CDM

Hanover Township Public Schools

March 25, 2010

Final Energy Audit Report

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March 25, 2010

Mr. Roy Aull, Sr.
Supervisor of Buildings and Grounds
Hanover Township Public Schools

Subject: Final Energy Audit Report for Hanover Township Public Schools

Dear Mr. Aull:

Please find enclosed four (4) copies of our final energy audit report detailing the findings and recommendations of CDM's energy audit for Hanover Township Public Schools. An electronic copy of this report has also been provided to TRC for their record.

Very truly yours,

Matthew T. Goss, P.E., C.E.M., C.E.A., LEED®AP
Project Manager
CDM

c: Theodore C. Schlette (CDM)
Colleen Kling (TRC)

Enclosure

Contents

Executive Summary

As part of an initiative to reduce energy cost and consumption, Hanover Township Public Schools has secured the services of Camp Dresser and McKee (CDM) to perform an energy audit for four (4) school buildings which are owned and operated by the Public School District in an effort to develop comprehensive Energy Conservation and Retrofit Measures (ECRMs).

CDM's energy audit team visited the schools on January 26th and 27th, 2010. As a result of the site visits and evaluation of the historical energy usage of the facilities, CDM was successful in identifying opportunities for energy savings measures.

CDM has also evaluated the potential for renewable energy technologies to be implemented at the Township's school buildings to offset the electrical energy usage. Specifically, the use of solar electric photovoltaic panels, ground source heat pumps and wind turbines were investigated.

CDM solicited a proposal from a third party electric energy supplier to investigate any additional energy cost savings that may be available for the Public School District. Additionally, there is potential for the Township to make money by participation in a Demand Response Program, as discussed in Section 5.2.

Not all ECRMs identified as a result of the energy audit are recommended. ECRMs must be economically feasible to be recommended to the Public School District for implementation. The feasibility of each ECRM was measured through a simple payback analysis. The simple payback period was determined after establishing Engineer's Opinion of Probable Construction Cost estimates, O&M estimates, projected annual energy savings estimates, and the potential value of New Jersey Clean Energy rebates, or Renewable Energy Credits, if applicable. ECRMs with a payback period of 20 years or less can be recommended.

Historical Energy Usage

The following table, Table ES-1, summarizes the historical energy usage at each of the buildings as presented in Section 3. These values can serve as a bench-marking tool, along with the building profiles that have been established through the EPA's Portfolio Manager Program, to quantify the reduction in electrical energy and natural gas usage following the implementation of the recommended ECRMs.

Table ES-1: Summary of Annual Energy Usage & Cost						
	Electrical Energy Use (kWH)	Peak Summer Demand (kW)	Peak Winter Demand (kW)	Fuel Use for Entire Building (therms)	Cost for Electric Service	Cost for Fuel
Memorial Junior Middle School	833,600	263	258	87,099	$142,052	$25,748
Bee Meadow Elementary School	514,000	196	212	45,388	$89,230	$13,103
Salem Drive Elementary School	250,960	96	93	32,546	$43,469	$10,511
Mountview Road Elementary School	230,080	97	83	28,912	$40,436	$9,866

Recommended ECRMs

The following Table ES-2 presents the ranking of recommended ECRMs identified for the building lighting and HVAC systems based on the simple payback analysis. The lighting system improvements that include upgrades to both the interior and exterior lighting systems have been recommended. Although these measure's have a longer payback period than improvements to the interior lighting system alone, implementing retrofits to both the interior and exterior lighting systems results in a greater energy savings.

Additional ECRMs associated with the building envelope and other miscellaneous appliances were identified and evaluated, as discussed in Sections 2 and 4; however, were not recommended due to longer payback periods. This table includes the Engineer's Opinion of Probable Construction Cost, projected annual energy cost savings, projected annual energy usage savings, and total simple payback period for each recommended ECRM. The ECRMs are ranked based on payback period.

Table ES-3 summarizes the Total Engineer's Opinion of Probable Construction Cost, annual energy savings, projected annual energy and O&M cost savings and the payback period based on the implementation of all recommended ECRMs.

Table ES-2[1] Ranking of Energy Savings Measures Summary					
Overall Ranking[3]	**ECRM**	**Total Cost**	**Energy Savings**	**Annual Fiscal Savings[2]**	**Simple Payback (Years)**
1	**Salem Drive School – Boiler Upgrade**	$110,281	8,648 Therms	$13,837	**8.0**
2	**Bee Meadow School – Boiler Upgrade**	$165,422	12,398 Therms	$19,837	**8.3**
3	**Bee Meadow School – Interior & Exterior Lighting**	$167,620	110,354 kWh	$19,521	**8.6**
4	**Salem Drive School - Interior & Exterior Lighting**	$78,004	48,789 kWh	$8,772	**8.9**
5	**Mountview Road School – Boiler Upgrade**	$110,281	7,731 Therms	$12,370	**8.9**
6	**Memorial Junior School – Boiler Upgrade**	$220,562	14,900 Therms	$23,480	**9.4**
7	**Mountview Road School – Interior & Exterior Lighting**	$87,466	49,587 kWh	$9,077	**9.6**
8	**Memorial Junior School – Air Source Heat Pumps**	$84,905	46,920 kWh	$8,070	**10.5**
9	**Memorial Junior School – Interior & Exterior Lighting**	$206,108	107,374 kWh	$19,348	**10.7**

1. Engineers Probable Construction Cost takes into account any applicable rebates.
2. Annual Fiscal Savings takes into account additional O&M cost or savings associated with the measure.
3. Overall Ranking is based on the simple payback period.

Table ES-3: Recommended ECRM's			
Total Engineer's Opinion of Probable Construction Cost	**Projected Annual Energy Savings (kWh or therms)**	**Annual Fiscal Savings**	**Simple Payback Period (years)**
$1,230,649	363,024 kWh 43,677 therms	$134,312	**9.2**

Renewable Energy Technologies

Solar Energy

Section 4 of the report provides for an economic evaluation of a solar energy system recommended to be installed at several of the Public School District's facilities. The evaluation covered the economic feasibility of the Township installing a solar energy system under a typical construction contract and to assume full responsibility of the operation of such a system.

Based on a simple payback model, summarized in Table ES-4, it would benefit the Township to further investigate the installation of a solar energy system at the four (4) school buildings. This is primarily based on the initial upfront capital investment

required for a solar energy system installation and the 11 to 12 year payback periods. This payback period may justify installing the solar energy system. Other options such as Power Purchase Agreements are potentially available as well to help finance the project. Solar technology is constantly changing and will most likely continue to lower in price.

Two major factors influencing the project financial evaluation is the variance of the prevailing energy market conditions and Solar Renewable Energy Credit (SREC) rates, with the largest impact to the payback model being the SREC credit pricing. For the payback model, conservative estimates of the SREC's market value over a 15 year period were assumed, as discussed in Section 4.

Table ES-4 includes a simple payback analysis for the installation of a solar energy system at the four (4) school buildings.

Table ES-4: Simple Payback Analysis for Solar Energy Systems

Estimated Budgetary Project Cost	$17,262,500
1st Year Production	1,826,144 kWh
Annual Electric Savings	$318,172
Annual Estimated SREC Revenue	$1,151,269
Project Simple Payback	**11.8**

Section 1
Introduction

1.1 General

As part of an initiative to reduce energy cost and consumption, Hanover Township Public Schools has secured the services of Camp Dresser and McKee (CDM) to perform an energy audit at four (4) school buildings in an effort to develop comprehensive energy conservation initiatives.

The performance of an Energy Audit requires a coordinated phased approach to identify, evaluate and recommend energy conservation and retrofit measures (ECRM). The various phases conducted under this Energy Audit included the following:

- Gather preliminary data on all facilities;
- Facility inspection;
- Identify and evaluate potential ECRMs and evaluate renewable/distributed energy measures;
- Develop the energy audit report.

Figure 1-1 is a schematic representation of the phases utilized by CDM to prepare the Energy Audit Report.

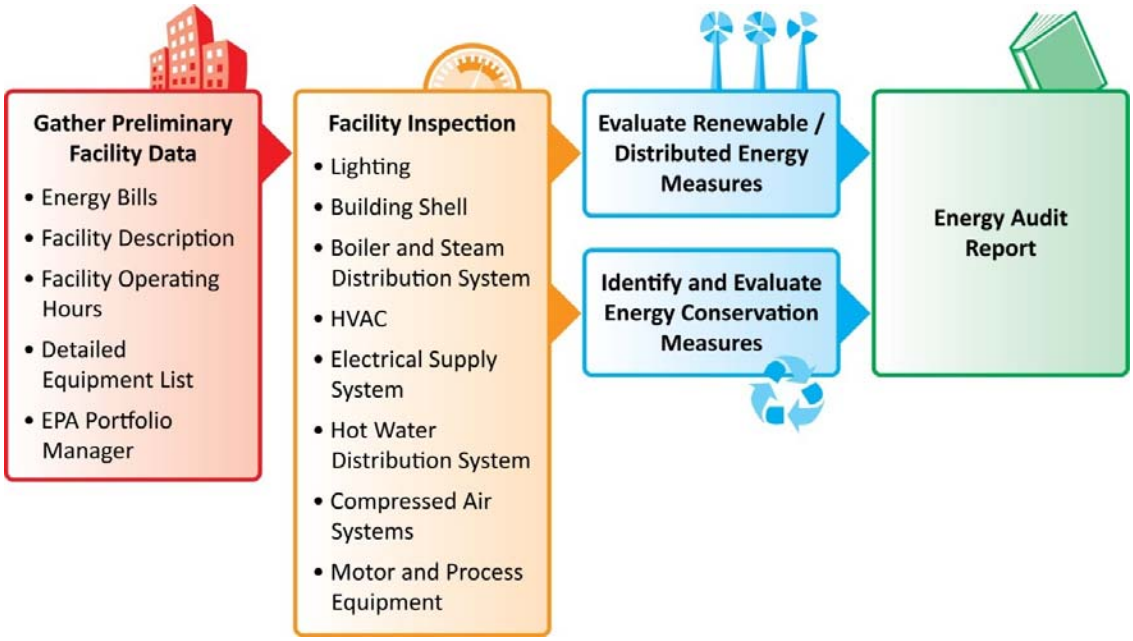


Figure 1-1: Energy Audit Phases

1.2 Background

The buildings that were included in the energy audit for the Hanover Township Public Schools were the Memorial Junior Middle School, Bee Meadow Elementary School, Salem Drive Elementary School and Mountview Elementary School.

The Memorial Junior Middle School is a 113,950 ft² building that was originally built in 1953, with two additions constructed in the mid-1960's and again in the 1970's to provide additional classroom space. The middle school is utilized for grades 6 through 8 and consists of office areas, class rooms, gym, auditorium space and a nurse's office. The building also has office space for the Board of Education staff. The school is occupied by 500 students and 60 faculty and staff members. The middle school is occupied from 7:30 am to 9 pm during the week and is partially occupied on weekends for athletic events.

The Bee Meadow Elementary School is a 65,467 ft² building that was originally built in 1974. The elementary school is utilized for grades K through 5 and consists of office areas, class rooms, gym, auditorium space and a nurse's office. The school is occupied by 300 students and 60 faculty and staff members. The elementary school is occupied from 7:30 am to 9 pm during the week.

The Salem Drive Elementary School is a 45,728 ft² building that was originally built in 1956. The elementary school is utilized for grades K through 5 and consists of office areas, class rooms, gym, auditorium space and a nurse's office. The school is occupied by 300 students and 60 faculty and staff members. The elementary school is occupied from 7:30 am to 9 pm during the week.

