/ hr]
Cafeteria	2,250	0%	2,250	0	3,750	0.46	0.67	0.07	1,283	0	8,000	3,750	9	1.00	563
Classrooms	10,800	30%	7,560	3,240	30,000	0.46	0.67	0.07	7,628	0	8,000	3,750	9	1.00	563

Exhibit G5-4A.1
North Hunterdon Voorhees Regional High School District
ECM 4A - Convert Constant Volume AHUs to VVT
Savings Summary

		Voorhees HS		**Total**		
C1	Average Percent Load	0.60				
C2	Fan Full Load Input Power	159			HP	
C3	Air Volume Delivered by Unit	158,850			CFM	
C3A	Air Volume None Cooling Units	40,350				
C4	Winter Thermostat Setpoint	68			F	
C5	Winter Cold Deck Temperature	55			F	
C6	Winter Hot Deck Temperature	110			F	
C7	Winter Mixed Air Temperature	65			F	
C8	Operating Hours per Week	60			hrs/wk	
C9	Heating Weeks per Year	22			wks/yr	
C10	Cooling Weeks per Year	26			wks/yr	
C11	Summer Hot Deck Temperature	80			F	
C12	Summer Thermostat Setpoint	74			F	
C13	Summer Cold Deck Temperature	55			F	
C14	Summer Mixed Air Temperature	65			F	
C15	Boiler Efficiency	0.76				
C16	Chiller Performance Factor	0.98			KW/ton	
C17	$ Therm	$1.30			Therms	
C18	Electricity Cost	$0.157			/KWH	
C19	Specific heat of air	1.085			BTU/hr-CFM-F	
C20	Heating Conversion Factor	100,000			BTU/Therm	
C21	Cooling Conversion Factor	12,000			BTU/ton-hr	
C22	Power Conversion Factor	0.746			KW/HP	
C23	Fan Savings	266,979			kWh	(C2*C22)*(1-C1^3)*C8*(C9+C10)
C24	Cooling Savings	15,725			kWh	((C11-C12)/(C11-C13))*(1-C1)*(C3-C3A)*(C14-C13)*C8*C10*C19/C21*C16
C25	Total kWh Savings	282,704		**282,704**	kWh	
C26	Total kWh Savings $$	$44,253		**$44,253**		
C27	Heating Savings	12,660		**12,660**		((C4-C5)/(C6-C5))*(1-C1)*C3*(C6 C7)*C19*C8*C9/C20/C15
	Heating Savings $$	$16,478		**$16,478**		
	De-Rate Electric	2%				
	De-Rate Heat	5%				
	Total kWh Savings	277,050		**277,050**		
	Total kWh Savings $$	43,368		**43,368**		
	Heating Savings	12,027		**12,027**		
	Heating Savings $$	$15,654		**$15,654**		

Greenhouse Gas Emissions (GHGs)

Fuel	**Savings**	**Units**	**Carbon Emission Factor**	**Units**	**Emissions**		**Equivalent Cars/yr**	**Equivalent Forested Acres/yr**
Electricity	277,050	kwh/yr	0.000592	Tons/kwh	164.0	Tons CO2/yr	28.6	17.3
Natural Gas	-	mmbtu/yr	0.058500	Tons/mmBtu	0.0	Tons CO2/yr	-	0.0
#2 Fuel Oil	1,202.71	mmbtu/yr	0.011190	Tons/gal	13.5	Tons CO2/yr	2.4	1.4
Totals					**177.4**		**31.0**	**18.7**

Exhibit G5.5A.1
North Hunterdon Voorhees Regional High School District
Building Envelope
Savings Summary

	A	B	C	D	E	F			G		H							
				(A x B x C)					(DxEx10)/F		(DxE)/F x 1x10^6/3,412							
	Flow Facto	(AP)^n	Area	Air Leakage (CFM)	Heating Degree Days	Heating Efficiency Factor	Fuel Cost	$/kWh	Therms	Savings Therm $$	kWh	Savings Electric	Derate therms	Derate Eletric	Therms	Therm $$	kWh	Savings Elctric
North Hunterdon HS	10	5.6	40	2,240	4,765	28,900	$ 1.12		3693	4,145			5%	2%	3509	$3,938		
Voorhees HS	10	5.6	40	2,240	4,765	28,900	$ 1.30		3693	4,807			5%	2%	3509	$4,567		
Totals									**7,387**	**$8,952**	**-**	**$0**			**7,017**	**$8,505**	**-**	**$0**

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	-	kwh/yr	0.000592	Tons/kwh	0.0	Tons CO2/yr	-	0.0
Natural Gas	351	mmbtu/yr	0.058500	Tons/mmBtu	20.5	Tons CO2/yr	3.6	2.2
#2 Fuel Oil	351	mmbtu/yr	0.011190	Tons/gal	3.9	Tons CO2/yr	0.7	0.4
Totals					**24.5**		**4.3**	**2.6**

Exhibit G5-6A.1
North Hunterdon Voorhees Regional High School District
ECM 6A Computer Controllers

	Total PCs		Total kWh	Total kWh$$	De-rate	kWh	kWh $$ Saved
North Hunterdon High School	500	$ 0.1596	84,240	$13,441	2%	82,555	$13,172
Voorhees HS	300	$ 0.1565	50,544	$7,912	2%	49,533	$7,754
Total	**800**		**134,784**	**$21,353**		**132,088**	**$20,926**

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	132,088	kwh/yr	0.000592	Tons/kwh	78.2	Tons CO2/yr	13.7	8.2
Natural Gas	-	mmbtu/yr	0.058500	Tons/mmBtu	0.0	Tons CO2/yr	-	0.0
Totals					**78.2**		**13.7**	**8.2**

	Total Number	Number Left "On" **	"Idle" Power Consumption (Watt)	"Sleep" Power Consumption (Watt)	Annual Hours of Power Management	Annual Energy Savings (kWh)		
Desktop PC's	500	180	84	6	6,000	84,240	North Hunterdon High School	
CRT Monitors	0	0	73	3	0	0		
LCD Monitors	0	0	28	2	0	0		
Laptops	0	0	20	1	0	0	Total	84,240

Desktop PC's	300	108	84	6	6,000	50,544	Voorhees	
CRT Monitors	0	0	73	3	0	0		
LCD Monitors	0	0	28	2	0	0	Total	50,544
Laptops	0	0	20	1	0	0		

Notes:
Power Consumption numbers based on Lawrence Berkeley National Lab 2006 study
Laptop power includes screen. Desktop PC assumes non-energy star models- based on age of computers.
***Default of 36% as the percentage of computers turned off each night is based upon 2004 Lawrence Berkeley National Lab Report entitled "After-hours Power*

Exhibit G5-7A.1
North Hunterdon Voorhees Regional High School District
ECM - 7A Install Energy Efficient Distribution Transformers

	North Hunterdon High School	Voorhees HS					Total
kWh savings	55,971	99,436					**155,408**
Rate $/kWh	$0.16	$0.16					
$$ Savings	$8,931	$15,565					**$ 24,496**
De-Rate	2%	2%					
kWh savings	54,852	97,448					**152,300**
$$ Savings	$8,752	$15,254					**$ 24,006**

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	152,300	kwh/yr	0.000592	Tons/kwh	90.1	Tons CO2/yr	15.7	9.5
Natural Gas	-	mmbtu/yr	0.058500	Tons/mmBtu	0.0	Tons CO2/yr	-	0.0
Totals					**90.1**		**15.7**	**9.5**

Exhibit G5-7A.2
North Hunterdon Voorhees Regional High School District
ECM - 7A Install Energy Efficient Distribution Transformers
North Hunterdon HS

		The ESP Calculator	
		Energy Savings Payback Calculator	
Project Description	North Hunterdon High School		
Date			
	Transformers on Project		
Data Entry	QTY	kVA	
	0	9	
	0	15	
	9	30	
	0	45	
	0	75	
	1	113	
	2	150	
	0	225	
	0	300	
	0	500	
	0	1,000	
	0	1,500	
	0	2,000	
	0	2,500	
	0	3,000	
Total Electrical System kVA	683	kVA	
System Power Factor	1		
Available Full Load kW (=kVA x PF)	546	kW	
equipment operating hrs/ day	12		
equipment operating days/yr	365	Calc Load kW	Calc Annual kWh
Load during normal operating hours	55%	300	1,315,314
Load outside operating hours	10%	55	239,148
		Total Annual Load kWh:	1,554,462
Annual Cost to Operate Load Only			
kWh rate	0.1596	Annual Consumption:	248,026
demand rate ($/kW/mo) ex. $10.00	6.99	Annual Demand:	0
		Total Cost to run load	248,026
Annual Cost of Status Quo Transformer Losses & Associated Air Conditioning (A/C) burden			
% Electronic Equipment (computers etc)	1	- > Associated Loss Multipli	2
Status Quo Transformer Linear Efficiency	1		
Actual Efficiency due to electronic content	1		
Transformer kW Losses (Normal Operation)	14	kW	
Transformer kW Losses (Outside op. hrs)	3	kW	
Annual addititional kWh from transformers	74,100	kWh	
Annual Cost of Transformer Losses	13,023		
A/C System Performance (kW/ton)	0.800		
Additional Tons of Cooling	4	tons	
Annual addititional kWh from A/C	16,841	kWh	
Annual Cost of Associated A/C	2,960		
Summary with Status Quo Transformer			
Annual Cost of feeding Building Load	248,026		
Annual Cost of Transformer Losses	13,023		
Annual Cost of Associated A/C	2,960		
Electrical Bill (Status Quo Transformer)	264,009		0
IMPORTANT: By using the ESP Calculator™, you are agreeing the TERMS OF USE section on page 3			
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Page 1 of 3			V03.10.17
	Page 2	The ESP Calculator	
Toll Free : 1-800-747-9627 or (905) 791-1493		Energy Savings Payback Calculator	
Using Powersmiths instead of status quo transformers			
Actual Efficiency under electronic load	98%		
Transformer kW Losses (Normal Operation)	6	kW	
Transformer kW Losses (Outside op. hrs)	1	kW	
Annual addititional kWh from transformers	28,493	kWh	
Annual Cost of Powersmiths Losses	5,008		
Additional Tons of Cooling (on peak)	2	tons	
Annual addititional kWh from A/C	6,476	kWh	
Annual Cost of Associated A/C	1,138		
Comparing Status Quo & Powersmiths			
	Status Quo	Powersmiths	
Annual Cost of feeding Building Load	248,026	248,026	
Annual Cost of Transformer Losses	13,023	5,008	
Annual Cost of Associated A/C	2,960	1,138	Reduction
Annual estimated Electrical Bill	264,009	254,172	4%
Annual kWh reduction	55,971	kWh	
Reduction in Air Conditioning Load (on peak)	0	tons	

Exhibit G5-7A.3
North Hunterdon Voorhees Regional High School District
ECM - 7A Install Energy Efficient Distribution Transformers
Voorhees HS

		The ESP Calculator	
		Energy Savings Payback Calculator	
Project Description	Voorhees HS		
Date			
	Transformers on Project		
Data Entry	QTY	kVA	
	0	30	
	6	25	
	1	38	
	13	50	
	3	75	
	0	113	
	1	150	
	0	225	
	0	300	
	0	500	
	0	1,000	
	0	1,500	
	0	2,000	
	0	2,500	
	0	3,000	
Total Electrical System kVA	1,213	kVA	
System Power Factor	1		
Available Full Load kW (=kVA x PF)	970	kW	
equipment operating hrs/ day	12		
equipment operating days/yr	365	Calc Load kW	Calc Annual kWh
Load during normal operating hours	55%	534	2,336,730
Load outside operating hours	10%	97	424,860
		Total Annual Load kWh:	2,761,590
Annual Cost to Operate Load Only			
kWh rate	0.1565	Annual Consumption:	432,283
demand rate ($/kW/mo) ex. $10.00	6.99	Annual Demand:	0
		Total Cost to run load	432,283
Annual Cost of Status Quo Transformer Losses & Associated Air Conditioning (A/C) burden			
% Electronic Equipment (computers etc)	1	- > Associated Loss Multiplier:	2
Status Quo Transformer Linear Efficiency	1		
Actual Efficiency due to electronic content	1		
Transformer kW Losses (Normal Operation)	25	kW	
Transformer kW Losses (Outside op. hrs)	5	kW	
Annual addititional kWh from transformers	131,642	kWh	
Annual Cost of Transformer Losses	22,738		
A/C System Performance (kW/ton)	0.800		
Additional Tons of Cooling	7	tons	
Annual addititional kWh from A/C	29,919	kWh	
Annual Cost of Associated A/C	5,168		
Summary with Status Quo Transformer			
Annual Cost of feeding Building Load	432,283		
Annual Cost of Transformer Losses	22,738		
Annual Cost of Associated A/C	5,168		
Electrical Bill (Status Quo Transformer)	460,189		0
IMPORTANT: By using the ESP Calculator™, you are agreeing the TERMS OF USE section on page 3			
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Page 1 of 3			V03.10.17
	Page 2	The ESP Calculator	
Toll Free : 1-800-747-9627 or (905) 791-1493		Energy Savings Payback Calculator	
Using Powersmiths instead of status quo transformers			
Actual Efficiency under electronic load	98%		
Transformer kW Losses (Normal Operation)	10	kW	
Transformer kW Losses (Outside op. hrs)	2	kW	
Annual addititional kWh from transformers	50,620	kWh	
Annual Cost of Powersmiths Losses	8,743		
Additional Tons of Cooling (on peak)	3	tons	
Annual addititional kWh from A/C	11,504	kWh	
Annual Cost of Associated A/C	1,987		
Comparing Status Quo & Powersmiths			
	Status Quo	Powersmiths	
Annual Cost of feeding Building Load	432,283	432,283	
Annual Cost of Transformer Losses	22,738	8,743	
Annual Cost of Associated A/C	5,168	1,987	Reduction
Annual estimated Electrical Bill	460,189	443,014	4%
Annual kWh reduction	99,436	kWh	
Reduction in Air Conditioning Load (on peak)	0	tons	