The Mountview Drive Elementary School is a 47,587 ft² building that was originally built in 1958. The elementary school is utilized for grades K through 5 and consists of office areas, class rooms, gym, auditorium space and a nurse's office. The school is occupied by 300 students and 60 faculty and staff members. The elementary school is occupied from 7:30 am to 9 pm during the week.

1.3 Purpose and Scope

The objective of the energy audit is to identify energy conservation and retrofit measures to reduce energy usage and to develop an economic basis to financially validate the planning and implementation of identified energy conservation and retrofit measures.

Significant energy savings may be available with retrofits to the buildings' envelopes, heating and cooling systems and lighting systems. It should be noted that the magnitude of energy savings available is not only dependent on the type of heating, lighting or insulation systems in use, but also on the age and condition of the equipment and the capital available to implement major changes. Due to the rising cost of power and the desire to minimize dependence on foreign oil supplies, energy consumption is taking a higher priority across the nation and feasible alternatives for

reducing energy consumption and operating costs must be evaluated on a case-by-case basis.

The purpose of this energy audit is to identify the various critical building comfort systems that are major consumers of electrical energy and are clear candidates for energy savings measures. In addition, potential energy producing systems such as combined heat and power co-generation, solar electric, ground source heat pumps, and wind energy systems were also evaluated. A discussion on these technologies is included in Section 4 Energy Conservation and Retrofit Measures (ECRM).

In addition to identifying ECRMs and the potential for on-site energy generation, an alternative third party supplier was contacted in an effort to identify further cost savings available for the Public Schools, by switching service providers. This is discussed further in Section 5.

Section 2
Facility Description

2.1 Memorial Junior School

2.1.1 Description of Building Envelope

The energy audit included an evaluation of the building's envelope (exterior shell) to determine the components' effective R-values to be utilized in the building model and to locate and fix any thermal weaknesses that may be present. The components of a building envelope include the exterior walls, foundation and roof. The construction and material, age and general condition of these components, including exterior windows and doors, impact the building's energy use.

The Memorial Junior Middle School is brick construction with concrete masonry CMU foundation blocks and sheetrock interior walls. The existing roofing system throughout the majority of the building consists of insulation and a ballasted roofing system over flat roof decks. The roofing system on the original corridor of the school consists of asphalt shingles over a pitched roof deck with a parapet. There was some pooling observed, but in general the flashing appeared to be in good condition, no blisters were observed and there was no interior evidence of leakage.

Window AC Units

The windows throughout the building are tinted double paned windows. The exterior doors are aluminum framed glass at the main building entrances and aluminum elsewhere. There were a few window air conditioning units in place at the time of the audit. It is recommended that the air conditioning sleeves be checked for a tight seal and as the units are left in place through the winter that AC covers be purchased and installed. An outdoor AC cover covers the top and sides of the unit to stop drafts. Window and through-wall AC covers are UV resistant, water repellent PVC vinyl with elasticized corners and straps for a tight fit. Outdoor or indoor AC covers can also be customized. A standard outdoor AC cover can cost around $15. The impact on the overall building heating load will be minimal; however, there will be a direct impact on the occupants comfort.

Example of an Outdoor AC Cover

Overall it was determined that the building envelope is in good condition and is currently providing a high level of insulation. As such, any modifications to the insulation system would not prove to be cost effective, from an energy savings stand-point.

2.1.2 Description of Building HVAC

Heating in the Memorial Junior School is primarily provided by a hot water system. Three Smith cast iron, gas-fired, hot water boilers, each with an I=B=R output capacity of 2,867 MBH (1 MBH = 1,000 BTU/Hr), generate hot water which is then distributed to unit ventilators and fin tube radiators in individual classrooms. Additionally, packaged air conditioning rooftop units with electric resistance heaters provide heat to administration areas, faculty rooms, and the informational materials center.

Cooling is provided to rooms served by rooftop packaged air conditioning units. Additionally, window air conditioning units were noted in the two health rooms.

2.1.3 Description of Building Lighting

The Memorial Junior School existing lighting system consists of 1X2 (1 and 2 lamp), 2X2 (2 lamp), 1X4 (1, 2 and 3 lamp), 2X4 (2, 3, and 4 lamp) T8 linear fluorescent fixtures with electronic ballasts, compact fluorescent fixtures, incandescent fixtures, and Metal Halide (150W and 400W) fixtures. Existing exterior lighting consists of High Pressure Sodium wall packs and canopy fixtures, incandescent floodlights, and High Pressure Sodium parking lot fixtures. Refer to Section 4 for a more detailed description. The School has already converted the entire interior building lighting system to energy efficient T8 lamps, with electronic ballasts.

2.2 Bee Meadow Elementary School

2.2.1 Description of Building Envelope

The Bee Meadow Elementary School is brick construction with concrete masonry CMU foundation blocks and sheetrock interior walls. The existing roofing system throughout the building consists of insulation and a ballasted roofing system over flat roof decks. The roofing system was in good condition, with minimal pooling and no interior evidence of leakage.

The windows throughout the building are tinted double paned windows. The exterior doors are aluminum framed glass at the main building entrances and aluminum elsewhere. It was determined that the building envelope is in good condition and is currently providing a high level of insulation. As such, any modifications to the insulation system would not prove to be cost effective, from an energy savings stand-point.

2.2.2 Description of Building HVAC

The Bee Meadow School is heated primarily by a hot water system. Two Smith cast iron, gas-fired, hot water boilers, each with an I=B=R output capacity of 4,025 MBH, generate hot water which is then distributed to unit ventilators and fin tube radiators in individual classrooms. Additionally, several packaged air conditioning rooftop units, with electric resistance heaters provide heat to areas such as the cafeteria and library.

Cooling is provided to the library, cafeteria, and several classrooms and administration areas through packaged rooftop air conditioners or air cooled condensing units interacting with the in-room unit ventilators. All equipment was found to be located on the roof.

2.2.3 Description of Building Lighting

The Bee Meadow School existing lighting system consists of 1X2 (2 lamp) standard efficiency T12 linear fluorescent fixture with magnetic ballasts, 1X4 (1 and 2 lamp), 2X2 (3 and 4 Lamp), 2X4 (2 and 4 lamp) T8 linear fluorescent fixtures with electronic ballasts, compact fluorescent fixtures, incandescent fixtures, and Metal Halide (400W) fixtures. Existing exterior lighting consists of High Pressure Sodium wall packs, canopy, and parking lot fixtures. Refer to Section 4 for a more detailed description.

2.3 Salem Drive Elementary School

2.3.1 Description of Building Envelope

The Salem Drive Elementary School is brick construction with concrete masonry CMU foundation blocks and sheetrock interior walls. The existing roofing system consists of insulation and a foam polyurethane roofing system at the original portion of the building and ballasted roofing system over the 2001 area of the building over flat metal roof decks. The roofing system at the library is metal seam over pitches roof decks. The roofing system was in good condition, with minimal pooling and no interior evidence of leakage.

The windows throughout the building are tinted double paned windows. The exterior doors are aluminum framed glass at the main building entrances and aluminum elsewhere. It was determined that the building envelope is in good condition and is currently providing a high level of insulation. As such, any modifications to the insulation system would not prove to be cost effective, from an energy savings stand-point.

2.3.2 Description of Building HVAC

The Salem Drive Elementary School is heated primarily by a hot water system. Two Smith cast iron, gas-fired, hot water boilers, each with an I=B=R output capacity of 2,172 MBH, generate hot water which is then distributed to unit ventilators and fin tube radiators in individual classrooms. Additionally, packaged air conditioning rooftop units, with gas-fired furnaces serve to heat the cafeteria.

Cooling is provided to the cafeteria and library through packaged rooftop air conditioners.

2.3.3 Description of Building Lighting

The Salem Elementary School existing lighting system consists of 1X4 (1 and 2 lamp), 2X2 (2, 3 and 4 Lamp), 2X4 (2 and 4 lamp) T8 linear fluorescent fixtures with electronic ballasts, compact fluorescent fixtures, incandescent fixtures, and Metal Halide (400W) fixtures. Existing exterior lighting consists of High Pressure Sodium wall packs and canopy fixtures. Refer to Section 4 for a more detailed description.

2.4 Mountview Road Elementary School

2.4.1 Description of Building Envelope

The Mountview Road Elementary School is brick construction with concrete masonry CMU foundation blocks and sheetrock interior walls. The existing roofing system throughout the building consists of insulation a ballasted roofing system over flat roof decks. Although there was pooling observed, the roofing system appeared to be in good condition, with continuous flashing and no interior evidence of leakage.

The windows throughout the building are tinted double paned windows. The exterior doors are aluminum framed glass at the main building entrances and aluminum elsewhere. It was determined that the building envelope is in good condition and is currently providing a high level of insulation. As such, any modifications to the insulation system would not prove to be cost effective, from an energy savings stand-point.

2.4.2 Description of Building HVAC

The Mountview Road Elementary School is heated primarily by a hot water system. Two Smith cast iron, gas-fired, hot water boilers, each with an I=B=R output capacity of 2,403 MBH, generate hot water which is then distributed to unit ventilators and fin tube radiators in individual classrooms. Additionally, packaged air conditioning rooftop units, with gas-fired furnaces serve to heat the cafeteria and media center.

Cooling is provided to the cafeteria and media center through packaged rooftop air conditioners.

2.4.3 Description of Building Lighting

The Mountview Elementary School existing lighting system consists of 1X2 (1 lamp), 1X4 (2 lamp) standard efficiency T12 linear fluorescent fixture with magnetic ballasts, 1X4 (1 and 2 lamp), 2X2 (2 lamp), 2X4 (2, 3 and 4 lamp) T8 linear fluorescent fixtures with electronic ballasts, compact fluorescent fixtures, incandescent fixtures, and Metal Halide (400W) fixtures. Existing exterior lighting consists of High Pressure Sodium wall packs and canopy fixtures, and compact fluorescent fixtures. Refer to Section 4 for a more detailed description.

2.5 Miscellaneous Equipment

In general, the classrooms of the Hanover Township Public Schools contain computers, printers, and a TV or overhead projector. In addition, the schools have computer classrooms and libraries with 20 to 30 computers each.

It is recommended that consideration be given to implementing the standardized use of Smart Strips. Computer peripherals, such as monitors, printers or scanners, continue to use energy even after they are shut off, which adds up over time. The Smart Strip power strips offer surge protection and the ability to monitor the current on a single 'control' outlet. When the computer that is plugged into that single outlet is shut down the Smart Strip shuts off all of the other peripherals on the power strip. This is discussed further in Section 4.4.

Memorial Junior M.S. Classroom

The schools also have office areas and a nurse's office that contain copiers, microwaves, refrigerators, vending machines, soda machines and coffee makers.

The schools' kitchens contain a number of appliances including convection ovens, refrigerators, electric warming tables and cabinets. Convection ovens are recommended for energy savings, as convection ovens create a uniform temperature with internal fans to circulate the hot air. In general, because the heated air transfers more efficiently to the cooking container or food surface, it takes less time and energy to cook. Two traditional radiant ovens were noted in the Bee Meadow Elementary School.

Bee Meadow E.S. Kitchen

It is recommended that the Township implement the standardized use of Energy Star appliances, as the need arises. Energy Star refrigerators and freezers, fo energy than models built in 2001. Energy Star appliances will not only reduce the utility bills, but will also outperform standard appliances, due to the improved design and advanced technologies. It was noted that the Board of Education office already has an Energy Star copier.

Section 3
Baseline Energy Use

3.1 Utility Data Analysis

The first step in the energy audit process is the compilation and quantification of the facility's current and historical energy usage and associated utility costs. It is important to establish the existing patterns of electric and gas usage in order to be able to identify areas in which energy consumption can be reduced.