Exhibit G5-7B.1
North Hunterdon Voorhees Regional High School District
ECM 7B -Energy Efficient Motors

	$/kWh	kWh Savings	kWh Savings $$	De-Rate	kWh Savings	kWh Savings $$
Voorhees HS	$0.1565	16,029	$2,509	2%	15,708	$2,459
Total		**16,029**	**$2,509**		**15,708**	**$2,459**

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	15,708	kwh/yr	0.000592	Tons/kwh	9.3	Tons CO2/yr	1.6	1.0
Natural Gas	-	mmbtu/yr	0.058500	Tons/mmBtu	0.0	Tons CO2/yr	-	0.0
#2 Fuel Oil	-	mmbtu/yr	0.011190	Tons/gal	0.0	Tons CO2/yr	-	0.0
Totals					**9.3**		**1.6**	**1.0**

Voorhees
Motor Savings

Item#	BLDG.	EQUIPMENT DESCRIPTION	MOTOR SIZE HP	MOTOR TYPE TEFC/ODP	OPERATING HOURS/YR	MOTOR LOAD *	STD EFF. FL-RPM	HI EFF. FL-RPM	RESHEAVE YES/NO	% > LOAD FROM RPM	STD EFF.	PREM. EFF.	SAVED KW	SAVED KWH	Total Savings	HP
A	B	D			F	G	H	I	J	K	L	M	N	O		
										if J= NO, 1 - (H/I)^3			=hp x 0.746 x G/L - hp x0.746 x G/M x (1+K)	=N x F	$$	
Zone																
						80%										
1	Voorhees HS	AHU 1	10	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.281	1,011	$158	10.0
2	Voorhees HS	AHU 2	3	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.084	303	$47	3.0
3	Voorhees HS	AHU 3	15	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.421	1,517	$237	15.0
4	Voorhees HS	AHU 4	20	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.562	2,023	$317	20.0
5	Voorhees HS	AHU 5	15	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.421	1,517	$237	15.0
6	Voorhees HS	AHU 6	15	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.421	1,517	$237	15.0
7	Voorhees HS	AHU 7	10	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.281	1,011	$158	10.0
8	Voorhees HS	AHU 8	3	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.084	303	$47	3.0
9	Voorhees HS	AHU 9	5	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.140	506	$79	5.0
10	Voorhees HS	AHU 10	5	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.140	506	$79	5.0
11	Voorhees HS	AHU 11	15	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.421	1,517	$237	15.0
12	Voorhees HS	AHU 13	7.5	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.211	758	$119	7.5
13	Voorhees HS	AHU 15	10	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.281	1,011	$158	10.0
14	Voorhees HS	AHU 17	20	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.562	2,023	$317	20.0
15	Voorhees HS	AHU 18	5	ODP	3,600	80%	1,740	1,760	NO	3.4%	85.6%	92.2%	0.140	506	$79	5.0
	TOTALS:		**158.50**										**4.45**	**16,029**	**$2,509**	**158.50**

Exhibit G5-7C.1
North Hunterdon Voorhees Regional High School District
ECM 7C -Install Variable Speed Drives on Pumps

Summary	Cost per kWh	kWh Savings	kWh Savings $$	De-Rate	kWh Savings	kWh Savings $$
Voorhees HS	$0.1565	24,625	$3,855	2%	24,132	$3,778
Totals		24,625	$3,855		24,132	$3,778

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Factor	Units	Emissions		Cars/yr	Acres/yr
Electricity	24,132	kwh/yr	0.000592	Tons/kwh	14.3	Tons CO2/yr	2.5	1.5
Natural Gas	-	mmbtu/yr	0.058500	Tons/mmBtu	0.0	Tons CO2/yr	-	0.0
#2 Fuel Oil	-	mmbtu/yr	0.011190	Tons/gal	0.0	Tons CO2/yr	-	0.0
Totals					**14.3**		**2.5**	**1.5**

			A	B		C	D	E	F	G	H	I
Item#	**BLDG.**	**DESCRIPTION**	**(Hp)**	**(kW)**	**TEFC/ODP**	**HOURS/YR**	**MOTOR LOAD**	**EFFIENCY**	**EXISTING kW**	**SPEED**	**NEW kW**	**SAVED kWh**
				A*.746					**B*C/D**		**F*G^3**	**H*C**
3	Voorhees	HHW Pump1	20	14.92	ODP	1,210	80%	92%	12.97	60%	2.80	12,312
4	Voorhees	HHW Pump2	20	14.92	ODP	1,210	80%	92%	12.97	60%	2.80	12,312
												24,625

Exhibit G5-8A.1
North Hunterdon Voorhees Regional High School District
ECM 8A- PV Photovoltaic Array

	Energy Value ($)	Size kW	Solar Radiation (kWh/m2/day)	AC Energy (kWh)	Energy Value ($)	De-Rate	AC Energy (kWh)	Energy Value ($)
North Hunterdon HS	0.1596	377.0	4.46	445,987	$71,161	2%	437,067	$69,737
Voorhees HS	0.1565	433.0	4.46	512,235	$80,182	2%	501,990	$78,579
Totals				**958,222**	**$151,343**		**939,058**	**$148,316**

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	939,058	kwh/yr	0.000592	Tons/kwh	555.8	Tons CO2/yr	97.1	58.5
Natural Gas	-	mmbtu/yr	0.058500	Tons/mmBtu	0.0	Tons CO2/yr	-	0.0
Totals					**555.8**		**97.1**	**58.5**

North Hunterdon HS

Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	377
DC to AC Derate Factor:	0.77
AC Rating:	290.29
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	0.1596

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	3.36	31209	$4,980
2	4.05	33699	$5,377
3	4.58	40880	$6,523
4	4.84	39952	$6,375
5	5.30	44019	$7,024
6	5.33	41517	$6,624
7	5.27	41927	$6,690
8	5.25	41490	$6,620
9	5.06	40251	$6,422
10	4.46	37906	$6,048
11	3.15	27051	$4,316
12	2.87	26086	$4,162
Year	4.46	445987	$71,161

Voorhees HS

Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	433
DC to AC Derate Factor:	0.77
AC Rating:	333.41
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	0.1565

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	3.36	35844	$5,611
2	4.05	38704	$6,058
3	4.58	46953	$7,350
4	4.84	45887	$7,183
5	5.30	50558	$7,914
6	5.33	47684	$7,464
7	5.27	48155	$7,538
8	5.25	47653	$7,459
9	5.06	46230	$7,237
10	4.46	43537	$6,815
11	3.15	31069	$4,863
12	2.87	29961	$4,690
Year	4.46	512235	$80,182

Exhibit G5-8B.1
North Hunterdon Voorhees Regional High School District
ECM 8B- Wind Power

		North Hunterdon HS	Voorhees HS	Total		
A	Wind Velocity	11.2	11.2		MPH	MPH
B	k = Conversion Factor to kW	0.0001330	0.0001330			
C	Cp = Maximum power coefficient,	0.45	0.45			Ranging from 0.25 to 0.45, Dimensionless Max =.59 (Note 1)
D	ρ = Air density, lb/ft3	0.083	0.083			ρ = Air density, lb/ft3
E	Rotor Diameter	6.0	6.0		FT	
F	A = Rotor swept area, ft2	28.26	28.26			π E^2/4
G	Power = k Cp 1/2 ρAV^3	0.1969	0.1969		kW	B x C x 1/2 x D x F x A^3 (Note 1)
C	Hours per Day	12	12			
D	Days per Year	360	360			
E	Number of Turbines	20	20	**40**		
F	Total kWh DC per year Generated	17,015	17,015		kWh DC	B x C x D x E
G	Inverter Loss	10%	10%			
H	kWh Savings	15,313	15,313	**30,627**	kWh	F x G
I	Cost per kWh	0.1596	0.1565			
J	kWh Savings $$	$2,443	$2,397	**$4,840**	$$	H x I
K	De-Rate	2%	2%			
L	kWh Savings	15,007	15,007	**30,014**		
M	kWh Savings $$	$2,394	$2,349	**$4,744**		

Note 1 - Reference Small Wind Electric Systems a NJ Consumer Guide - US Department of Energy, Energy Efficiency and Renewable Energy Wind and Hydropower Technologies Program

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	30,014	kwh/yr	0.000592	Tons/kwh	17.77	Tons CO2/yr	3.1	1.9
Natural Gas	-	mmbtu/yr	0.058500	Tons/mmBtu	0.00	Tons CO2/yr	-	0.0
#2 Fuel Oil	-	mmbtu/yr	0.011190	Tons/gal	0.00	Tons CO2/yr	-	0.0
Totals					**17.77**		**3.1**	**1.9**

Exhibit G5-8C.1
North Hunterdon Voorhees Regional High School District
ECM 8C- Geothermal

		North Hunterdon HS	Voorhees HS	Totals		
C1	Building Square Footage	284,219	276,312		sf	
C2	Cooling Load Intensity	300	300		sf/ton	
C3	Cooling Tons	947	921			C1/C2
C4	Conversion Factor	0.85	0.85		kW/ton	
C5	Estimated Building Cooling Load	805	783		kw	C3*C4
C6	Cooling Load Hours	1	1			
C7	Kwh	805	783			C6*C5
C8	Btu/kWh	3,412	3,412			Conversion Factor
C9	Btu Cooling	2,747,640	2,671,200			C7*C8
C10	Heating Load Intensity	25	25		Btu/sf	
C11	Estimated Heating Load	7,105,475	6,907,800		Btu/hr	C10*C1
C12	Cooing Load Diversity Factor	40%	40%			Estimate
C13	Heating Load Diversity Factor	25%	25%			Estimate
C14	Target Load	2,875,425	2,795,430			(C9*C12+C13*C11)
C15	Estimated Well Output	36,000	36,000		Btu	
C16	Estimated Number of Wells	80	78	**158**		C14/C15
C17	Occupied Cooling Hours Estimate	1,320	1,320			Weeks/yr * Days/Wk*Hrs/Day
C18	Occupied Heating Hours	2,875	1,967			BMS ECM 3A
C19	$/kWh	0.1596	0.1565			
C20	Cost per Therm	$1.12	$1.30			
C21	Cooling Savings	406,296	394,993	**801,289**	kWh	C9*C12/C14*C7*C17
C22	Cooling Savings $$	$64,828	$61,830	**$126,658**		C19*C21
C23	Heating Savings	51,073.6	33,964.1	**85,038**		C11*C13*C18/100000
C24	Heating Savings $$	$57,323	$44,206	**$101,529**		C23*C20
C25	De-Rate Electric	2%	2%			
C26	De-Rate Thermal	5%	5%			
C27	Cooling Savings	398,170	387,093	**785,263**		
C28	Cooling Savings $$	$63,531	$60,593	**$124,124**		
C29	Heating Savings	48,520	32,266	**80,786**		
C30	Heating Savings $$	$54,457	$41,996	**$96,453**		

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	785,263	kwh/yr	0.000592	Tons/kwh	464.80	Tons CO2/yr	81.2	48.9
Natural Gas	48,520	mmbtu/yr	0.058500	Tons/mmBtu	2838.42	Tons CO2/yr	495.8	298.8
#2 Fuel Oil	32,265.87	mmbtu/yr	0.011190	Tons/gal	361.06	Tons CO2/yr	63.1	38.0
Totals					**3664.27**		**640.0**	**385.7**

Exhibit G5-9A.1

North Hunterdon Voorhees Regional High School District

ECM 9A - Steam Trap Retrofit

Building	Thermo-static	F&T or Bucket	Total Traps	Mlb Savings	$/Therm	Therms	Therms $$	De-Rate	Therms	Therms $$
North Hunterdon HS	370	77	447	924	$1.12	12,419	$13,939	5%	11,798	$13,242
Totals	**370**	**77**	**447**	**924**		**12,419**	**$13,939**		**11,798**	**$13,242**

North Hunterdon HS 213,164 SF

Failed Traps Losses at 2% Total Steam Capacity

Leaking Traps at 2 % Total Steam Capacity

Cost of Fuel: $11.2 /MMBtu

Boiler Efficency 73%

Hours/ Year	Steam Press. Psig	Equip.	Steam Trap Model	Orifice Dia. (Inches)	Trap Qty	5.0% Failed Qty	5.0% Leaking Qty	Single Trap Failed Loss/hr	Single Trap Leaking Loss/hr	Total Steam Loss Lb/hr	Annual Steam Losses Mlb/year
4380	7	Drip	Thermo.	0.250	21	1.1	1.1	27.4	6.8	36.0	157
4380	7	Drip	F&T	0.188	51	2.6	2.6	15.5	3.9	49.4	216
2000	2	Hvac	3/4" - 1" F&T	0.218	10	0.5	0.5	16.0	4.0	10.0	20
2000	2	Hvac	1-1/4" F&T	0.312	14	0.7	0.7	32.8	8.2	28.7	57
2000	2	Hvac	1-1/2" F&T	0.390	2	0.1	0.1	51.3	12.8	6.4	13
1000	2	Rad	Thermo.	0.250	298	14.9	14.9	21.1	5.3	392.7	393
1000	2	Rad	UV	0.250	51	2.6	2.6	21.1	5.3	67.2	67
					447	**22.4**	**22.4**			**590.4**	**924**

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	-	kwh/yr	0.000592	Tons/kwh	0.0	Tons CO2/yr	-	0.0
Natural Gas	1,180	mmbtu/yr	0.058500	Tons/mmBtu	69.0	Tons CO2/yr	12.1	7.3
Totals					**69.0**		**12.1**	**7.3**

Exhibit G5-10A.1
North Hunterdon Voorhees Regional High School District
ECM 10A - Kitchen Hood Controllers

School	$/kWh	kWh	Savings $$	De -Rate	kWh	$$ kWh	$/therms	Therms	$ Savings	De -Rate	Therms	$ Savings
North Hunterdon HS	0.1596	10415.78	1661.92	0.02	10,207	$1,629	1.12	451.16	506.37	0.05	428.61	481.05
Voorhees HS	0.1565	10415.78	1630.43	0.02	10,207	$1,598	1.30	451.16	587.22	0.05	428.61	557.85
Total Savings		20831.56	3292.34		20414.93	$3,226		902.33	1093.58		857.21	1038.90

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	20414.9	kwh/yr	0.0	Tons/kwh	12.1	Tons CO2/yr	2.1	1.3
Natural Gas	42.9	mmbtu/yr	0.1	Tons/mmBtu	2.5	Tons CO2/yr	0.4	0.3
#2 Fuel Oil	42.9	mmbtu/yr	0.0	Tons/gal	0.5	Tons CO2/yr	0.1	0.1
Totals					15.1		2.6	1.6

Exhibit G5-10A.2
North Hunterdon Voorhees Regional High School District
ECM 10A - Kitchen Hood Controllers
North Hunterdon High School

District	**North Hunterdon Voorhees Regional High School District**
Building:	**North Hunterdon School**
ECM Title:	**Kitchen Fume Hood Control**

Supply Fan bhp	5.0	Drive Eff %	0.9
Supply Fan kW	5.3	Min Load %	0.4
Exhaust fan bhp	1.5	Load Factor	0.8
Exhaust Fan kW	1.6	Fan Pwr Exp	5
Total fan kW	6.9		

Outside Air cfm	5,000	btu/gal oil	
		boiler efficiency	73%
Cooling load diversi	0%	Fan rise °F	3.4
AHU lvg Clg Temp °	60.0		
Room Temp °F	72.0		

Fan Energy Savings

Hours of operation - Post ECM #1			Proposed turndown percentage during hours of operation			Savings kWh
1 to 8	9 to 16	17 to 24	1 to 8	9 to 16	17 to 24	
25%	100%	25%	90%	90%	90%	
Post ECM #1 fan kW			Proposed fan kW			
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	705	19	-	463	12	249
-	1,770	109	-	1,161	71	646
12	1,957	242	8	1,284	159	760
218	2,220	494	143	1,456	324	1,008
762	2,462	761	500	1,615	499	1,370
615	1,736	519	404	1,139	340	987
405	1,189	379	265	780	248	678
432	1,639	420	284	1,075	276	857
425	1,507	439	279	989	288	816
474	1,673	415	311	1,098	272	881
379	1,079	363	248	708	238	626
365	892	341	239	585	223	549
394	691	251	259	454	164	460
301	332	182	197	218	119	280
168	228	73	110	150	48	161
59	111	22	39	73	15	66
31	-	12	20	-	8	15
7	-	7	5	-	5	5
2	-	2	1	-	1	1
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
5,048	20,191	5,048				**10,416**

Heating Savings

Heat load btuh	Hours of operation - Post ECM #1			Proposed turndown percentage during hours of operation			Savings Therms
	1 to 8	9 to 16	17 to 24	1 to 8	9 to 16	17 to 24	
	25%	100%	25%	90%	90%	90%	
	Post ECM #1 mmbtu			Proposed mmbtu			
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
27,000	2.4	6.8	2.0	2.2	6.1	1.8	15
54,000	3.2	9.3	3.0	2.8	8.4	2.7	21
81,000	5.1	19.2	4.9	4.6	17.3	4.4	40
108,000	6.6	23.5	6.9	6.0	21.2	6.2	51
135,000	9.2	32.7	8.1	8.3	29.4	7.3	69
162,000	8.9	25.3	8.5	8.0	22.7	7.7	58
189,000	10.0	24.4	9.3	9.0	21.9	8.4	60
216,000	12.3	21.6	7.8	11.1	19.4	7.0	57
243,000	10.6	11.7	6.4	9.5	10.5	5.7	39
270,000	6.5	8.9	2.8	5.9	8.0	2.6	25
297,000	2.5	4.8	1.0	2.3	4.3	0.9	11
324,000	1.5	-	0.6	1.3	-	0.5	3
351,000	0.4	-	0.4	0.3	-	0.3	1
378,000	0.1	-	0.1	0.1	-	0.1	0
405,000	-	-	-	-	-	-	-
432,000	-	-	-	-	-	-	-
459,000	-	-	-	-	-	-	-
486,000	-	-	-	-	-	-	-
513,000	-	-	-	-	-	-	-
540,000	-	-	-	-	-	-	-
567,000	-	-	-	-	-	-	-
Total							**451**

Exhibit G5-10A.3
North Hunterdon Voorhees Regional High School District
ECM 10A - Kitchen Hood Controllers
Voorhees HS

District	**North Hunterdon Voorhees Regional High School District**
Building:	**Voorhees HS**
ECM Title:	**Kitchen Fume Hood Control**

Supply Fan bhp	5.0	Drive Eff %	0.9
Supply Fan kW	5.3	Min Load %	0.4
Exhaust fan bhp	1.5	Load Factor	0.8
Exhaust Fan kW	1.6	Fan Pwr Exp	5
Total fan kW	6.9		

Outside Air cfm	5,000	btu/gal oil	
		boiler efficiency	73%
Cooling load diversity	0%	Fan rise °F	3.4
AHU lvg Clg Temp °F	60.0		
Room Temp °F	72.0		

Fan Energy Savings

Hours of operation - Post ECM #1			Proposed turndown percentage during hours of operation			Savings kWh
1 to 8	9 to 16	17 to 24	1 to 8	9 to 16	17 to 24	
25%	100%	25%	90%	90%	90%	
Post ECM #1 fan kW			Proposed fan kW			
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	705	19	-	463	12	249
-	1,770	109	-	1,161	71	646
12	1,957	242	8	1,284	159	760
218	2,220	494	143	1,456	324	1,008
762	2,462	761	500	1,615	499	1,370
615	1,736	519	404	1,139	340	987
405	1,189	379	265	780	248	678
432	1,639	420	284	1,075	276	857
425	1,507	439	279	989	288	816
474	1,673	415	311	1,098	272	881
379	1,079	363	248	708	238	626
365	892	341	239	585	223	549
394	691	251	259	454	164	460
301	332	182	197	218	119	280
168	228	73	110	150	48	161
59	111	22	39	73	15	66
31	-	12	20	-	8	15
7	-	7	5	-	5	5
2	-	2	1	-	1	1
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
5,048	20,191	5,048				**10,416**

Heating Savings

Heat load btuh	Hours of operation - Post ECM #1			Proposed turndown percentage during hours of operation			Savings Therms
	1 to 8	9 to 16	17 to 24	1 to 8	9 to 16	17 to 24	
	25%	100%	25%	90%	90%	90%	
	Post ECM #1 mmbtu			Proposed mmbtu			
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
27,000	2.4	6.8	2.0	2.2	6.1	1.8	15
54,000	3.2	9.3	3.0	2.8	8.4	2.7	21
81,000	5.1	19.2	4.9	4.6	17.3	4.4	40
108,000	6.6	23.5	6.9	6.0	21.2	6.2	51
135,000	9.2	32.7	8.1	8.3	29.4	7.3	69
162,000	8.9	25.3	8.5	8.0	22.7	7.7	58
189,000	10.0	24.4	9.3	9.0	21.9	8.4	60
216,000	12.3	21.6	7.8	11.1	19.4	7.0	57
243,000	10.6	11.7	6.4	9.5	10.5	5.7	39
270,000	6.5	8.9	2.8	5.9	8.0	2.6	25
297,000	2.5	4.8	1.0	2.3	4.3	0.9	11
324,000	1.5	-	0.6	1.3	-	0.5	3
351,000	0.4	-	0.4	0.3	-	0.3	1
378,000	0.1	-	0.1	0.1	-	0.1	0
405,000	-	-	-	-	-	-	-
432,000	-	-	-	-	-	-	-
459,000	-	-	-	-	-	-	-
486,000	-	-	-	-	-	-	-
513,000	-	-	-	-	-	-	-
540,000	-	-	-	-	-	-	-
567,000	-	-	-	-	-	-	-
Total							**451**

Exhibit G5-10B.1
North Hunterdon Voorhees Regional High School District
ECM 10B- Walk-In Controller
Savings Summary

Savings by Controller

	North Hunterdon High School	Voorhees High School		Total		
Exisitng Builidng kWh	3,462,810	3,074,274				
Existing Cooling Usage	2%	2%				Assume @ 2%
Existing Cooling Usage	69,256	61,485			kWh	
Savings by Controller	5%	5%				Assume @ 5%
Number of Controllers	2	2		4		
Savings by Controller	6,926	6,149			kWh	
Post Retrofit Usage	62,331	55,337			kWh	
Cost per kWh	$ 0.160	$ 0.157				
$$ kWh	$ 1,105	$ 962		**$ 2,067**		
kWh	6,926	6,149		**13,074**	kWh	
Derate	2%	2%				
	$ 1,083	$ 943		**$ 2,026**		
	6,787	6,026		**12,813**	kWh	

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	2,026	kwh/yr	0.000592	Tons/kwh	1.2	Tons CO2/yr	0.2	0.1
Natural Gas	-	mmbtu/yr	0.058500	Tons/mmBtu	0.0	Tons CO2/yr	-	0.0
Totals					**1.2**		**0.2**	**0.1**

Exhibit G5-10C.1
North Hunterdon Voorhees Regional High School District
ECM 10C - Kitchen Rinse Sprayer
Savings Summary

		North Hunterdon High School	Voorhees HS		Total	Units	
	Input Data						
A	Number Of Fixtures	1	1		**2**		
B	Frequency of Use	60	60			Min/Day/Fixture	
C	Diversity of Use Between Fixtures	78%	78%			%	
D	Operational Days	182	182			Days/Year	
	Thermal Data						
E	Mixed Water Temp.	110	110			F	
F	Cold Water Temp.	55	55			F	
G	Boiler Plant Efficiency	85%	73%				DHW Eff.
	Baseline Consumption						
H	Fixture Flow Rate	4.5	4.5			GPM	
I	Annual Water Consumption	38,329	38,329			Gallons	= A x B x C x D x H
J	Annual Thermal Consumption	207	241			Therms	= 8.33 x I x (E - F) / G / 100,000
	Post Retrofit Consumption						
K	Fixture Flow Rate	1.3	1.3			GPM	
L	Annual Water Consumption	11,073	11,073			Gallons	= A x B x C x D x K
M	Annual Thermal Consumption	60	70			Therms	= 8.33 x I x (E - F) / G / 100,000
	Savings						
N	Water	27,256	27,256			Gallons	= I -L
O	Sewer	27,256	27,256			Gallons	= N
P	Thermal Energy	147	171		**318**	Therms	= J -M
	Cost Per Therm	$ 1.12	$ 1.30				
	Thermal Savings $$	$ 165	$ 223		**$ 388**	$$	
	De-Rate	5%	5%				
	Thermal Energy	140	163		**302**	Therms	
	Thermal Savings $$	$ 157	$ 212		**$ 368**	$$	

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units		Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity		kwh/yr		0.000592	Tons/kwh	0.0	Tons CO2/yr	-	0.0
Natural Gas	14	mmbtu/yr		0.058500	Tons/mmBtu	0.8	Tons CO2/yr	0.1	0.1
#2 Fuel Oil	16.27	mmbtu/yr		0.011190	Tons/gal	0.2	Tons CO2/yr	0.0	0.0
Totals						**1.0**		**0.2**	**0.1**

Exhibit G5-10D.1
Camden County Technical School
ECM 10D - Kitchen Pedal Valves
Savings Summary