For this study, the monthly gas and electric bills per facility were analyzed and unit costs of energy were obtained. The unit cost of energy, as determined from the information provided by the Schools, was utilized in determining the feasibility of switching from one energy source to another or reducing the demand on that particular source of energy to create annual cost savings for the Hanover Township Public Schools.

3.1.1 Electric Charges

It is important to understand how the utility companies charge for the service. The majority of the energy consumed is electric, as a result of both indoor and outdoor lighting pumping systems, and mechanical equipment. Electricity is charged by three basic components: electrical consumption (kWh), electrical demand (kW) and power factor (kVAR) (reactive power). The cost for electrical consumption is similar to the cost for fuel oil, the monthly consumption appears on the utility bill as kWh consumed per month with a cost figure associated with it. The service connections are either billed on a flat rate or time of day rates per kWh.

Electrical demand can be as much as 50 percent or more of the electric bill. The maximum demand (kW value) during the billing period is multiplied by the demand cost factor and the result is added to the electric bill. It is often possible to decrease the electric bill by 15 – 25 percent by reducing the demand, while still using the same amount of energy.

The power factor (reactive power) is the power required to energize electric and magnetic fields that result in the production of real power. Power factor is important because transmission and distribution systems must be designed and built to manage the need for real power as well as the reactive power component (the total power). If the power factor is low, then the total power required can be greater than 50 percent or more than the real power alone. The power factor charge is a penalty for having a low power factor. This charge is not applied to the use at the public schools.

The other parts of the electric bill are the supply charges, delivery charges, system benefits, transmission revenue adjustments, state and municipality tariff surcharges and sales taxes, which cannot be avoided.

JCP&L is the current supplier and distributor of electric energy for the four Hanover Public Schools.

3.1.2 Natural Gas Charges

PSE&G is the current distributor of natural gas for the Schools. The Township is currently being charged a service charge, a distribution charge and a societal benefits charge from PSE&G. There are no supply charges from PSE&G and upon compiling the natural gas use and charges per school building an average cost per therm of $0.30 was obtained. Typically the aggregate cost for natural gas ranges between $1.20 and $1.60/therm.

As such, it has been assumed that a third party supplier, such as Pepco, is utilized and an aggregate cost per therm of $1.60/therm has been carried for the payback analyses presented in Section 4.

3.2 Facility Results

3.2.1 Memorial Junior Middle School

Electric power for the Memorial Junior Middle School is fed from one General Primary Service three phase line from JCP&L. Figure 3.2-1 illustrates the energy consumption from June 2008 through November 2009. For example, for the month of October, the bar graph represents average energy consumption for October 2008 and October 2009. This same graphical representation approach has been carried through for all months and is typical for all graphs presented in this Section. Electrical usage has been averaged by month for the above referenced time period to portray a more encompassing monthly usage trend.

From this graph, it can be determined that the average annual baseline electrical consumption for Memorial Junior Middle School is approximately 62,000 kWh / month.

Figure 3.2-2 illustrates the average monthly demand load for the school from June 2008 through November 2009.

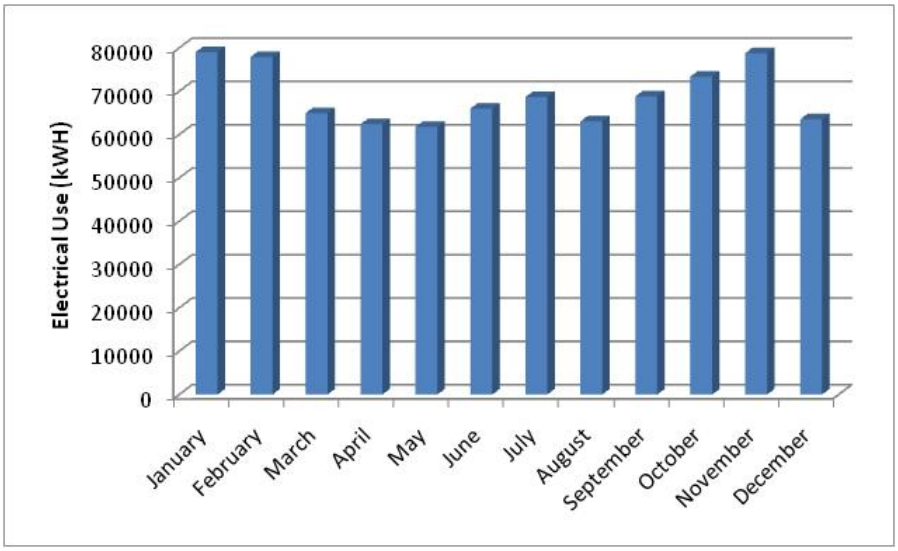


Figure 3.2-1: Memorial Junior Middle School Electrical Usage

The charges listed below can be found on the electrical bill given by JCP&L. The School is billed as a flat rate service, and the tariff rates from JCP&L are as follows:

	Acct #: 100005638844
Customer Charge:	$11.65/month
Basic Generation Service:	$0.108987/kWh
Non-Utility Generation Service:	$0.016960/kWh
Delivery Service Charges:	$0.008674/kWh
	$6.233101/kW
Societal Benefits Charge:	$0.003222/kWh
System Control Charge:	$0.000079/kWh
RGGI Recover Charge:	$0.000064/kWh (72% of total kWh)

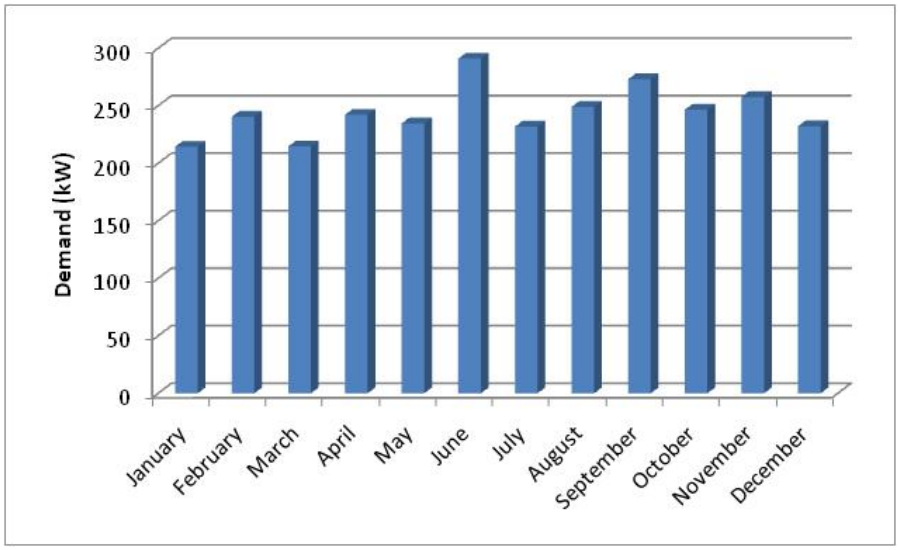


Figure 3.2-2: Memorial Junior Middle School Maximum Monthly Demand

Refer to Table 3.3-1, in Section 3.3 for the average electrical aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

The gas usage for the entire Memorial Junior Middle School is metered at one location. The monthly total gas consumption from June 2008 through October 2009 at the School is illustrated in Figure 3.2-3.

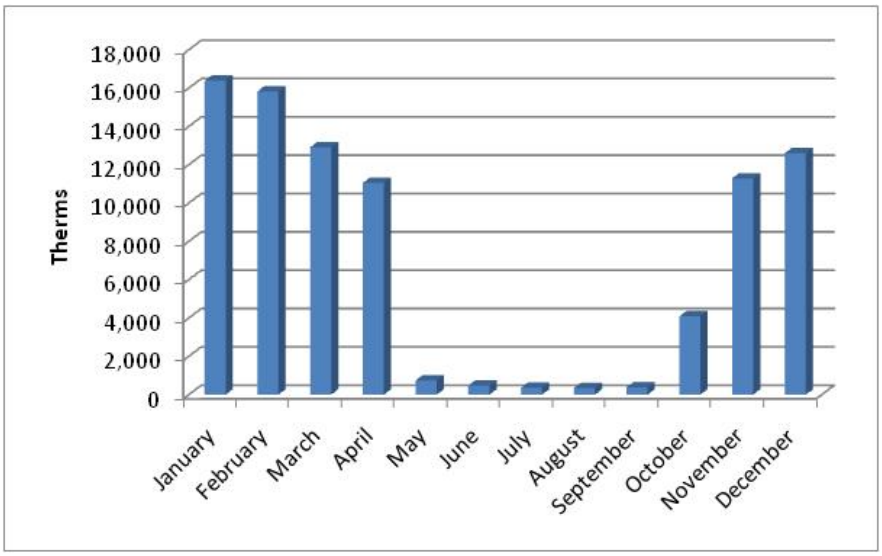


Figure 3.2-3: Memorial Junior Middle School Total Gas Usage

For more on Memorial Junior Middle School's gas usage, refer to Section 4.3.

3.2.2 Bee Meadow Elementary School

Electric power for Bee Meadow Elementary School is fed from one General Primary Service three phase line from JCP&L. Figure 3.2-4 illustrates the average monthly total energy consumption from June 2008 through November 2009. From this graph, it can be determined that the average annual baseline electrical consumption for the elementary school is approximately 30,000 kWh / month.

Figure 3.2-5 illustrates the monthly demand load for Bee Meadow from June 2008 through November 2009.

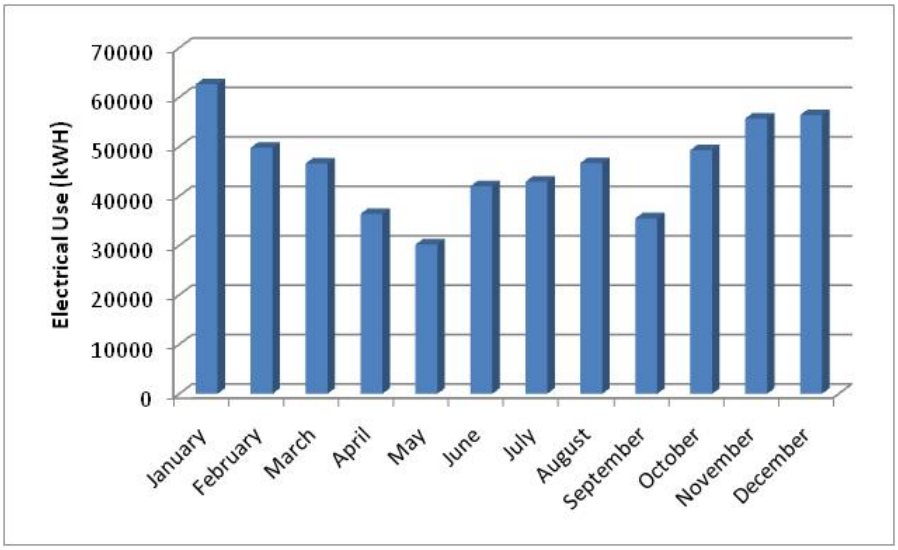


Figure 3.2-4: Bee Meadow Elementary School Electrical Usage

The charges listed below can be found on the electrical bill given by JCP&L. Bee Meadow School is billed as a flat rate service, and the tariff rates from JCP&L are as follows:

	Acct #: 100005335300
Customer Charge:	$11.65/month
Basic Generation Service:	$0.1192559/kWh
Non-Utility Generation Service:	$0.016960/kWh
Delivery Service Charges:	$0.008951/kWh
	$6.123662/kW
Societal Benefits Charge:	$0.003161/kWh
System Control Charge:	$0.000079/kWh