	Location	**North Hunterdon HS**	**Voorhees HS**		**Total**	
A	Number of Fixtures	8	6		**14**	
A1	Hours of Operation	8	8			
B	Meals per Day	600	400			
C	Existing Sink Consumption Rate (Gal/meal	2	2			Estimated Consumption rate as per ASHRAE Systems, Chapt 54 Table 1.
D	Average Daily Load Gal/Day	1200	800			C x D
E	Average Daily Load Gal/hr	150	100			D / A1
F	Occupant Days	182	182			
G	Boiler Efficiency	73%	73%			
H	Total Consumption MBtus	144,159	96,106		**240,265**	) x F x ft3/gal x H2O density x Delta T/ Eff.
	Proposed System					
I	%Run Time Savings	20%	20%			Estimated Run Time Savings
J	Total Consumption MBtus	115,327	76,885		**192,212**	H x (1 - I)
	Savings					
K	Total Consumption Therms	231	115		**346**	A x (H - J) / 1000
	$/Therm	$1.12	$1.30			
	Savings $$	$259	$150		**$409**	
	De-Rate	5%	5%			
	Total Consumption Therms	219	110		**329**	
	Savings $$	$246	$143		**$389**	

Greenhouse Gas Emissions (GHGs)

Fuel	**Savings**	**Units**		**Carbon Emission Factor**	**Units**	**Emissions**		**Equivalent Cars/yr**	**Equivalent Forested Acres/yr**
Electricity	-	kwh/yr		0.000592	Tons/kwh	0.0	Tons CO2/yr	-	0.0
Natural Gas	22	mmbtu/yr		0.058500	Tons/mmBtu	1.3	Tons CO2/yr	0.2	0.1
#2 Fuel Oil	10.96	mmbtu/yr		0.011190	Tons/gal	0.1	Tons CO2/yr	0.0	0.0
Totals						**1.4**		**0.2**	**0.1**

Exhibit G5-11A.1
North Hunterdon Voorhees Regional High School District
Demand Response
Savings Summary

	KWh Savings	$/kWh	kWh Saving $$	De-Rate	KWh Savings	kWh Saving $$
North Hunterdon HS	239,034	$0.16	$38,140	2%	234,253	$37,377
Voorhees HS	216,313	$0.16	$33,860	2%	211,986	$33,183
	455,346		**$72,000**		**446,239**	**$70,560**

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	446,239	kwh/yr	0.00059190	Tons/kwh	264.1	Tons CO2/yr	46.136	27.8
Natural Gas	-	mmbtu/yr	0.05850000	Tons/mmBtu	0.0	Tons CO2/yr	-	0.0
Totals					**264.1**		**46.136**	**27.8**

Exhibit G5-12A.1
North Hunterdon Voorhees Regional High School District
Water Conservation
Savings Summary

		NHHS	Total		
	Item				Description
B5	Daily Occupants	1,100		Persons	
B6	Area of Occupied Facilities	284,219		SF	
B7	Occupancy Factor	90%			Estimate
B8	Occupied Days	191			Estimate
B9	Occupant Days	189,090			B5*B7*B8
	Water Closet Consumption				
B12	Toilet Usage Rate	1.04		Flushes/day/occ.	Estimate
B13	Existing Toilet Flow Rate	4		gal/flush	Manufacture's Spec
B14	Existing Annual Toilet Flow	787		kgallons	B9*B12*B13/1000
B15	Proposed Toilet Flow Rate	1.6		gal/flush	Manufacture's Spec
B16	Proposed Annual Toilet Flow	315		kgallons	B9*B12*B15/1000
	Urinal Consumption				
B20	Urinal Usage Rate	0.98		flushes/occ-days	Estimate
B21	Urinal Usage Factor	60%			Estimate
B22	Existing Urinal Flow Rate	2.5		gal/flush	Manufacture's Spec
B23	Existing Annual Urinal Flow	278		kgallons	B9*B20*B21*B22/1000
B24	Proposed Urinal Flow Rate	1.0		gal/flush	Manufacture's Spec
B25	Proposed Annual Urinal Flow	111		kgallons	B9*B20*B21*B24/1000
	Lavatory/Sink Consumption				
B28	Sink Usage Factor	0.90		min/occ days	Estimate
B29	Existing Sink Flow Rate	2.2		gal/min	Manufacture's Spec
B30	Existing Annual Sink Flow	374		kgallons	B9*B28*B29/1000
B31	Proposed Sink Flow Rate	0.5		gal/min	Manufacture's Spec
B32	Proposed Annual Sink Flow	85		kgallons	B9*B28*B31/1000
	Shower Consumption				
B35	Shower Usage Factor	0.25		min/occ days	Estimate
B36	Existing Shower Flow Rate	2.5		gal/min	Manufacture's Spec
B37	Existing Annual Shower Flow	118		kgallons	B9*B35*B36/1000
B38	Proposed Shower Flow Rate	1.5		gal/min	Manufacture's Spec
B39	Proposed Annual Shower Flow	71		kgallons	B9*B35*B38/1000
	Kitchen Consumption				
B43	% Persons Eat Breakfast	0%		person/resident day	Estimate
B44	% Persons Eat Lunch	80%		person/occ. day	Estimate
B45	% Persons Eat Dinner	0%		person/resident day	Estimate
B46	Breakfast Consumption	0.650		gal/breakfast	Estimate
B47	Lunch Consumption	0.950		gal/lunch	Estimate
B48	Dinner Consumption	1.000		gal/dinner	Estimate
B49	Total Meal Consumption	143.71		kgallon	((B46*B43)+(B47*B44)+(B48*B45))*B9/1000
	Miscellaneous				
B52	Drinking Water	0.06		gal/occ. Day	Estimate
B53	Cleaning	0.01		gal/occ sf/day	Estimate
B54	Campus Area	0		acres	
B55	Garden Area	0.15		gal/acres/day	Estimate
B56	Total Irrigation	0		kgallon	B54*B55*B8/1000
B57	Vehicle Washing	0		gallon	Estimate
B58	Lab Equipment testing	0		gallon	Estimate
B59	Annual Cooling Load to tower	0		MMBtu	From EMS Calc
B60	Cooling Tower M/U	0		kgallon	B59*1,000,000*0.97/970.3/8.33/1000
B61	Boiler Make-up	0		kgallon	Estimate
B62	Total Misc. uses	554		kgallon	((B52*B9)+(B53*B8*B6)+B57+B58)/1000+B56+ B60+B61
	Laundry				
B65	Load person	0		Load/resident day	Estimate
B66	% Occupant Laundry Done	0		Usage Factor	Estimate
B67	Gal/Load	0		gal/load	Estimate
B68	Annual Use	-		kgallons	B9*B7*B8*B65*B66*B67/1000
	Leaks				
B71	% Total Water Use	3%			Estimate
B72	Total Loss	106.24		kgallon	
B73	% of Loss Repaired During Retrofit	10%			
B74	Retrofit Water Consumption	95.61942		kgallon	B72*(1-B73)
B76	**Existing Water Usage**	2,361.31		kgallon	B14+B23+B30+B37+B49+B62+B68+B72
B78	**Proposed Water Usage**	1,375.36			B16+B25+B32+B39+B49+B62+B68+B74
B79	**Savings**	985.95	985.95	kgallon	B76-B78
B80	**$/kGal**	$4.05		$/kgallon	
	Savings $$	$3,995	$3,995		
B80	**Thermal Savings**				
B81	City Water Temperature	60		F	
B82	Sink Water temperature	120		F	
B83	Shower Water Temperature	110		F	
B84	Boiler Efficiency	92%			
B85	Thermal Savings	1,643		Therms	((B30-B32)*1*8.33*(B82-B81))+((B37-B39)*1*8.33*(B83-B81))/1000
B86	Actual Thermal Savings	1,786	1,786		
	Cost per Therm	$1.12			
	Thermal Savings $$	$2,004	$2,004		
	De-Rate 5%	5%			
	Actual Thermal Savings	1,696	1,696		
	Thermal Savings $$	$1,904	$1,904		

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	-	kwh/yr	0.00059190	Tons/kwh	0.0	Tons CO2/yr	-	0.0
Natural Gas	1,785.71	mmbtu/yr	0.05850000	Tons/mmBtu	104.5	Tons CO2/yr	18.247	11.0
#2 Fuel Oil	-	mmbtu/yr	0.01119000	Tons/gal	0.0	Tons CO2/yr	-	0.0
Totals					**104.5**		**18.247**	**11.0**

Exhibit G5-12B
North Hunterdon Voorhees Regional High School District
ECM 12B - Roof Replacements

	NHHS	Voorhees HS	Total	
Electrical Cost	$ 0.1596	$0.16		
Fuel Cost	$1.12	$1.30		
Electical Savings	2,846	2,312	5,158	kWh
Electical Savings $$	$ 454	$ 362	$ 816	
Therm Savings	4,971	3,852	8,822	Therms
Therm Savings $$	$ 5,579	$ 5,013	$ 10,592	
De-Rate Electric	2%	2%		
De-Rate Mechanical	5%	5%		
Electical Savings	2,789	2,266	5,055	kWh
Electical Savings $$	$ 445	$ 355	$ 800	
Therm Savings	4,722	3,659	8,381	Therms
Therm Savings $$	$ 5,300	$ 4,762	$ 10,062	

Greenhouse Gas Emissions (GHGs)

Fuel	Savings	Units	Carbon Emission Factor	Units	Emissions		Equivalent Cars/yr	Equivalent Forested Acres/yr
Electricity	5,055	kwh/yr	0.000592	Tons/kwh	3.0	Tons CO2/yr	0.5	0.3
Natural Gas	472	mmbtu/yr	0.058500	Tons/mmBtu	27.6	Tons CO2/yr	4.8	2.9
#2 Fuel Oil	366	mmbtu/yr	0.011190	Tons/gal	4.1	Tons CO2/yr	0.7	0.4
Totals					**34.7**		**6.1**	**3.7**

North Hunterdon HS								UAdT	UAdT					
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Window Square Feet	Cooling Gain and Heating Loss Btu's Existing	Cooling and Heating Gain Btu's Proposed	Cooling and Heating Gain Savings Btu's	cooling ton-hrs or heating therms saved	Chiller Eff - kw/ton, boiler efficiency	input kwh saved	Input therms saved
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
Cooling														
95-100	97.5	76.3	0	5	1	6	160,000	2,112,166	1,703,549.06	408,617	34	0.65	22.1	
90-95	92.5	74.0	33	7	40	80	160,000	22,640,207	18,260,264.44	4,379,943	365	0.65	237.2	
85-90	87.5	72.0	92	30	122	244	160,000	52,210,526	42,109,951.29	10,100,575	842	0.65	547.1	
80-85	82.5	69.3	330	162	500	992	160,000	143,792,925	115,974,947.81	27,817,977	2318	0.65	1506.8	
75-80	77.5	67.5	98	257	265	620	160,000	47,075,065	37,967,988.87	9,107,076	759	0.65	493.3	
70-75	72.5	64.4	325	236	286	847	160,000	5,846,419	4,715,379.26	1,131,040	94	0.65	61.3	
Heating														
50-55	52.5	47.0	218	223	289	730	160,000	173,809,524	140,577,717	33,231,807	332	73%		456
45-50	47.5	42.2	243	196	195	634	160,000	194,081,633	156,973,865	37,107,767	371	73%		509
40-45	42.5	37.9	193	171	149	513	160,000	191,938,776	155,240,715	36,698,060	367	73%		503
35-40	37.5	33.6	357	311	355	1023	160,000	452,346,939	365,859,697	86,487,241	865	73%		1,186
30-35	32.5	29.4	277	221	236	734	160,000	374,489,796	302,888,583	71,601,213	716	73%		982
25-30	27.5	24.8	159	98	134	391	160,000	226,088,435	182,861,073	43,227,362	432	73%		593
20-25	22.5	20.4	89	48	58	195	160,000	126,020,408	101,925,722	24,094,686	241	73%		330
15-20	17.5	15.4	74	20	31	125	160,000	89,285,714	72,214,580	17,071,134	171	73%		234
10-15	12.5	10.0	35	7	5	47	160,000	36,768,707	29,738,652	7,030,055	70	73%		96
5-10	5.5	6.2	17	9	8	34	160,000	29,836,735	24,132,050	5,704,685	57	73%		78
0-5	2.5	0.6	1	0	0	1	160,000	918,367	742,779	175,589	2	73%		2
-5-0	-2.5	-3.1	0	0	0	0	160,000	-	-	-	-	73%		-
						7210							2,846	4,971

Col.	Notes				
A-F	Weather Data for Newburgh, from Normal Engineering Weather Data for U.S. Cities				
			Inputs		
G	Total Bin Hours	7210			
H	Roof Square Footage from Audit	160,000	Roof Square Feet Audited	160,000	sq.ft
I	Cooling Gain and Heating Loss mmBtu's Existing		C of Existing Roof (Winter)	0.0850	btu/sf hr deg F
			C of Existing Roof (Summer)	0.0863	btu/sf hr deg F
J	Cooling and Heating Gain mmBtu's Proposed		C of Proposed Roof (Winter)	0.0688	btu/sf hr deg F
			C of Proposed Roof (Summer)	0.0696	btu/sf hr deg F
K	Cooling and Heating Gain Savings mmBtu's		Winter Inside Set Point	70	Deg F
M	Cooling Ton-hrs or heating therms saved		Summer Inside Set Point	72	Deg F
N	Chiller/boiler efficiency		Heating cost	$1.12	$/therm
O	Input kwh saved	2,846	Cooling cost	$0.16	$/kwh
P	Input therms saved	4,971	Cost savings	$6,032.89	

North Hunterdon HS								UAdT	UAdT					
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Window Square Feet	Cooling Gain and Heating Loss Btu's Existing	Cooling Gain and Heating Loss Btu's Existing	Cooling Gain and Heating Loss Btu's Existing	Cooling Gain and Heating Loss Btu's Existing	Chiller Eff - kw/ton, boiler efficiency	input kwh saved	Input therms saved
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**
Cooling														
95-100	97.5	76.3	0	5	1	6	130,000	1,716,135	1,384,133.61	332,001	28	0.65	18.0	
90-95	92.5	74.0	33	7	40	80	130,000	18,395,168	14,836,464.86	3,558,703	297	0.65	192.8	
85-90	87.5	72.0	92	30	122	244	130,000	42,421,053	34,214,335.42	8,206,717	684	0.65	444.5	
80-85	82.5	69.3	330	162	500	992	130,000	116,831,752	94,229,645.09	22,602,106	1884	0.65	1224.3	
75-80	77.5	67.5	98	257	265	620	130,000	38,248,490	30,848,990.95	7,399,499	617	0.65	400.8	
70-75	72.5	64.4	325	236	286	847	130,000	4,750,216	3,831,245.65	918,970	77	0.65	49.8	
Heating														
50-55	52.5	47.0	218	223	289	730	130,000	141,220,238	114,219,395	27,000,843	270	76%		353
45-50	47.5	42.2	243	196	195	634	130,000	157,691,327	127,541,265	30,150,061	302	76%		394
40-45	42.5	37.9	193	171	149	513	130,000	155,950,255	126,133,081	29,817,174	298	76%		390
35-40	37.5	33.6	357	311	355	1023	130,000	367,531,888	297,261,004	70,270,884	703	76%		919
30-35	32.5	29.4	277	221	236	734	130,000	304,272,959	246,096,974	58,175,985	582	76%		761
25-30	27.5	24.8	159	98	134	391	130,000	183,696,854	148,574,622	35,122,232	351	76%		459
20-25	22.5	20.4	89	48	58	195	130,000	102,391,582	82,814,649	19,576,932	196	76%		256
15-20	17.5	15.4	74	20	31	125	130,000	72,544,643	58,674,347	13,870,296	139	76%		181
10-15	12.5	10.0	35	7	5	47	130,000	29,874,575	24,162,655	5,711,920	57	76%		75
5-10	5.5	6.2	17	9	8	34	130,000	24,242,347	19,607,290	4,635,057	46	76%		61
0-5	2.5	0.6	1	0	0	1	130,000	746,173	603,508	142,666	1	76%		2
-5-0	-2.5	-3.1	0	0	0	0	130,000	-	-	-	-	76%		-
						7210							2,312	3,852

Col.	Notes				
A-F	Weather Data for Newburgh, from Normal Engineering Weather Data for U.S. Cities				
			Inputs		
G	Total Bin Hours	7210			
H	Roof Square Footage from Audit	130,000	Roof Square Feet Audited	130,000	sq.ft
I	Cooling Gain and Heating Loss mmBtu's Existing		C of Existing Roof (Winter)	0.0850	btu/sf hr deg F
			C of Existing Roof (Summer)	0.0863	btu/sf hr deg F
J	Cooling and Heating Gain mmBtu's Proposed		C of Proposed Roof (Winter)	0.0688	btu/sf hr deg F
			C of Proposed Roof (Summer)	0.0696	btu/sf hr deg F
K	Cooling and Heating Gain Savings mmBtu's		Winter Inside Set Point	70	Deg F
M	Cooling Ton-hrs or heating therms saved		Summer Inside Set Point	72	Deg F
N	Chiller/boiler efficiency		Heating cost	$1.30	$/therm
O	Input kwh saved	2,312	Cooling cost	$0.16	$/kwh
P	Input therms saved	3,852	Cost savings	$5,375.00	

Measurement, Verification and Guarantee of Energy Savings/ Recommended Maintenance
Section E

Honeywell has proven capabilities in applying measurement and verification methods appropriately to develop and verify energy baselines. Honeywell has also demonstrated abilities to conduct post-installation and regular interval verification inspections to confirm guaranteed energy savings.

Honeywell will develop savings methodologies that follow current industry practice, such as outlined by the New Jersey Board of Public Utilities (NJBPU), Federal Energy Management Program's (FEMP) M&V Guidelines: Measurement and Verification for Federal Energy Projects. References to M&V protocols from the International Performance Measurement and Verification Protocol (IPMVP), ASHRAE Guideline 14 and the Air-Conditioning Refrigeration Institute (ARI) are used to further qualify the M&V plan.

Honeywell uses a variety of the M&V options as defined in the NJBPU Guidelines, as the basis for selecting methodologies to evaluate each Energy Conservation Measure (ECM) technology category identified and implemented through a performance contract.

In all performance contracting agreements, Honeywell discusses the M&V options available for savings verification with the District during the audit phase. The following tables are used as benchmarks for these discussions. In all cases, a mutual decision is reached on the M&V protocols that will be used for each ECM.

For each implemented ECM, energy savings are derived from a mutually agreed-upon, site-specific M&V plan. The M&V plan will provide an explanation of the objectives for M&V activities, which will comply with the steps outlined in the NJBPU Guidelines.

The plan will also define the parameters to be monitored, and a detailed description of the usage groups, population sizes and sample sizes that are proposed for each ECM. Definition of the baseline, post- installation, and regular interval parameters associated with each ECM are also defined in the M&V plan.

An M&V Specialist will work in close concert with the Performance Contracting Engineers (PCE's), the project installation team, and your District to ensure that accurate information is obtained.

M&V Options Summary			
FEMP Guidelines / Option	**Verification of Potential to Perform (and Generate Savings)**	**Verification of Performance (Savings)**	**Performance Verification Techniques**
Option A - Verifying that the opportunity has the potential to perform and to generate savings	Yes	Stipulated	Engineering calculations (possibly including spot measurements) with stipulated values
Option B - Verifying that the opportunity has the potential to perform and verifying actual performance by end use	Yes	Yes	Engineering calculations with metering and monitoring throughout term of contract
Option C - Verifying that the opportunity has the potential to perform and verifying actual performance (whole building analysis)	Yes	Yes	Utility meter billing analysis
Option D - Simulating that the opportunity has the potential to perform and simulating actual performance	Yes	Yes	Computer simulation

Honeywell Energy Auditing Process

The audit process begins with baseline development *before* ECMs are designed and the contract is signed. It continues throughout the term of the contract guarantee, and can continue as an ongoing service at the conclusion of the guarantee period.

Energy auditing is a *process,* but not so rigidly structured that it is devoid of independent decision making. It is a mistake to think that the energy auditing process is a series of tasks, performed sequentially the same way every time. Honeywell looks at energy auditing as a systematic means of analyzing and reporting results, and deciding which actions to take to meet the requirements of specific contracts. The following summarizes the energy auditing process. Energy audits can be provided on a quarterly, semi-annual or annual basis as determined by the District.

1. Data about a building's operation, utility costs, and usage is assembled to establish the baseline energy consumption model. If changes did occur, adjustment calculations will need to be done and the district will need to approve the adjustment.
2. Data is analyzed to determine base loads and to provide a check of savings figures. (i.e. are energy savings figures realistic?)
3. Requirements of the Honeywell scope & internal Risk Review Process are completed. All personnel involved in the Review Process approve the project, including the Honeywell Measurement & Verification Specialist Lead.
4. Industry standard energy engineering calculations and methods are utilized and are part of the contract documents. All calculations will be reviewed to satisfy the requirement that these must be a reasonable representation, or model, of facility energy consumption before and after the energy retrofit projects are completed.
5. The *Project Manager* will help ensure performance compliance, and will be responsible for proper installation, operation, and maintenance of the ECMs in accordance with design and contractual parameters. This includes ensuring that verification data is accurately collected and analyzed, and that measuring equipment is calibrated in accordance with prescribed standards.

Measurement and Verification Options

Options A, B, C, and D are four options which contain measurement guidelines consistent with those defined in the September 2000 version of the FEMP M&V Guidelines. The four options were created to provide flexibility in the determination of savings.

This flexibility allows one to arrive at an optimum position regarding increased cost for decreased uncertainty in the determination the realized savings. The District's expectations and specific features of the campus facilities will dictate which particular option (A, B, C, or D) will be the most reasonable and cost-effective solution, providing accountable and verifiable results.

Option A – No Metering / Spot Metering

Requires verification that the ECM has the potential to perform and to generate savings. Verification of performance (savings) may be stipulated. Performance verification techniques for Option A include engineering calculations, spot measurements or stipulated (mutually agreed-upon) values. Field audits will be required in most cases with the application of Option A.

Spot metering will entail taking instantaneous measurement of volts, amperes, kVA, pF and kW. Measurements will be taken one time only. The type of data collection devices include: run-time loggers, kW/kWh transducers, occupancy data loggers, flow meters, and digital hygrometers. Measurement equipment will be calibrated in accordance with the manufacturer's specifications.

Option B – Regular Interval / Continuous Metering

Requires verification that the ECM has the potential to perform. It also requires verification of actual performance by end-use system or device. Verification of performance (savings) is required with this option. Performance verification techniques include engineering calculations, spot and short-term metering or continuous metering. Development of a sampling plan may be required when using Option B as measurement and verification option.

Short term metering will be conducted for a minimum period of three weeks. The data collected may be used to extrapolate after retrofit annual energy demand and consumption profiles.

Continuous data collection is done by totalization and trending consumption of energy consuming systems or end-use devices through an energy management system (EMS) or placement of an additional meter (sub-metering).

Option C – Utility Bill Analysis
Requires verification that the opportunity has the potential to perform, as well as verification of actual performance via whole building analysis. Verification of potential to perform (generate savings) and verification of performance (savings) is required with this option. Performance verification techniques include utility meter billing analysis possibly with computer simulation.

Utility bill analysis consists of the review of two years of utility data to determine and establish the 365-day baseline. The baseline model is developed from utility bills and independent variables such as weather, operating schedules, and occupancy patterns.

Utility data is entered into a baseline-modeling program such as Metrix® that performs utility billing analysis using multivariate regression. Adjustments to the baseline that may be required are mutually agreed upon. The Metrix® utility accounting system is a third party software package designed by SRC Systems, Inc. in Berkley, California. The utility accounting system is used to track, budget, and verify utility operating costs and savings.

Option D – Computer Simulation
Requires verification that the opportunity has the potential to perform, as well as verification of actual performance by end-use systems or devices. Verification of potential to perform (generate savings) and verification of performance (savings) is required with this option. The performance verification technique is a computer simulation analysis. Option D provides a measurement and verification protocol for those ECMs which involve building envelope improvements, upgrades/expansions of existing energy management systems, ECMs which are variable load projects, or those ECMs which have interactive effects. Computer simulation will involve developing models by such building simulation programs as DOE 2.1e, Carrier HAP, or Trace 600.

Baseline Adjustments
Regular Adjustments
Every time an energy audit (determination of energy savings) is performed, the "regular" adjustments are calculated and applied to the baseline usage and cost data. These are adjustments for weather, billing period length and utility rates. These adjustments are usually performed through energy accounting software such as Metrix.

Periodic Adjustments
Periodic adjustments are performed separately from the energy accounting software. Often these adjustments involve the application of building energy simulation tools and techniques. Because the periodic adjustments are performed separately and cannot be developed automatically through the energy accounting software, these adjustments are recalculated only when it appears that conditions have changed enough to warrant a recalculation.

Combining and Applying Adjustments
Once developed, the regular usage adjustments and periodic usage adjustments are combined with an Excel spreadsheet to arrive at the total month by month usage adjustment, which accurately reflects what the baseline period usage would have been under current period conditions.

The applicable utility rate changes are then applied to arrive at what the baseline period energy costs would have been under current period conditions and rates. This figure is then compared against the actual current period energy cost to determine the amount of energy cost savings which has occurred.

<u>Audit Adjustment Methodologies</u>
The Energy Analyst will determine actual annual energy savings by comparing the energy consumed during each guarantee year, with the base year, adjusted as described below. The purpose of base year adjustments is to ensure that the annual reconciliation is quantified on a comparison of energy consumption for each type of fuel.

Some typical adjustments are related to the following:

- Added mechanical or HVAC equipment
- Additional square footage
- Office equipment (computers, copiers, etc.)
- Changes in occupancy
- Equipment failures

Specific adjustment methodologies are as follows:

Billing Period Adjustment
Adjustment to the monthly comparison periods will reflect same start date and equal number of days being compared.

Weather Adjustment
Adjustment to the base-year will reflect weather differences between the base-year or period and current year or period.

Square Footage Adjustment
Additions or permanent closures of floor space will be accounted for and factored into the comparison of the base-year and current period.

Utility Rate Adjustment
The energy audit methodology will use the rate schedules and charges documented in the contract as they apply to the current monthly bills.

Operational and Occupancy Hours Adjustment
Additions to or reductions in the sizes or types, as well as hours of operation of use for equipment will be accounted for and factored into the comparison of base-year and current period, based upon standard engineering calculations and data measured electronically for this purpose. Significant changes in conditioning set points will also be accounted for and adjusted.