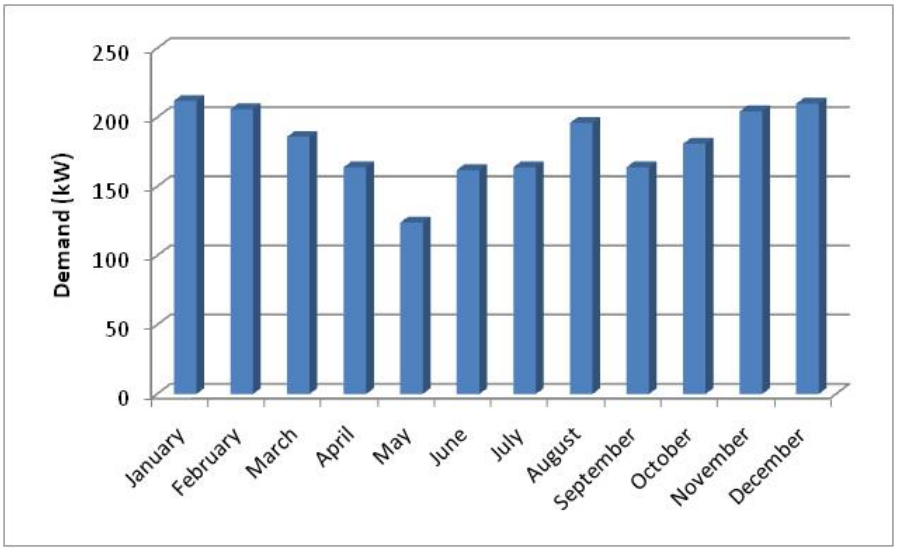


Figure 3.2-5: Bee Meadow School Maximum Monthly Demand

Refer to Table 3.3-1, in Section 3.3, for average electrical aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

The gas usage for the entire Bee Meadow School is metered at one location. The monthly total gas consumption from June 2008 through November 2009 at the School is illustrated in Figure 3.2-6.

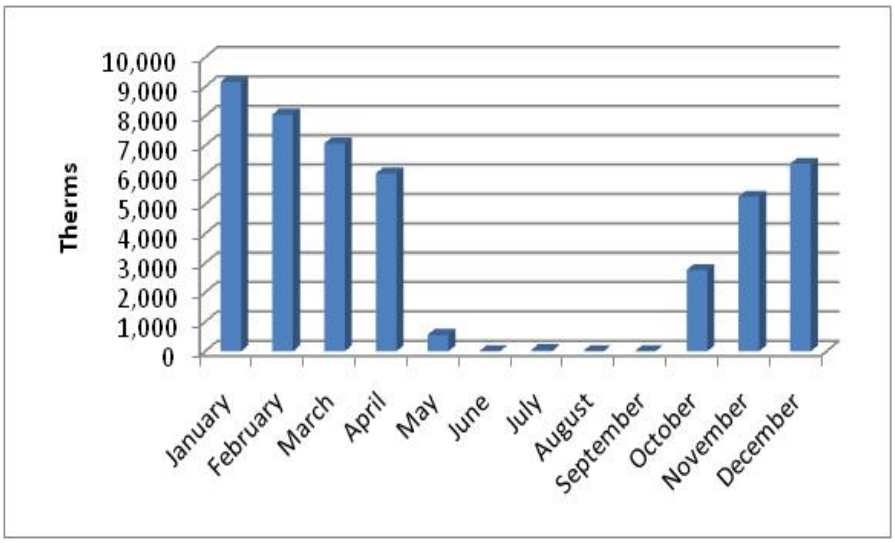


Figure 3.2-6: Bee Meadow School Total Gas Usage

For more on Bee Meadow School's gas usage, refer to Section 4.3.

3.2.3 Salem Drive Elementary School

Electric power for Salem Drive School is fed from one General Primary Service three phase line from JCP&L. Figure 3.2-7 illustrates the average monthly total energy consumption from June 2008 through November 2009. From this graph, it can be determined that the average annual baseline electrical consumption for Salem Drive School is approximately 13,500 kWh / month.

Figure 3.2-8 illustrates the monthly demand load for Salem Drive School from June 2008 through November 2009.

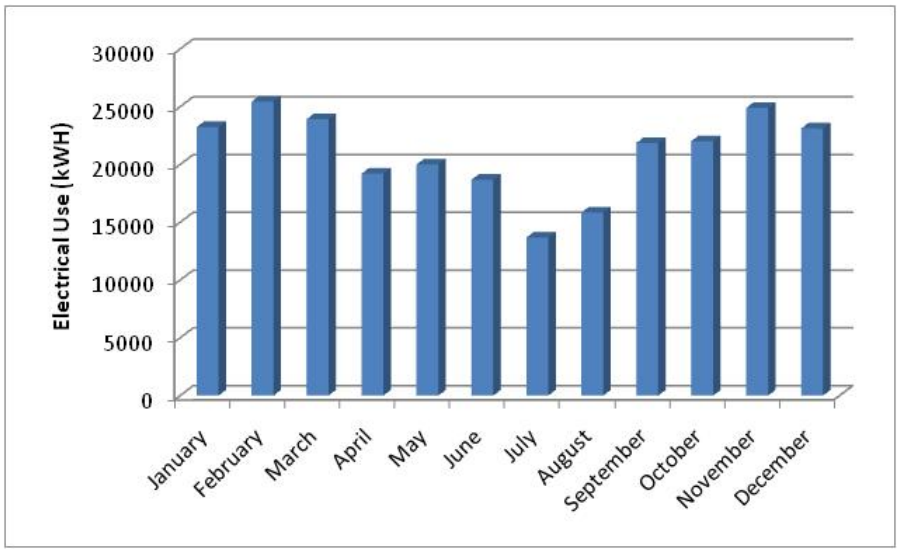


Figure 3.2-7: Salem Drive Elementary School Electrical Usage

The charges listed below can be found on the electrical bill given by JCP&L. Salem Drive School is billed as a flat rate service, and the tariff rates from JCP&L are as follows:

	Acct #: 100005971146
Customer Charge:	$11.65/month
Basic Generation Service:	$0.108987/kWh
Non-Utility Generation Service:	$0.016960/kWh
Delivery Service Charges:	$0.010363/kWh
	$5.797401/kW
Societal Benefits Charge:	$0.003222/kWh
System Control Charge:	$0.000079/kWh
RGGI Recovery Charge:	$0.000064/kWh (72% of total kWh)

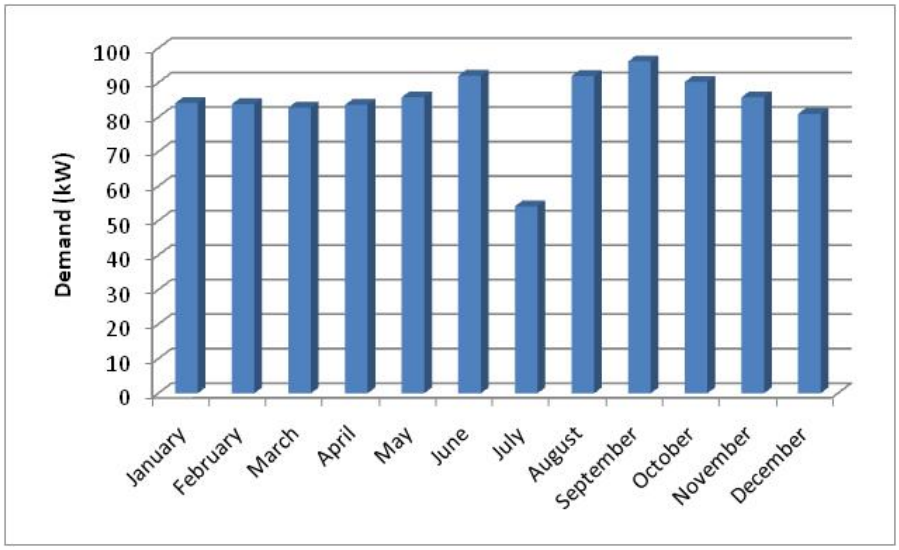


Figure 3.2-8: Salem Drive School
Maximum Monthly Demand

Refer to Table 3.3-1, in Section 3.3, for average electrical aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

The gas usage for the entire Salem Drive School is metered at one location. The monthly total gas consumption from June 2008 through October 2009 at the School is illustrated in Figure 3.2.9.

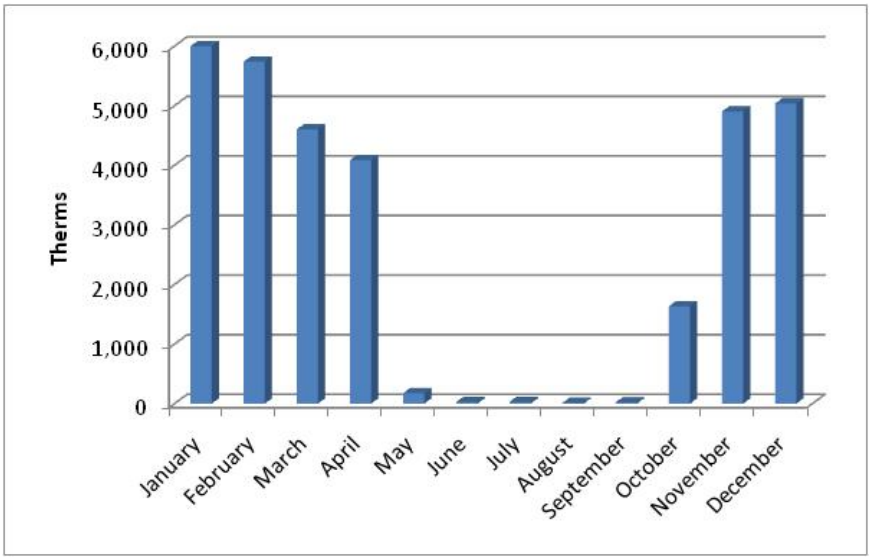


Figure 3.2-9: Salem Drive School Total Gas Usage

For more on Salem Drive School's gas usage, refer to Section 4.3.

3.2.4 Mountview Road Elementary School

Electric power for Mountview Road Elementary School is fed from one General Primary Service three phase line from JCP&L. Figure 3.2-10 illustrates the average monthly total energy consumption from June 2008 through November 2009. From this graph, it can be determined that the average annual baseline electrical consumption for Mountview Road School is approximately 18,600 kWh / month.

Figure 3.2-11 illustrates the monthly demand load for Mountview Road School from June 2008 through November 2009.

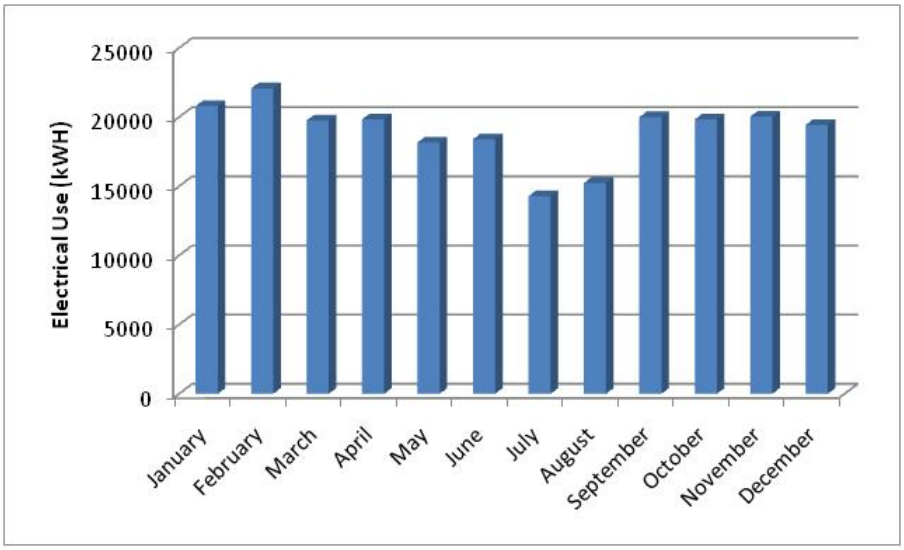


Figure 3.2-10: Mountview Road School Electrical Usage

The charges listed below can be found on the electrical bill given by JCP&L. Mountview Road School is billed as a flat rate service, and the tariff rates from JCP&L are as follows:

	Acct #: 100005201551
Customer Charge:	$11.65/month
Basic Generation Service:	$0.108987/kWh
Non-Utility Generation Service:	$0.016960/kWh
Delivery Service Charges:	$0.010593/kWh
	$5.669307/kW
Societal Benefits Charge:	$0.003161/kWh
System Control Charge:	$0.000079/kWh

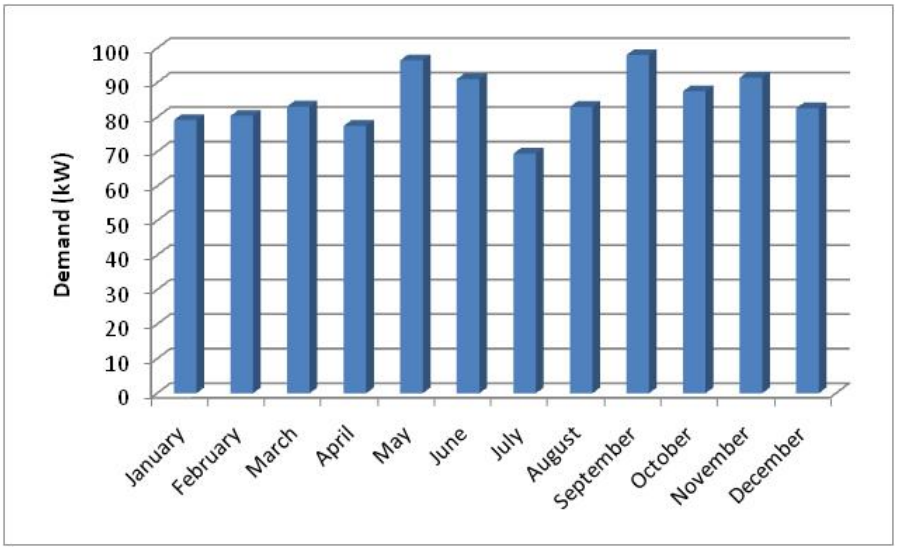


Figure 3.2-11: Mountview Drive School
Maximum Monthly Demand

Refer to Table 3.3-1, in Section 3.3, for average electrical aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

The gas usage for the entire Mountview Road School is metered at one location. The monthly total gas consumption from June 2008 through November 2009 at the School is illustrated in Figure 3.2-12.

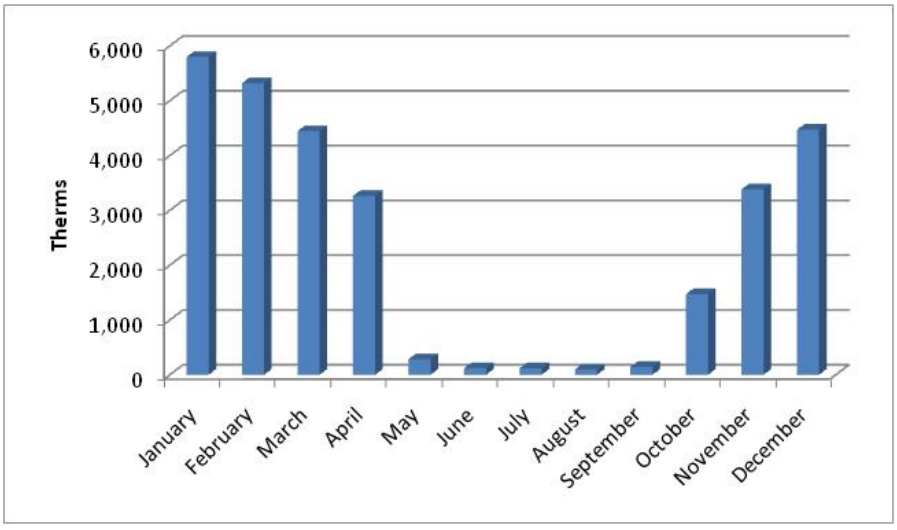


Figure 3.2-12: Mountview Road School Total Gas Usage

For more on Mountview Road School's gas usage, refer to Section 4.3.

3.3 Aggregate Costs

For the purposes of computing energy savings for all identified energy conservation and retrofit measures, aggregate unit costs for electrical energy and fuel, in terms of cost/kWh and cost/therm, were utilized in the simple payback analyses discussed in subsequent sections. The aggregate unit cost accounts for all distribution and supply charges for each location. As discussed in Section 3.1.2 the supply charges for the natural gas service were not provided, as such an aggregate cost of $1.60/therm was assumed as a conservative approach and utilized in the economic analyses presented in Section 4.

Table 3.3-1 and Table 3.3-2 summarize the aggregate costs for electrical energy consumption and therms utilized, respectively. Electrical aggregate unit cost was computed based on utility data from 2008 to 2009.

Table 3.3-1: Electrical Aggregate Unit Costs

Service Location	Aggregate $ / kW-hr
Memorial Junior School	$0.1720
Bee Meadow School	$0.1750
Salem Drive School	$0.1760
Mountview Road School	$0.1790

Table 3.3-2: Natural Gas Aggregate Unit Costs

Service Location	Aggregate $ / therm
All Schools	$1.60

3.4 Portfolio Manager

3.4.1 Portfolio Manager Overview

Portfolio Manager is an interactive energy management tool that allows the Hanover Township to track and assess energy consumption at the Schools in a secure online environment. Portfolio Manager can help the Hanover Township set investment priorities, verify efficiency improvements, and receive EPA recognition for superior energy performance.

3.4.2 Energy Performance Rating

For many facilities, you can rate their energy performance on a scale of 1–100 relative to similar facilities nationwide. Your facility is *not* compared to the other facilities

entered into Portfolio Manager to determine your ENERGY STAR rating. Instead, statistically representative models are used to compare your facility against similar facilities from a national survey conducted by the Department of Energy's Energy Information Administration. This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), is conducted every four years, and gathers data on building characteristics and energy use from thousands of facilities across the United States. Your facility's peer group of comparison is those facilities in the CBECS survey that have similar facility and operating characteristics. A rating of 50 indicates that the facility, from an energy consumption standpoint, performs better than 50% of all similar facilities nationwide, while a rating of 75 indicates that the facility performs better than 75% of all similar facilities nationwide.

3.4.3 Portfolio Manager Account Information

A Portfolio Manager account has been established for Hanover Township, which includes a profile for each of the four (4) schools evaluated under this energy audit. Information entered into this Portfolio Manager Facility profile, including electrical energy consumption and natural gas consumption has been used to establish a performance baseline.

It is recommended that the information be updated to track the buildings' energy usage. At the time of the audit, the school buildings received the following ratings:

Memorial Junior Middle School: 20
Bee Meadow Elementary School: 35
Salem Drive Elementary School: 49
Mountview Road Elementary School: 68
Appendix B contains the Statements of Energy Performance for each building and a Portfolio Manager Reference sheet.

The following website link, username and password shall be used to access the Portfolio Manager account and building profiles that has been established for the Board:

https://www.energystar.gov/istar/pmpam/

USERNAME: HanoverTwpSchools

PASSWORD: EnergyStar

Section 4
Energy Conservation and Retrofit Measures (ECRM)

The following is a summary of how Annual Return on Investment (AROI), Internal Rate of Return (IRR), and Net Present Value (NPV) will be broken down in the cost analysis for all ECRMs recommended in this report.

Included in the simplified payback analysis summary table is the 'Annual Return on Investment' (AROI) values. This value is a performance measure used to evaluate the efficiency of an investment and is calculated using the following equation:

$$AROI = \frac{AECS + OCS}{NET\ ECM\ Cost} - \frac{1}{Lifetime}$$

Where OCS = Operating Cost Savings, and AECS = Annual Energy Cost Savings.

Also included in the table are net present values for each option. The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (DR) (assume bond rate of 3%). NPV is calculated using the following equation:

$$NPV = \sum_{n=0}^{N} \frac{C_n}{(1 + DR)^n}$$

Where C_n=Annual cash flow, and N = number of years.

The IRR expresses an annual rate that results in a break-even point for the investment. If the school district is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows the school district to compare ECRM's against each other to determine the most appealing choices.

$$IRR \rightarrow 0 = \sum_{n=0}^{N} \frac{C_n}{(1 + IRR)^n}$$

Where C_n=Annual cash flow, and N = number of years.

The lifetime energy savings represents the cumulative energy savings over the assumed life of the ECRM.

4.1 Building Lighting Systems

The goal of this section is to present any lighting energy conservation measures that may also be cost beneficial. It should be noted that replacing current bulbs with more energy-efficient equivalents will have a small effect on the building heating and cooling loads. The building cooling load will see a small decrease from an upgrade to more efficient bulbs and the heating load will see a small increase, as the more energy efficient bulbs give off less heat.

Two options are offered for most buildings. The first option will be for upgrading existing interior lighting, if applicable. The second option will be for upgrading existing exterior lighting, if applicable. A total cost for upgrading both options at the same time will be presented. Retrofitting of existing fluorescent fixtures includes upgrading both ballasts and lamps for the fixture. Refer to Appendix D for more information.

For Hanover Public Schools, it was noted that all four Schools in this report have energy efficient T8 fluorescent fixtures with electronic ballasts throughout the buildings. Only two Schools carry a few minor inefficient T12 fluorescent fixtures with magnetic ballasts which should be retrofitted or replaced. The existing energy efficient T8 fixtures should remain and no option has been proposed to retrofit or replace them with anything better. Retrofitting them significantly increases simple paybacks and therefore would not make any economical sense to do so due to the large number of fixtures present.

Additionally, it was noted that there were no interior occupancy sensors installed in any of the Schools. Installing occupancy sensors will typically increase energy savings; however, if the space is not occupied often in the first place, there will be little savings by installing occupancy sensors. However, many areas of the Schools could benefit from installation of occupancy sensors. Therefore, occupancy sensor installation has been recommended in this report. Refer to Appendix D for occupancy sensor locations and quantities.

Please note that the Engineer's Estimate of Probable Construction Costs presented herein are estimates based on historic data compiled from similar installations and engineering opinions. Additional engineering will be required for each measure identified in this report and final scope of work and budget cost estimates will need to be confirmed prior to the coordination of project financing or the issuance of a Request for Proposal.

4.1.1 Memorial Junior School

Most of the interior linear fluorescent fixtures at this School already have energy efficient T-8 lamps with electronic ballasts. However there are a number of existing inefficient incandescent fixtures which should be retrofitted. The existing gymnasium metal halide fixtures should be replaced with fluorescent high bays. CDM's survey also identified select locations where the installation of occupancy sensors would increase overall energy savings.

The exterior fixtures at this School have either HID fixtures or halogen incandescent fixtures. The current outdoor HID fixtures at the facility are somewhat efficient by today's standards, but produce a poor quality of light, and in seeking the highest of efficiency standards, it is recommended that the HID fixtures be replaced with LED fixtures for an increase in quality of light, light output, a decrease in energy consumption, and the ability to have instant on/instant off capabilities instead of waiting 5-10 minutes for the HID fixtures to light up. The halogen incandescent lamps should be replace with LEDs as well.