Demand Charges Adjustment
Demand charges incurred as a result of equipment usage not controlled or operated for energy conservation under the project scope will be identified adjusted for in the annual savings reconciliation.

<u>Audit Adjustment Procedures</u>

If it is necessary to make baseline adjustments, the following adjustment procedures will be followed.

The Energy Analyst will estimate (using appropriate engineering calculations) how much energy was used due to the changed condition. The calculations will be based upon such factors as installed kW, BTU input, efficiency, runtime, etc.

For Example:

If the customer installed a new computer lab subsequent to the baseline year, and it has 30 PCs at 300 watts each and it runs 30 hours per week, the calculation would show:

30 PCs X 300 Watts = 9 kW (Peak load increase)
9 kW X 30 hrs per week = 270 kWh per week
270 kWh X 4 weeks = 1080 kWh per four week period.

An increase usage of about 1,080 kWh per 4-week period, plus an additional peak load of 9 kW.

The Energy Analyst will document all changes in the audit:

- Equipment sizes
- Operating hours
- Energy calculation used
- Results

This information will be shown as adjustment documentation that is a permanent part of the audit file, and is used in preparing energy audits. It will be tracked throughout the term of the contract. Without such adjustments, increased energy usage at the facility would reduce the value of the cost avoidance calculated by Metrix.

This is because cost avoidance is based on adjusted energy reduction-the difference between adjusted baseline energy consumption and current energy consumption. If the baseline is not adjusted upward to account for additional energy consumption (that Honeywell has no control over, and which was not present during the base year), the adjusted energy reduction will be less than the amount we had based our savings guarantee on.

The customer must agree to and understand all adjustments at the time of audit delivery (quarterly, semiannual, or annual). Their agreement and acceptance of the audit indicates their acceptance of the audit methodology, including all adjustments (due to changes in weather, changes in occupancy, addition of new equipment, etc.).

<u>ECM-based Measurement and Verification (M&V) Audit Adjustments</u>

ECM-based Measurement and Verification (M&V), is another credible way to demonstrate energy savings. The technique has evolved considerably with the adoption of automated data collection tools (such as building automation systems with direct digital controllers, programmable meters and dataloggers) in facilities. ECM-based measurement and verification is the derivation of energy savings (and the associated value of those savings) from measured data collected before and after the

implementation of the energy conservation measures (ECMs). It can also apply to demand savings, and the associated value of those savings. A form of this technique can be used for supply-side strategies that reduce the cost of the energy consumed (examples are cogeneration, thermal storage, and rate-switching or fuel-switching projects).

ECM Based M&V Audits are different from the utility bill auditing methods, which uses data obtained from the monthly bills. With the utility bill auditing method, it can be difficult to impossible to quantify the value of adjustments to baseline energy consumption, especially in a facility with few meters and many energy events that are not measured.

In ECM-Based Measurement and Verification, the ongoing energy savings are measured and calculated using the same calculation models and measurement methods that were used to determine the baseline energy savings. The Energy Analyst and the Engineer work closely together to ensure that the audit methodology matches the methodology used for the original energy savings estimates.

When ECM-based Measurement and Verification is used, the following five components are essential for demonstrating guaranteed energy savings:

1. Pre-retrofit energy use profile (baseline).
2. Post-retrofit time-of -use measurement.
3. Post-retrofit energy and/or demand measurement (directly measured or derived from other measured variables).
4. Post-retrofit value of energy and demand saved.
5. Acceptable sampling plan.

In Utility Bill Auditing, Honeywell uses energy consumption and demand information for the entire facility to develop the baseline energy use. In ECM-Based Measurement and Verification, Honeywell will model the energy use and demand associated with each individual ECM implemented.

Dollar Savings Calculations

Honeywell's policy to assigning a dollar value to savings is to first identify the consumption reduction of the particular utility. When the consumption reduction is identified, the corresponding cost of the utility unit is used to determine the value of the savings. The savings is based upon units of energy and the dollar value is associated with agreed upon based year per unit costs for oil, electric, gas, and water.

Maintenance Savings

For each improvement measure a list of potential maintenance savings or benefits will be developed. This list will be reviewed with North Hunterdon - Voorhees Regional High School District to determine if any maintenance or material dollars can be applied to help justify specific investments identified in the audit.

Guaranteed Savings

The approach that Honeywell utilizes in this asset management program includes two key components: a *performance guarantee* and *financial savings*. Honeywell guarantees the Customer that all installations and work performed are subject to final inspection and Customer's acceptance. This procedure ensures all work will be to the level of quality the Customer expects.

Honeywell also guarantees it will meet the objectives mutually defined with the Customer. Honeywell takes its commitment to partner with the Customer for the life of the contract seriously, and looks forward to a successful, long-term partnership.

Honeywell will provide a cost avoidance guarantee to the Customer. It will contain both energy and operational savings based on data from your utility bills, building operation, and budget information. The energy savings guarantee is structured to accommodate changes in utility rates, changes in building structures, changes in building occupancy patterns, and weather variances. In simple terms, this means that Honeywell guarantees a level of energy consumption based on conditions as they existed in the base year. Any changes or modifications to the buildings operating conditions need to be communicated on a regular basis. An example of this would be constructing an addition on a building. This addition would increase your energy baseline and would need to be documented. The energy guarantee is documented with any assumptions in our final contract and is shown in Attachments F & G, in our contract.

Honeywell considers the guarantee to be the cornerstone of our service to you. To be considered a *performance contract* an energy guarantee is a required component. The basis of an energy performance contract is that the majority of risk is shifted from the customer to the vendor. The strength of the Guarantee is only as good as the Company backing it and their financial solvency. Honeywell has entered into over 4,300 energy performance contracts and has had over $1 Billion in energy guarantees. We have the strength and background to support the Customer for the long term.

It is important to make a distinction between Honeywell's guarantee and other possible savings assurance structures. Honeywell guarantees that the Customer will benefit from 100% of the cost savings, reductions, and cost avoidance realized. Alternate structures that may be proposed by other vendors include having the Customer share savings with the vendor, effectively reducing both the scope achievable under the savings captured by the Customer and limiting the overall financial benefits.

The guarantee is generally structured to cover the ongoing monitoring and auditing. Honeywell will work with the Customer to determine the scope of ongoing maintenance services required in order for the guarantee to remain in place and for the savings to be achieved.

Recommended Preventive Maintenance Services

A Comprehensive Portfolio, a Customized Approach.

Honeywell offers a uniquely comprehensive portfolio of services – one of the most extensive in the industry. As part of the Energy Savings Plan, we recommend the following services for consideration to ensure achievement of the Enrgy Savings outlined in this plam

According to the NJ ESIP program, all services are required to be bid by the school district for services as desired. Based on Honeywell's vast service organization, we are uniquely qualified to develop design specification for the public bidding according to NJ Law.

Honeywell strongly believes that the long-term success of any conservation program is equally dependent upon the appropriate application of energy savings technologies, as well as solid fundamental maintenance and support. One of the primary contributors to energy waste and premature physical plant deterioration is the lack of operations, personnel training and equipment maintenance.

Honeywell recommends routine maintenance on the following systems throughout the district for the duration of an energy guarantee of savings

Maintenance, Repair and Retrofit Services:

- Mechanical Systems
- Building Automation Systems
- Temperature Control Systems
- Air Filtration

Honeywell will work with the School District to evaluate current maintenance practices and procedures. This information will be the basis of a preventive maintenance and performance management plan designed to maximize building operating efficiencies, extend the useful life of your equipment and support the designed Energy Savings Plan.

At a minimum, we recommend the following tasks be performed on a quarterly basis with the district wide Building Management System.

System Support Services

1. Review recent mechanical system operation and issues with customer primary contact, on a monthly basis.
2. Review online automation system operation and event history logs and provide summary status to the customer primary contact. Identify systemic or commonly re-occurring events.
3. Check with customer primary contact and logbook to verify that all software programs are operating correctly.
4. Identify issues and prioritize maintenance requests as required.
5. Provide technical support services for trouble shooting and problem solving as required during scheduled visits.
6. Provide ongoing system review and operations training support; including two semi-annual lunches and learn sessions.
7. Establish dedicated, site-specific emergency stock of spare parts to ensure prompt replacement of critical components. These will be stored in a secure location with controlled access.

Configuration Management

1. Update documentation and software archives with any minor changes to software made during maintenance work.
2. Verify and record operating systems and databases.
3. Record system software revisions and update levels.
4. Archive software in designated offsite Honeywell storage facility, on an annual basis.
5. Provide offline software imaging for disaster recovery procedures, updated on a regular basis.

Front End / PC Service

1. Verify operation of personal computer and software:
2. Check for PC errors on boot up
3. Check for Windows errors on boot up
4. Check for software operations and performance, responsiveness of system, speed of software
5. Routinely back up system files, on an annual basis:
6. Trend data, alarm information and operator activity data
7. Custom graphics and other information
8. Ensure disaster recovery procedures are updated with current files
9. Clean drives and PC housing, on an annual basis:
10. Open PC and remove dust and dirt from fans and surfaces
11. Open PC interface assemblies and remove dust and dirt
12. Clean and verify operation of monitors.
13. Verify printer operation, check ribbon or ink.
14. Initiate and check log printing functions.
15. Verify modem operation (if applicable).
16. Review IVR schedule for alarms and review (if applicable).

Temperature Control / Mechanical Services

AIR COMPRESSORS/TEMPERATURE CONTROLS

Services Performed

Major Inspection
1. Inspect starter and disconnect, and clean contacts.
2. Clean or replace intake filter element.
3. Inspect, clean and lubricate motor.
4. Inspect belts and adjust tension.
5. Perform sequence test of all controls.
6. Time on-off cycle.
7. Test check valve operation, if applicable.
8. Test operation of automatic drain.
9. Check oil level.

Seasonal Inspection
1. Lubricate motor as required.
2. Inspect belts and adjust tension.
3. Test operation of automatic drain.
4. Check oil level.

UNIT VENTS

Services Performed

Annual Inspection
1. Inspect motor and lubricate.
2. Lubricate fan bearings.
3. Inspect coil(s) for leaks.
4. Vacuum interior.
5. Test operation of unit controls.

PUMPS

Services Performed

Preseason Inspection
1. Tighten loose nuts and bolts.
2. Check motor mounts and vibration pads.
3. Inspect electrical connections and contactors.

Seasonal Start-up
1. Lubricate pump and motor bearings per manufacturer's recommendations.
2. Visually check pump alignment and coupling.
3. Check motor operating conditions.
4. Inspect mechanical seals or pump packing.
5. Check hand valves.

Mid-season Inspection
1. Lubricate pump and motor bearings as required.
2. Inspect mechanical seals or pump packing.
3. Ascertain proper functioning.

Seasonal Shut-down
1. Switch off pump.
2. Verify position of hand valves.
3. Note repairs required during shut-down.

PACKAGED AIR-CONDITIONING SYSTEMS

Services Performed

Preseason Inspection
1. Energize crankcase heater.
2. Lubricate fan and motor bearings per manufacturer's recommendations.
3. Check belts and sheaves. Adjust as required.
4. Lubricate and adjust dampers and linkages.
5. Check condensate pan.

Seasonal Start-up
1. Check crankcase heater operation.
2. Check compressor oil level.
3. Inspect electrical connections, contactors, relays, operating and safety controls.
4. Start compressor and check operating conditions. Adjust as required.
5. Check refrigerant charge.
6. Check motor operating conditions.
7. Inspect and calibrate temperature, safety and operational controls, as required.
8. Secure unit panels.
9. Pressure wash all evaporator and condenser coils (if applicable)
10. Log all operating data.

Mid-season Inspection
1. Lubricate fan and motor bearings per manufacturer's recommendations.
2. Check belts and sheaves. Adjust as required.
3. Check condensate pan and drain.
4. Check operating conditions. Adjust as required.
5. Log all operating data.

Seasonal Shut-down *
1. Shut down per manufacturer's recommendations.

* If no Shut-down is required then (2) Mid-season Inspections are performed

BOILERS
Services Performed

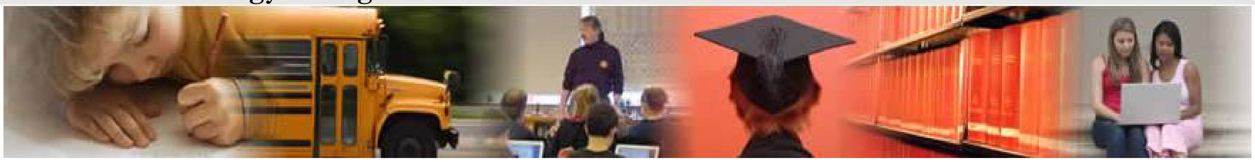
Preseason Inspection
1. Inspect fireside of boiler and record condition.
2. Brush and vacuum soot and dirt from flues (not chimneys) and combustion chamber.
3. Inspect firebrick and refractory for defects.
4. Visually inspect boiler pressure vessel for possible leaks and record condition.
5. Disassemble, inspect and clean low-water cutoff.
6. Check hand valves and automatic feed equipment. Repack and adjust as required.
7. Inspect, clean and lubricate the burner and combustion control equipment.
8. Reassemble boiler.
9. Check burner sequence of operation and combustion air equipment.
10. Check fuel piping for leaks and proper support.
11. Review manufacturer's recommendations for boiler and burner start-up.
12. Check fuel supply.
13. Check auxiliary equipment operation.