The annual energy savings for these options are as follows:

Interior Lighting: 15.1kW, 82,302.8 kWh and $14,156.07
Exterior Lighting: 6.3kW, 25,072 kWh and $4,312.38

In addition, the project will generate annual maintenance savings from avoided costs related to changing lamps and ballasts. The strategies included in this section focus on maximizing energy savings and maintaining or exceeding existing lighting levels, while also maintaining the existing look of each fixture; therefore, proposed lamp styles remain consistent with existing lamp styles. Please refer to Appendix D for a line-by-line proposed detailed lighting upgrades list.

The following table, Table 4.1-1, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Memorial Junior School.

4.1.2 Bee Meadow Elementary School

Most of the interior linear fluorescent fixtures at this School already have energy efficient T8 lamps with electronic ballasts. However there are a few existing inefficient T12 fluorescent fixtures, which should retrofitted with T8 bulbs and electronic ballasts. However there are a number of existing inefficient incandescent fixtures which should be retrofitted. The existing gymnasium metal halide fixtures should be replaced with fluorescent high bays. CDM's survey also identified select locations where the installation of occupancy sensors would increase overall energy savings.

The exterior fixtures at this School have HID fixtures. The current outdoor HID fixtures at the facility are somewhat efficient by today's standards, but produce a poor quality of light, and in seeking the highest of efficiency standards, it is recommended that the HID fixtures be replaced with LED fixtures for an increase in quality of light, light output, a decrease in energy consumption, and the ability to have instant on/instant off capabilities instead of waiting 5-10 minutes for the HID fixtures to light up.

Table 4.1-1
Memorial Junior School Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$104,460.97	$112,007.13	$216,468.09
New Jersey SmartStart Rebate	$10,360*	$0****	$10,360*
Total Cost	$94,100.97	$112,007.13	$206,108.09
Annual Energy Savings	$14,156.07	$4,312.38	$18,468.50
Annual Maintenance Cost Savings (AMCS)	$837.16	$42.82	$879.98
Simple Payback	**6.28 years**	**25.72 years**	**10.65 years**
Annual Return on Investment (AROI)	9.277%	-2.78%	2.72%
Lifetime Energy Savings (15 years)**	$263,287.53	$80,205.58	$343,494.04
Internal Rate of Return (IRR)	16.38%	-3.58%	7.32%
Net Present Value (NPV)	$124,247.04	-$48,581.89	$75.666.04

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs
***See Appendix J for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

The annual energy savings for these options are as follows:

Interior Lighting: 8.4kW, 83,250.2 kWh and $14,583.34
Exterior Lighting: 6.8kW, 27,104 kWh and $4,743.20

In addition, the project will generate annual maintenance savings from avoided costs related to changing lamps and ballasts. The strategies included in this section focus on maximizing energy savings and maintaining or exceeding existing lighting levels, while also maintaining the existing look of each fixture; therefore, proposed lamp styles remain consistent with existing lamp styles. Please refer to Appendix D for a line-by-line proposed detailed lighting upgrades list.

The following table, Table 4.1-2, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Bee Meadow Elementary School.

Table 4.1-2
Bee Meadow Elementary School Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$92,256.59	$80,958.56	$173,215.16
New Jersey SmartStart Rebate	$5,595*	$0****	$5,595*
Total Cost	$86,661.59	$80,958.56	$167,620.16
Annual Energy Savings	$14,583.34	$4,743.20	$19,326.5
Annual Maintenance Cost Savings (AMCS)	$143.54	$51.68	$195.22
Simple Payback	**5.88 years**	**16.88 years**	**8.59 years**
Annual Return on Investment (AROI)	10.33%	-0.74%	4.98%
Lifetime Energy Savings (15 years)**	$271,234.28	$88,218.37	$359,451.91
Internal Rate of Return (IRR)	17.69%	1.15%	10.69%
Net Present Value (NPV)	$127,807.54	-$11,130.21	$116,676.73

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs

***See Appendix J for ECRM Financial Analyses

****No incentives are available for the type of retrofit being recommended.

4.1.3 Salem Drive Elementary School

Most of the interior linear fluorescent fixtures at this School already have energy efficient T-8 lamps with electronic ballasts. However there are a number of existing inefficient incandescent fixtures which should be retrofitted. The existing gymnasium metal halide fixtures should be replaced with fluorescent high bays. CDM's survey also identified select locations where the installation of occupancy sensors would increase overall energy savings.

The exterior fixtures at this School have HID fixtures. The current outdoor HID fixtures at the facility are somewhat efficient by today's standards, but produce a poor quality of light, and in seeking the highest of efficiency standards, it is recommended that the HID fixtures be replaced with LED fixtures for an increase in quality of light, light output, a decrease in energy consumption, and the ability to have instant on/instant off capabilities instead of waiting 5-10 minutes for the HID fixtures to light up.

The annual energy savings for these options are as follows:

Interior Lighting: 3.1kW, 37,757.8 kWh and $6,645.37
Exterior Lighting: 2.8kW, 11,032 kWh and $1,941.63

In addition, the project will generate annual maintenance savings from avoided costs related to changing lamps and ballasts. The strategies included in this section focus on maximizing energy savings and maintaining or exceeding existing lighting levels, while also maintaining the existing look of each fixture; therefore, proposed lamp styles remain consistent with existing lamp styles. Please refer to Appendix D for a line-by-line proposed detailed lighting upgrades list.

The following table, Table 4.1-3, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Salem Drive Elementary School.

Table 4.1-3
Salem Drive Elementary School Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$46,441.31	$34,908.25	$81,349.56
New Jersey SmartStart Rebate	$3,345*	$0****	$3,345*
Total Cost	$43,096.31	$34,908.25	$78,004.56
Annual Energy Savings	$6,645.37	$1,941.63	$8,587.0
Annual Maintenance Cost Savings (AMCS)	$162.73	$22.37	$185.10
Simple Payback	**6.33 years**	**17.77 years**	**8.89 years**
Annual Return on Investment (AROI)	9.13%	-1.04%	4.58%
Lifetime Energy Savings (15 years)**	$123,596.66	$36,112.21	$158,964.92
Internal Rate of Return (IRR)	16.21%	0.54%	10.12%
Net Present Value (NPV)	$56,050.78	-$6,306.31	$49,744.47

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs

***See Appendix J for ECRM Financial Analyses

****No incentives are available for the type of retrofit being recommended.

4.1.4 Mountview Road Elementary School

Most of the interior linear fluorescent fixtures at this School already have energy efficient T8 lamps with electronic ballasts. However there are a few existing inefficient T12 fluorescent fixtures, which should retrofitted with T8 bulbs and electronic ballasts. There also are a number of existing inefficient incandescent fixtures which should be retrofitted with CFL's. The existing gymnasium metal halide fixtures should be replaced with fluorescent high bays. CDM's survey also identified select locations where the installation of occupancy sensors would increase overall energy savings.

The exterior fixtures at this School have HID fixtures. The current outdoor HID fixtures at the facility are somewhat efficient by today's standards, but produce a poor quality of light, and in seeking the highest of efficiency standards, it is recommended that the HID fixtures be replaced with LED fixtures for an increase in quality of light, light output, a decrease in energy consumption, and the ability to have instant on/instant off capabilities instead of waiting 5-10 minutes for the HID fixtures to light up.

The annual energy savings for these options are as follows:

Interior Lighting: 3.8kW, 37,927.1 kWh and $6,788.95
Exterior Lighting: 2.9kW, 11,660.0 kWh and $2,087.14

In addition, the project will generate annual maintenance savings from avoided costs related to changing lamps and ballasts. The strategies included in this section focus on maximizing energy savings and maintaining or exceeding existing lighting levels, while also maintaining the existing look of each fixture; therefore, proposed lamp styles remain consistent with existing lamp styles. Please refer to Appendix D for a line-by-line proposed detailed lighting upgrades list.

The following table, Table 4.1-4, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Mountview Road Elementary School.

Table 4.1-4
Mountview Road Elementary Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$38,679.53	$52,362.38	$91,041.91
New Jersey SmartStart Rebate	$3,575*	$0****	$3,575*
Total Cost	$35,104.53	$52,362.38	$87,466.91
Annual Energy Savings	$6,788.95	$2,087.14	$8,876.1
Annual Maintenance Cost Savings (AMCS)	$177.09	$24.25	$201.34
Simple Payback	**5.04 years**	**24.80 years**	**9.64 years**
Annual Return on Investment (AROI)	13.18%	-2.63%	3.71%
Lifetime Energy Savings (15 years)**	$126,267.10	$38,818.54	$165,085.82
Internal Rate of Return (IRR)	21.09%	-3.20%	8.84%
Net Present Value (NPV)	$66,342.65	-$21,613.98	$44,728.82

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs
***See Appendix J for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

4.2 HVAC Systems

The goal of this section is to present any heating and cooling energy reduction and cost saving measures that may also be cost beneficial. Where possible, measures will be presented with a life-cycle cost analysis. This analysis displays a payback period based on weighing the capital cost of the measure against predicted annual fiscal savings. To do this, the buildings have been modeled as accurately as possible to predict energy usage for space heating and cooling, as well as domestic hot water use.

Each building is modeled using software called eQuest, a Department of Energy-sponsored energy modeling program, to establish a baseline space heating and cooling energy usage. Climate data from Morris Plains, NJ was used for analyses.

From this, the model may be calibrated, using historical utility bills, to predict the impact of theoretical energy savings measures. Once annual energy savings from a particular measure have been predicted and the initial capital cost has been estimated,

payback periods may be approximated. Equipment cost estimate calculations are provided in Appendix H.

4.2.1 Memorial Junior School

A model of the Memorial Junior School was created in eQuest to predict heating and cooling loads for the building. To calibrate this model, CDM used electricity bills from June, 2008 through December, 2009, and natural gas bills from May, 2008 through October, 2009. Figure 4.2-1 below compares actual monthly electricity usages, with those predicted by the eQuest model. Historical monthly usages were averaged for each month observed over multiple years. For example, usage during the month of June was averaged for the three years, to yield an approximate average usage during the month of June.

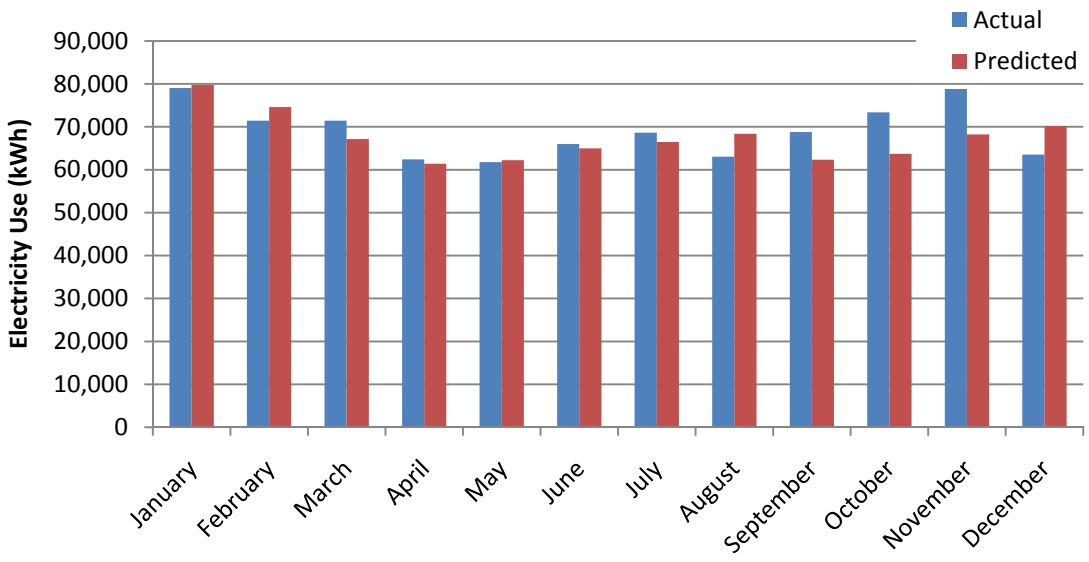


Figure 4.2-1: Memorial Junior School Electricity Usage

Once the eQuest model was calibrated, it could be used to predict approximate major usage categories, such as lighting, plug loads (miscellaneous), ventilation, and cooling. It should be noted that these are only estimated usages based on information gathered during CDM's field audit. Figure 4.2-2 presents this information to help the Board visualize where CDM anticipates the electricity is ultimately being used.

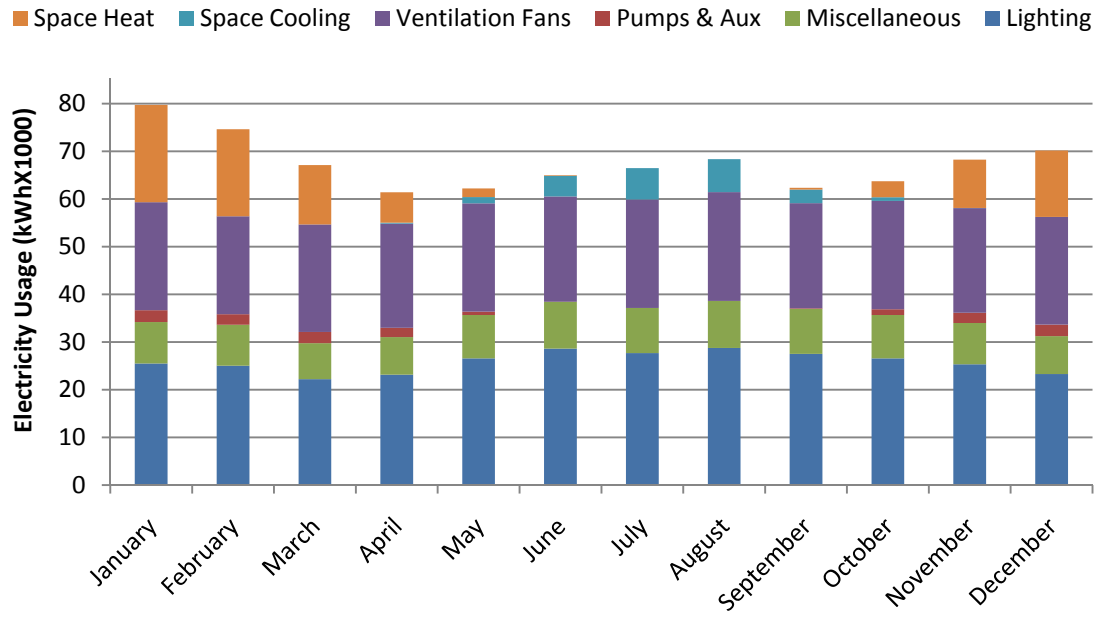


Figure 4.2-2: Memorial Junior School Electricity Usage Breakdown

Figure 4.2-3 below compares actual natural gas usage to model-predicted natural gas use.

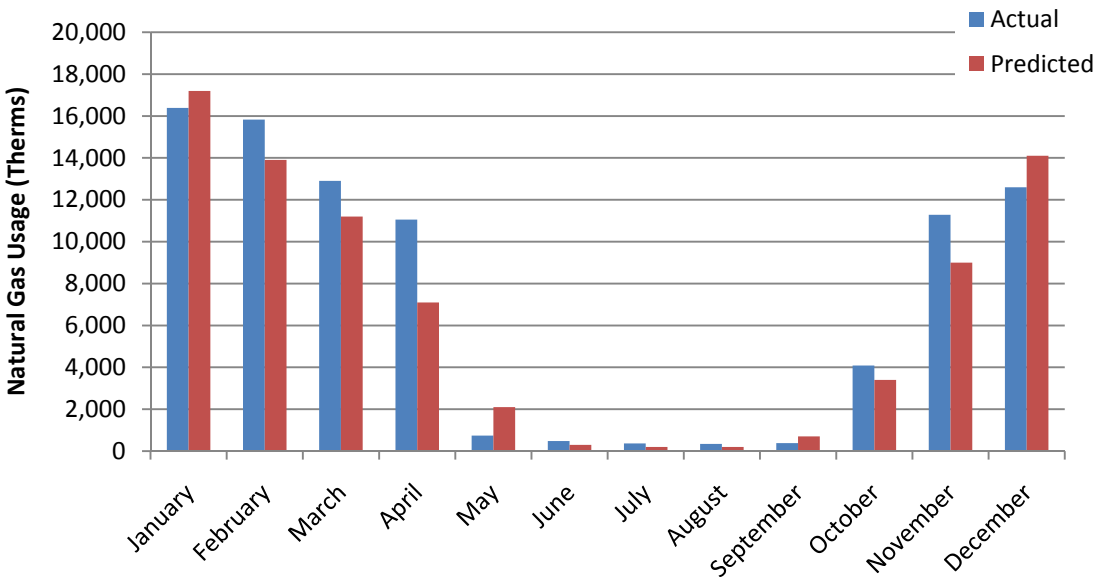


Figure 4.2-3: Memorial Junior School Natural Gas Usage

Currently, the heating system utilizes three (3) Smith cast iron boilers, each with an I=B=R hot water heating capacity of 2,867 MBH. CDM conservatively estimates these boilers to be 80% efficient.

CDM recommends replacing these boilers with high-efficiency, condensing boilers. Based on the building model, and accounting for a 25% safety factor, CDM has calculated a peak heating load of 5,650 MBH. This indicates that the existing boiler system likely consists of two primary boilers, with the third boiler acting as a standby. Four (4) 2,000 MBH condensing boilers should comfortably account for building peak heating requirements, while maintaining one as a standby unit.

Figure 4.2-4 compares current gas usage with predicted gas usage resulting from a switch to high-efficiency, condensing boilers. Condensing boilers are modeled with a full-load efficiency of ~90% and return water temperature of 100°F.

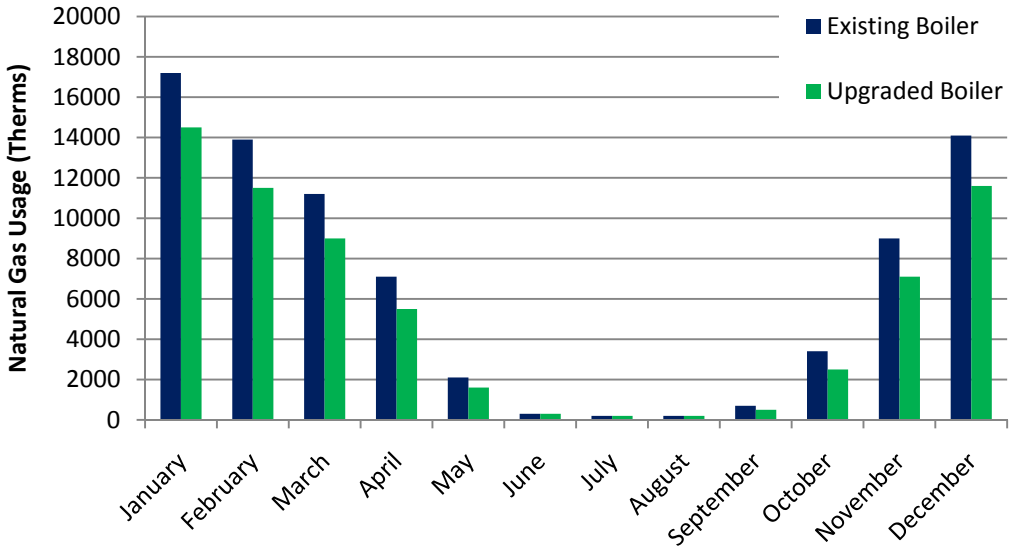


Figure 4.2-4: Memorial Junior School – Boiler Upgrade - Natural Gas Usage

Fiscal savings from such an upgrade are then identified in Table 4.2-1 below. Lifetime savings calculations for all ECRM's may be found in Appendix J. It's important to note that these are estimates based on building models, and further investigation is warranted before pursuing boiler replacements.

Due to the improved automation and control within modern condensing boilers, their operation and maintenance costs tend to be less than those of typical cast iron boilers. CDM estimates a cast iron boiler will typically cost around $3,500 per year for regular preventative maintenance, whereas a condensing boiler would cost around $2,000 per year. Therefore, replacing the two existing boilers with three condensing boilers should result in an operation and maintenance cost savings of $1,500 per year.

Table 4.2-1: Memorial Junior School Boiler Upgrade Payback	
Predicted Annual Savings (Therms)	14,900
Total Annual Savings	$23,480
Initial Capital Cost of Upgrade	$228,562
Incentives**	$8,000
Cost of Upgrade	$220,562
Simple Payback	**9.4**
Lifetime Energy Savings (24 years)*	$714,305
Annual Maintenance Cost Savings (AMCS)	$1,500
Annual Return on Investment (AROI)	7.32%
Internal Rate of Return (IRR)	13.33%
Net Present Value (NPV)	$369,884

*Assumes 2% yearly inflation on natural gas costs
**Incentives, per New Jersey Clean Energy Program, are $1.00 per MBH

The hot water circulation pumps are currently set to provide a constant flow through the hot water system when in operation. The Board has expressed interest in variable speed control for the hot water circulation pumps. Varying the flow in the hot water system to match heating requirements can provide significant electricity savings, as the pumps are no longer consistently running at full speed. Table 4.2-2 provides anticipated savings associated with the implementation of variable speed drives for all pumps. CDM anticipates no maintenance cost savings associated with variable speed drives.

Over several decades, ASHRAE has compiled data pertaining to service lives of most HVAC related equipment. From this, ASHRAE indicates a median service life (life until replacement) for HVAC related equipment that may be used as an estimate for the useful life of HVAC equipment currently in service. For example, ASHRAE indicates a window air conditioning unit has a median service life of 10 years. Therefore, if a window unit has been in service for more than 10 years, the owner may want to consider replacement. Not only will a replacement ensure minimal downtime between units (the unit is replaced before it ceases to function), but it will also maintain rated system efficiency, as efficiency tends to decrease with age.

Table 4.2-2: Memorial Junior School Variable Speed Hot Water Pump Payback	
Predicted Annual Savings (kWh)	5,730
Electricity-related Savings	$986
Predicted Annual Savings (Therms)	-300
Gas-related Savings	-$480
Total Annual Savings	$506
Initial Capital Cost of Upgrade	$40,394
Incentives**	$0
Cost of Upgrade	$40,394
Simple Payback	**79.8**
Lifetime Energy Savings (15 years)*	$10,038
Annual Maintenance Cost Savings (AMCS)	$0
Annual Return on Investment (AROI)	-5.41%
Internal Rate of Return (IRR)	-13.78%
Net Present Value (NPV)	-$33,025

*Assumes 2% yearly inflation on natural gas costs, 3% inflation on electricity costs
**No incentives were noted for variable speed drives on hot water circulation pumps

All major equipment noted during CDM's on site audit is listed in Table 4.2-3 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that only equipment that was observed at the time of the audit is included. Where equipment ages were not found on the equipment tags, they have been estimated based on the unit appearance or approximate renovation dates. In some cases, service locations may have been estimated based on unit proximity. Additionally, in cases where a unit's manufacturer and/or model could not be determined due to an unreadable, faded, destroyed, or lost tag, manufacturer and model number information has been represented as "unknown".