Seasonal Start-up
1. Inspect burner, boiler and controls prior to start-up.
2. Start burner and check operating controls.
3. Test safety controls and pressure relief valve.
4. Perform combustion analysis.
5. Make required control adjustments.
6. Log all operating conditions.
7. Review operating procedures and owner's log with boiler operator.

Mid-season Inspection
1. Review operator's log.
2. Check system operation.
3. Perform combustion analysis.
4. Make required control adjustments.
5. Log all operating conditions.
6. Review operating procedures and log with boiler operator.

Seasonal Shut-down

1. Review operator's log.
2. Note repairs required.



Design Approach
Section F

Design Approach

In accordance with the ESIP PL 2009, c.4 as part of the implementation process, an agreement between your school district and Honeywell will determine the energy conservation measures (ECM's) to be implemented. Honeywell is then required to secure the services of a NJ Licensed Engineering firm and / or Architectural firm in order to properly comply with local building codes, compliance issues and NJ Public contract law. Specifications will be designed and developed to exact standards as recommended by Honeywell in order to achieve all savings outlined in this Energy Savings Plan (ESP). Once specifications are completed, Honeywell will publicly solicit contractors capable of meeting the requirements of the specification for each trade. However, even before the completion of the bidding process, Honeywell will be providing construction and project management services in order to maintain a schedule in order to meet the school districts expectations. An overview of these activities and functions are detailed below.

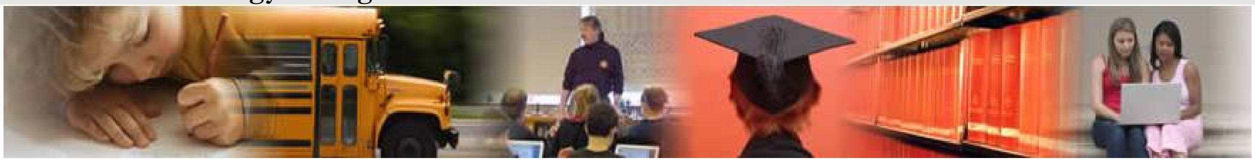
Project Management – Construction Management Planning

A Honeywell Project Management Plan defines plans and controls the tasks that must be completed for your project. But more than task administration, our project management process oversees the efficient allocation of resources to complete those tasks.

Each project and each customer's requirements are unique. At Honeywell we address customer needs through a formal communication process. This begins by designating one of our project managers to be responsible for keeping the customer abreast of the status of the project.

As the facilities improvements portion of the partnership begins, the Project Manager serves as a single focal point of responsibility for all aspects of the partnership. The Project Manager monitors labor, material, and project modifications related to the North Hunterdon–Voorhees SD/Honeywell partnership and makes changes to ensure achievement of performance requirements in the facilities modernization component. The Project Manager regularly reviews the on-going process of the project with the customers.

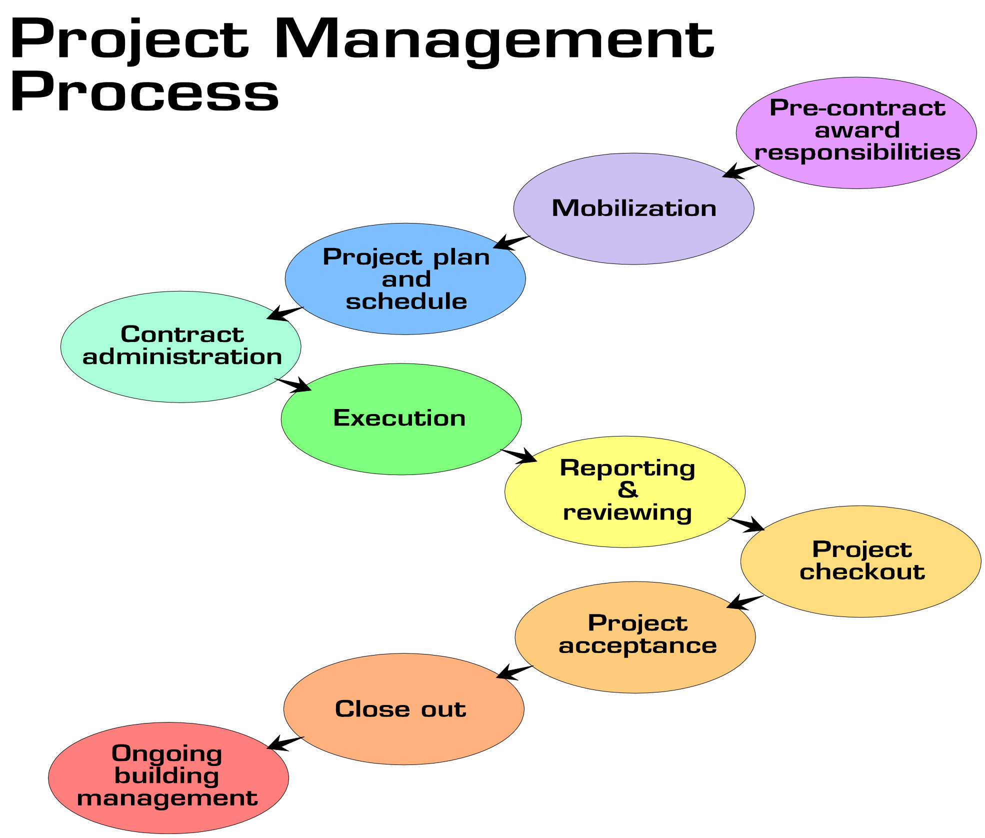
The Project Manager will develop and maintain effective on-going contact with the District and all other project participants to resolve issues and update project status.

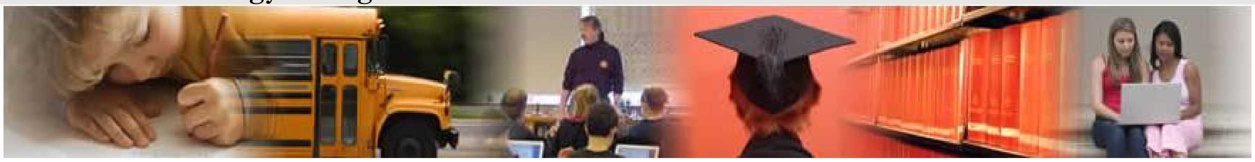


There are several challenges in this position. The Project Manager must staff the project and create a work force capable of handling the technologies associated with the project and plan for and use these personnel to achieve optimum results focused on occupant comfort and guarantee requirements.

The project management process applies technical knowledge, people and communication skills, and management talent in an on-site, pro-active manner to ensure that our contract commitments are met on time, within budget, and at the quality you expect.

There are ten distinctive phases of the project management process:





Construction Management

Prior to any work in the buildings, our Project Manager, Jim Freeman will sit down with your administrative and building staff to outline the energy conservation upgrades that we will be installing in the buildings. We will discuss proper contractor protocol of checking in and out of the buildings on a daily basis, wearing identifiable shirts, and checking in with your facilities staff. We will coordinate certain projects for different times of the day so we do not interrupt the building and learning environments. Our staff will work a combination of first and second shifts to accomplish the pre-set implementation schedule.

Communication is the key success factor in any construction management plan, and our project manager will be the key focal point during the installation process. Our team will prevent schedule slippages by continuously tracking the location of all equipment and components required for the project. We make sure all equipment and components will be delivered on time prior to the scheduled date of delivery. Our thorough survey, evaluation and analysis of existing conditions, performed prior to the commencement of construction, will also prevent schedule slippages.

Subcontracting

As indicated above, Honeywell would develop detailed specifications with a NJ Licensed Engineering firm for each ECM project accepted by the School District. The contractor would need to be able to meet all requirements of NJ Public contracting laws regarding insurance, bonding, and performance requirements.

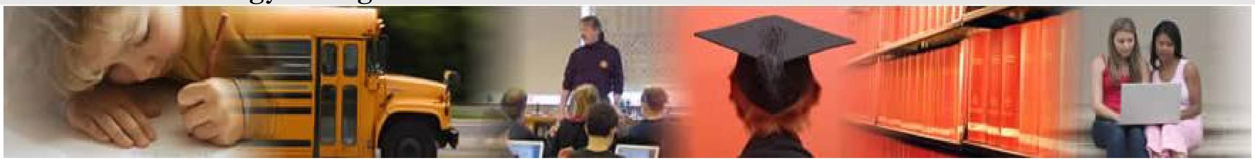
Typical areas that are subcontracted are as follows:

- Electrical Installation
- Water Conservation (Plumbing)
- HVAC Installation
- Renewable technologies
- Associated General Contracting specialty items to support the project etc., (ceilings, windows, concrete, structural steel, roofing, demolition and removal of equipment, painting and rigging)

Honeywell uses the following guidelines in hiring subcontractors to perform work on our projects.

- Firm's Qualifications and WBE/MBE Status
- Firm's Financial Stability
- Ability to perform the work within the project timeline
- Price
- Ability to provide service on the equipment or materials installed over a long period of time.

Approval of subcontractors that Honeywell proposes to use lies with the School District.



Installation Standards

When Honeywell designs a solution, we take into account current and future operations. For any upgrades we install, we follow building codes/standards, which dictate certain standards for energy or building improvements. Listed in tables following this section are standards for building design. During the life of the agreement, there is a partnership approach to maintaining these standards for reasons of comfort and reliability. For lighting our standard is generally to meet or exceed current light levels, achieving the relevant standards wherever possible.

In the case of lighting upgrades, we recommend that a group re-lamping of lamps be done around five years after the initial installation depending upon run times. Your building facility staff, on an as needed basis, can complete normal routine maintenance of lamps and ballasts. This maintains the quality of the lighting levels, and color rendering qualities of the lamps.

Space temperatures will be set by the energy management system and local building controls, and will be maintained on an annual basis. Flexibility will be maintained to regulate space temperatures as required to accommodate building occupant needs.

Your facility staff and building personnel will do the operation of the energy management system with ongoing training from Honeywell. Therefore, both the District and Honeywell will maintain the standards of comfort. The comfort standards will be maintained throughout the life of the agreement through sound maintenance planning and services recommended as part of this ESP.

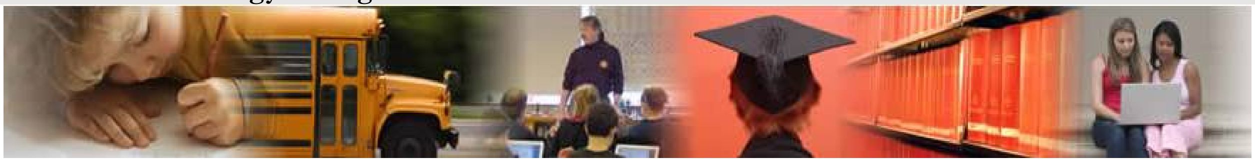
With regard to ventilation, Honeywell will upgrade ventilation to meet current standards in those areas where our scope of work involves upgrades to or replacement of systems providing building ventilation. We generally will not upgrade ventilation in those areas where our work doesn’t involve the upgrade or replacement of systems or equipment providing ventilation to a building or facility.

Heating and Cooling Standards

Heating Temperatures	Cooling Temperatures	Unoccupied Temperatures
68-70° F	75° F	55-60° F

Lighting Standards:

Recommended Light Levels	
Task Area	**Foot-candles**
Corridors/Stairways/Restrooms	10-20
Storage Rooms	10-50
Conference Rooms	20-50
General Offices	50-100
Drafting/Accounting	100-200
Areas with VDTs	75
Classrooms	50-55
Cafeterias	50
Gymnasiums	30-50



Honeywell uses a variety of in-house labor as well as subcontractors to install the energy conservation measures. We have on staff trained professionals in fire, security, energy management systems, all temperature control systems, and HVAC. However, according to the ESIP law, all trades will be publicly bid except for specific controls applications. Honeywell will also utilize the control system that is already in the facility so long as it can achieve the performance goals of the School District. Listed below is a sampling of some of the disciplines that would apply to the District, but is not all encompassing.

Improvements	Honeywell	Subcontractor
Engineering Design/Analysis	X	
Technical Audit	X	
Construction Administration/Management	X	
Installation of Energy Management System	X	X
Manufacturer of Energy Management Equipment	X	X
Installation of HVAC/Mechanical Equipment		X
Installation of Renewable Technology		X
Installation of Building Envelope		X
Energy Supply Management Analysis/Implementation	X	
Installation of Boilers		X
Maintenance of Energy Management Equipment	X	X
Manufacturer/Installation of Temperature Control s	X	X
Monitoring/Verification Guarantee	X	
Training of Owner Staff	X	
Financial Responsibility for Energy Guarantees	X	

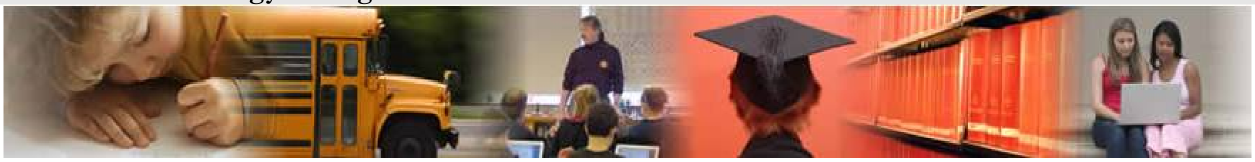
Hazardous waste disposal or recycling

Honeywell disposes of all PCB ballasts or mercury containing materials removed as part of the project per EPA guidelines, and will fill out all the required paperwork for the District. Honeywell will work with the School District to review your hazardous material reports, and will identify the areas where work will be completed so that the District can contract to have any necessary material abatement completed.

Honeywell can help schedule or coordinate waste removal, but cannot contract for or assume responsibility for the abatement work. Honeywell also has the capabilities to assist the District in working with the EPA under compliance management issues. We also develop and manufacture automated systems to track and report a wide variety of environmental factors.

Commissioning

Honeywell provides full commissioning of energy conservation measures (ECM's) at the request of the customer. We will customize this process based on the complexity of Energy Conservation Measures and make our services available to the school district appointed commissioning agent as directed.



Upon project acceptance by the North Hunterdon - Voorhees Regional High School District, the assigned Commissioning Agent (CA) will be responsible for start-up and commissioning of the new equipment and systems to be installed during the project. This will include verifying that the installed equipment meets specifications, is installed and started up in accordance with manufacturer's recommendations, and operates as intended. A commissioning plan will be prepared that describes the functional tests to be performed on the equipment and the acceptance criteria.

Prior to customer acceptance of the project, the CA submits the final commissioning report containing signed acceptance sheets for each ECM. Signed acceptance sheets are obtained upon demonstrating the functionality of each ECM to an agency-appointed representative.

Honeywell provides training for agency operators and personnel as needed when each ECM is completed and placed into service. All training is documented in the final commissioning report.

Financing the ESIP

Upon adoption of this ESP, Honeywell will explore and obtain financing arrangements to fund the implementation phase of the process. Several options are available under the ESIP act PL 2009, c.4

An ESIP can be financed through energy savings obligations. The term refers to the two primary financing tools, debt and lease-purchase instruments. Each of these options is discussed below.

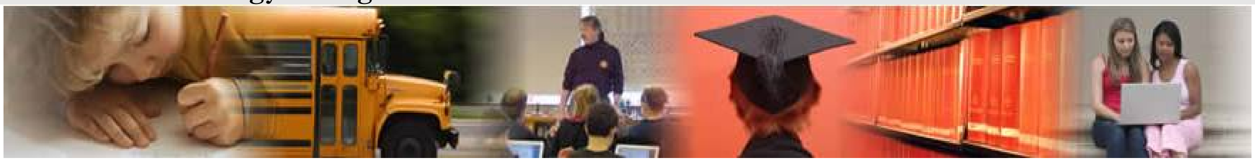
Financing an ESIP is based on the principle, that with certain exceptions (i.e., audit and verification costs), the cost of the improvements (including planning, design, engineering, construction, etc.) will be paid through the value of reduced energy costs. Using the BPU protocols for calculating savings, energy costs, and inflation as standards across all local units is a critical component of the ESIP.

Energy savings obligations shall not be used to finance maintenance, guarantees, or the required third party verification of energy conservation measures guarantees. Energy saving obligations, however, may include the costs of an energy audit and the cost of verification of energy savings as part of adopting an energy savings plan or upon commissioning. While the audit and verification costs may be financed, they are not counted in the energy savings plan as a cost to be offset with savings.

In all cases, the maturity schedules for energy savings obligations must not exceed the estimated useful life of the individual energy conservation measure.

An ESIP can also include installation of renewable energy facilities, such as solar panels. Under an energy savings plan, solar panels can be installed, and the reduced cost of energy reflected as savings.

The law also provides that the cost of energy saving obligations may be treated as an element of the local unit's utility budget, as it replaces energy costs.



Debt Issuance

The law specifically authorizes municipalities, school districts, counties, and fire districts to issue refunding bonds as a general obligation, backed with full faith and credit of the local unit to finance the ESIP. Because an ESIP does not effectively authorize new costs or taxpayer obligations, the refunding bond is appropriate and proper, as it does not affect debt limits, or in the case of a board of education, voter approval. The routine procedures for refunding bonds found in the Local Bond Law and Public School Bond Law would be followed for issuance of debt, along with any required Bond Anticipation Notes as authorized pursuant to law.

With regard to bonds for public schools, the Department of Education (DoE) has concluded that debt financed ESIP projects are not covered by State aid for debt service or a "Section 15 EFFCA Grant" as there is no new local debt being authorized.

Lease Purchase Financing

A local unit can enter into a lease-purchase agreement to implement an ESIP with a single investor lease or certificates of participation. The agreement can be entered into directly by the local unit, with ESCO, other private financing party, or through a county improvement authority or the New Jersey Economic Development Authority.

The following additional requirements affect ESIP leasing:

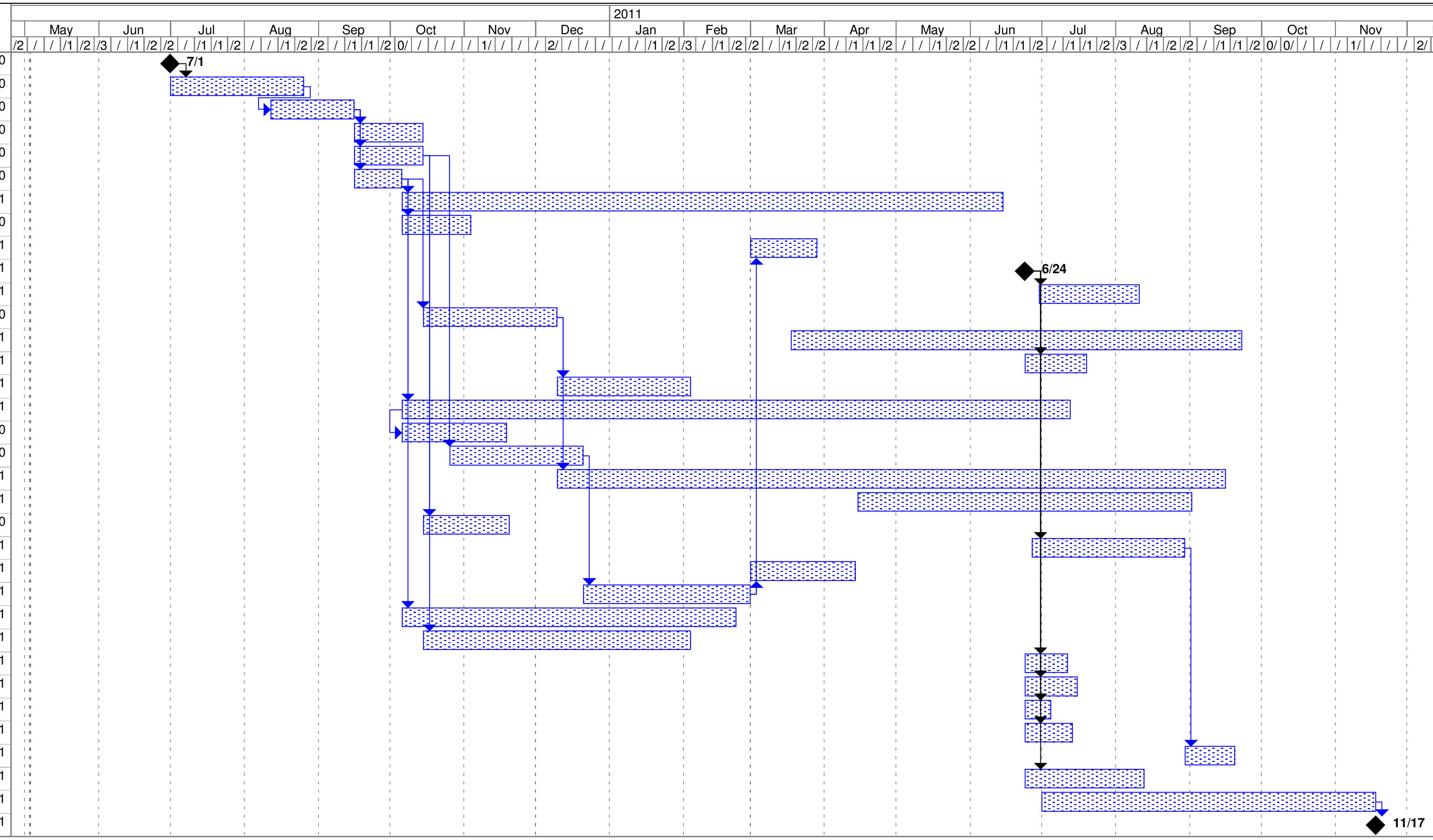
i. Ownership of the energy savings equipment or improvements shall remain with the third party financing entity until all lease payments have been made or other requirements of the financing documents for the satisfaction of the obligation are met. If improvements are made to facilities owned by the local unit, the local unit will have to enter into a ground lease of the facilities to be leased back to the local unit.

ii. The duration of a lease-purchase agreement shall not exceed 15 years, except that the duration of a lease purchase agreement for a combined heat and power (CHP) or cogeneration project shall not exceed 20 years. CHP and cogeneration facilities are specialized types of energy conservation measures. The law supersedes the existing 5 year limit on lease-purchase financing for these types of projects.

iii. Any lease purchase agreement may contain a clause making it subject to the availability of sufficient funds as may be required to meet the extended obligation; or a non-substitution clause maintaining that if the agreement is terminated for non-appropriation, the contracting unit may not replace the leased equipment. While normal for these types of leases, the optional nature in the law permits the transaction attorney to negotiate them as terms of a lease agreement.

North Hunterdon
Honeywell ER Project

ID		Task Name	Duration	Start	Finish
1		Notice to Proceed	0 days	Thu 7/1/10	Thu 7/1/10
2		Engineering	40 days	Thu 7/1/10	Wed 8/25/10
3		Design Documents	25 days	Thu 8/12/10	Wed 9/15/10
4		Bidding	21 days	Thu 9/16/10	Thu 10/14/10
5		Equipment Procurement	21 days	Thu 9/16/10	Thu 10/14/10
6		Permits	14 days	Thu 9/16/10	Tue 10/5/10
7		1A -Lighting Retrofit	180 days	Wed 10/6/10	Tue 6/14/11
8		1B -Vending Misers	21 days?	Wed 10/6/10	Wed 11/3/10
9		2A -New Burner Controls	20 days	Tue 3/1/11	Mon 3/28/11
10		'11 School Year Ends	0 days	Fri 6/24/11	Fri 6/24/11
11		2B -DHW Heater Replacements	30 days	Thu 6/30/11	Wed 8/10/11
12		2C -AHU Replacements	40 days	Fri 10/15/10	Thu 12/9/10
13		2D -Converting Elec Heating Sys. To Gas	135 days	Fri 3/18/11	Thu 9/22/11
14		2E -Non Chemical Water Treatment	18 days	Fri 6/24/11	Tue 7/19/11
15		2F -RTU Replacements	40 days	Fri 12/10/10	Thu 2/3/11
16		3A -Building Management Modifications	200 days	Wed 10/6/10	Tue 7/12/11
17		3B -Demand Control Ventilation	32 days	Wed 10/6/10	Thu 11/18/10
18		3C -Chiller Replacement	40 days	Tue 10/26/10	Mon 12/20/10
19		4A -Constant Volume Multi-zone Units to VVT	200 days	Fri 12/10/10	Thu 9/15/11
20		5A -Building Envelope Improvements	100 days	Fri 4/15/11	Thu 9/1/11
21		6A -Computer Controllers	26 days	Fri 10/15/10	Fri 11/19/10
22		7A -Transformer Replacements	46 days	Mon 6/27/11	Mon 8/29/11
23		7B -Install Premium Efficiency Motors	32 days	Tue 3/1/11	Wed 4/13/11
24		7C -Variable Speed Drives on Pump Motors	50 days	Tue 12/21/10	Mon 2/28/11
25		8A -Install Photovoltaic System	100 days	Wed 10/6/10	Tue 2/22/11
26		9A -Steam Trap Repair	80 days	Fri 10/15/10	Thu 2/3/11
27		10A -Kitchen Hood Controllers	12 days	Fri 6/24/11	Mon 7/11/11
28		10B -Walk-in Freezer Controllers	16 days	Fri 6/24/11	Fri 7/15/11
29		10C -Kitchen Pre-rinse Sprayer	7 days	Fri 6/24/11	Mon 7/4/11
30		10D -Kitchen Sink Pedal Valves	14 days	Fri 6/24/11	Wed 7/13/11
31		11A -Demand Response	15 days	Tue 8/30/11	Mon 9/19/11
32		11B -Roof Replacement	36 days	Fri 6/24/11	Fri 8/12/11
33		Punchlist	100 days	Fri 7/1/11	Thu 11/17/11
34		Delivery and Acceptance	0 days	Thu 11/17/11	Thu 11/17/11



Project: North Hunterdon
Date: Mon 5/3/10

Task		Milestone		Rolled Up Task		Rolled Up Progress		External Tasks		Group By Summary	
Progress		Summary		Rolled Up Milestone		Split		Project Summary		Deadline	

APPENDIX I

- CDM Energy Audit
- Electronic Copy of Honeywell Energy Savings Plan