Table 4.2-3 Memorial Junior School HVAC Equipment Service Lives							
Description [Tag ID]	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Packaged Air-Conditioning Rooftop Unit (RTU)	Roof	Faculty Room	Nesbitt	RSA1003E33BAEA 00E00B	EER 8-9 100% Heat	>15	15
RTU	Roof	Maintenance Office	HEIL	PAAA24N1K1	Unknown	<15	15
RTU	Roof	Computer Lab	Trane	YCD181C3CAAA	EER 12	13	15
RTU	Roof	Nurse & Guidance Offices (assumed)	Nesbitt	RMA10045S30R7A BC4A450000BD31	EER 8-9 100% Heat	<15	15
RTU	Roof	Main Office Area	Nesbitt	RMA10045C2203A B06A100504	EER 8-9 100% Heat	>15	15
RTU	Roof	Informational Materials Center	Nesbitt	RSA25032F09 CCA00A000A	EER 8-9 100% Heat	>15	15
Boiler, Cast Iron	Boiler Room 1	Entire Building	HB Smith	Series 28A-13	78%	17	35
Boiler, Cast Iron	Boiler Room 1	Entire Building	HB Smith	Series 28A-13	78%	17	35
Boiler, Cast Iron	Boiler Room 2	Entire Building	HB Smith	Series 28A-13	78%	17	35

CDM noted that the Nesbitt rooftop units serving the main office, informational materials center, and faculty room may have surpassed their ASHRAE-expected service lives. However, as these units heat using electricity, there may be opportunity to save energy by replacing these units with packaged air source heat pump (ASHP) systems. ASHP systems use refrigerant systems to transfer heat from the environment to interior spaces during moderate weather, to help offset heating requirements. In doing so, they reduce the electrical consumption required to heat the space.

While the unit serving the nurse and guidance office areas did not appear to be past its ASHRAE-expected service life, it relies on electricity to heat the space, and therefore has also been considered as a candidate for replacement by a packaged air source heat pump system. Figure 4.2-5 demonstrates the anticipated energy savings from switching the four Nesbitt rooftop units with packaged air source heat pumps of similar capacity. Air source heat pumps for these areas have been sized to deliver approximately 50 BTU/hr per square foot, based on areas calculated as closely as possible by CDM.

Figure 4.2-5: Memorial Junior School – Air Source Heat Pumps - Electricity Usage

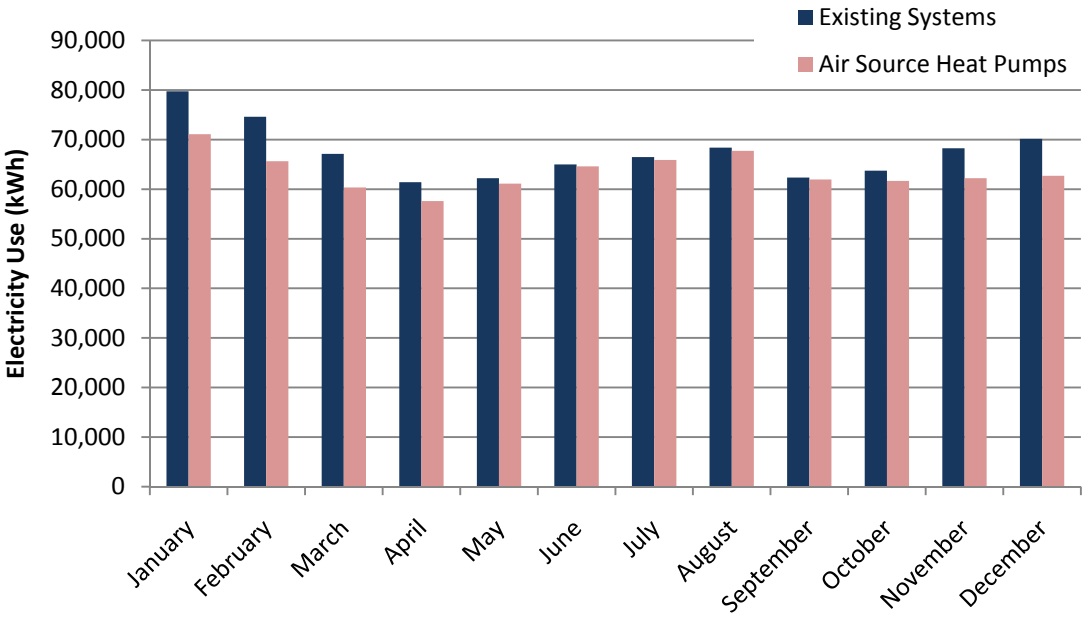


Table 4.2-4 demonstrates the anticipated simple payback derived from these replacements. CDM anticipates a slight maintenance cost increase associated with a switch to air source heat pumps.

Table 4.2-4: Memorial Junior School Air Source Heat Pump Payback	
Predicted Annual Savings (kWh)	46,920
Total Annual Savings	$8,070
Initial Capital Cost of Upgrade	$89,090
Incentives**	$4,185
Cost of Upgrade	$84,905
Simple Payback	**10.5**
Lifetime Energy Savings (15 years)*	$150,093
Annual Maintenance Cost Savings (AMCS)	-$3,739
Annual Return on Investment (AROI)	-1.57%
Internal Rate of Return (IRR)	-0.61%
Net Present Value (NPV)	-$21,832

*Assumes 3% yearly inflation on electricity costs
**Incentives, per New Jersey Clean Energy Program, are $79 per Ton for 12 Ton & 22.5 Ton units and $73 per Ton for (2) 10 Ton units

CDM also creates an inventory of observed domestic water heaters. This will attempt to inform the Board of any water heaters that are in need of replacement. Equipment observed to be in poor or aging condition would warrant replacement, as they are likely not operating at peak efficiency. This domestic water heater inventory may be seen as Table 4.2-5 below.

Table 4.2-5 Memorial Junior School Domestic Water Heaters						
Location	Make	Storage Capacity (Gallons)	Model Number	Type	Heating Capacity	Observed Condition
Boiler Room	AO Smith	100	BTR 275A 118	Gas	275 MBH	Good

CDM creates a similar inventory pneumatic HVAC control system compressors, which may be seen as Table 4.2-6.

Table 4.2-6 Memorial Junior School Compressors				
Location	Make	Receiver Capacity (Gallons)	Motor (HP)	Observed Condition
Boiler Room 1	Honeywell	120	3 3	Good

4.2.2 Bee Meadow Elementary School

A model of Bee Meadow Elementary School was created in eQuest to predict heating and cooling loads for the building. To calibrate this model, CDM used electricity bills from June, 2008 through December, 2009, and natural gas bills from May, 2008 through November, 2009. Figure 4.2-6 below compares actual monthly electricity usages, with those predicted by the eQuest model. Historical monthly usages were averaged for each month observed over multiple years.

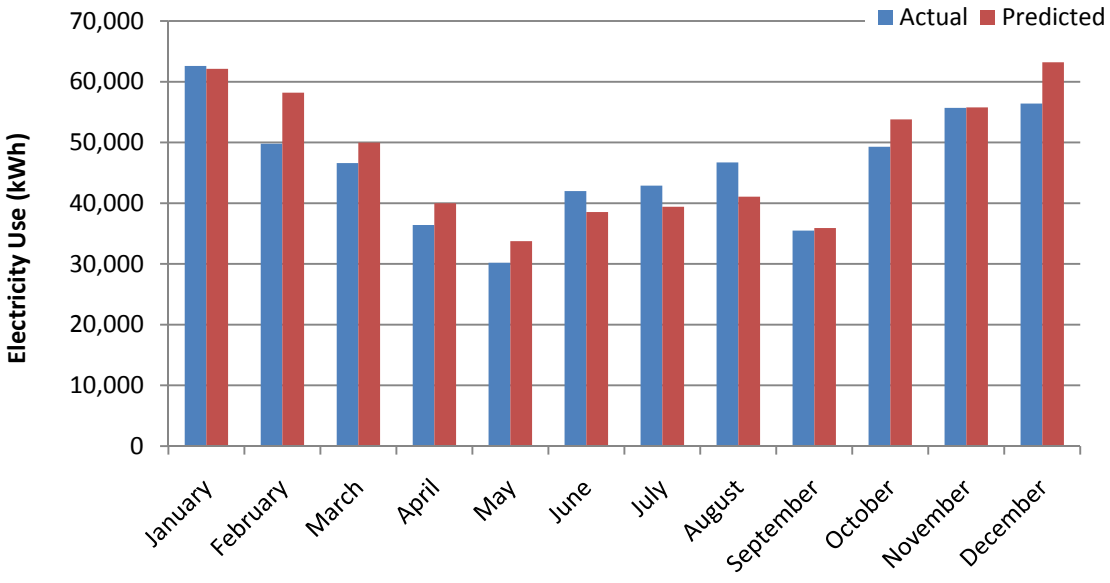


Figure 4.2-6: Bee Meadow Elementary School Electricity Usage

Figure 4.2-7 presents an end-usage breakdown to help the Board visualize where CDM anticipates the electricity is ultimately being used. It should be noted that these are only estimated usages based on information gathered during CDM's field audit.

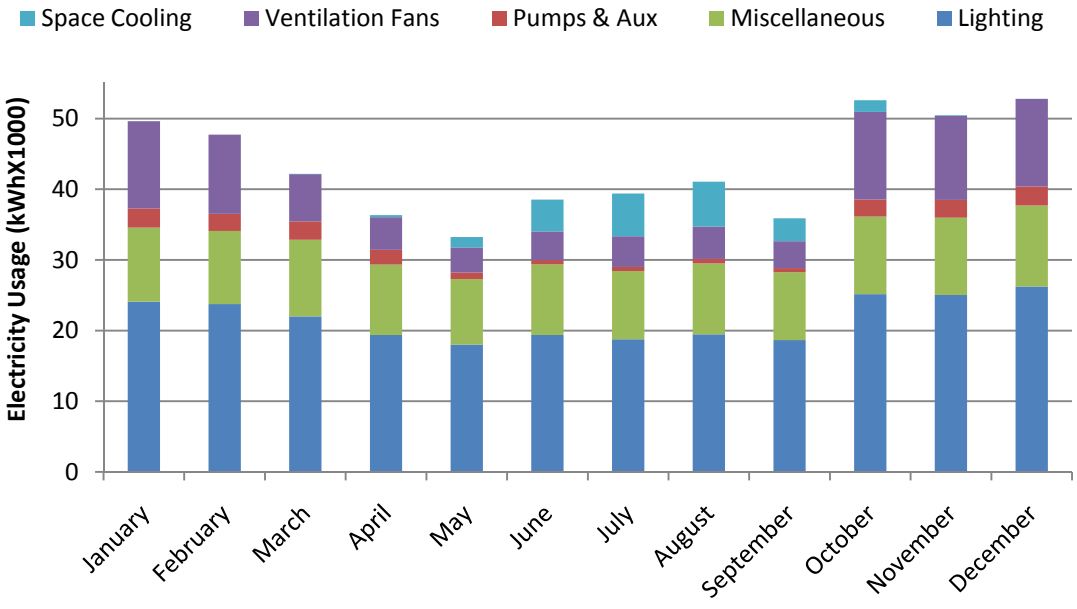


Figure 4.2-7: Bee Meadow Elementary School Electricity Usage Breakdown

Figure 4.2-8 below compares actual natural gas usage to model-predicted natural gas use.

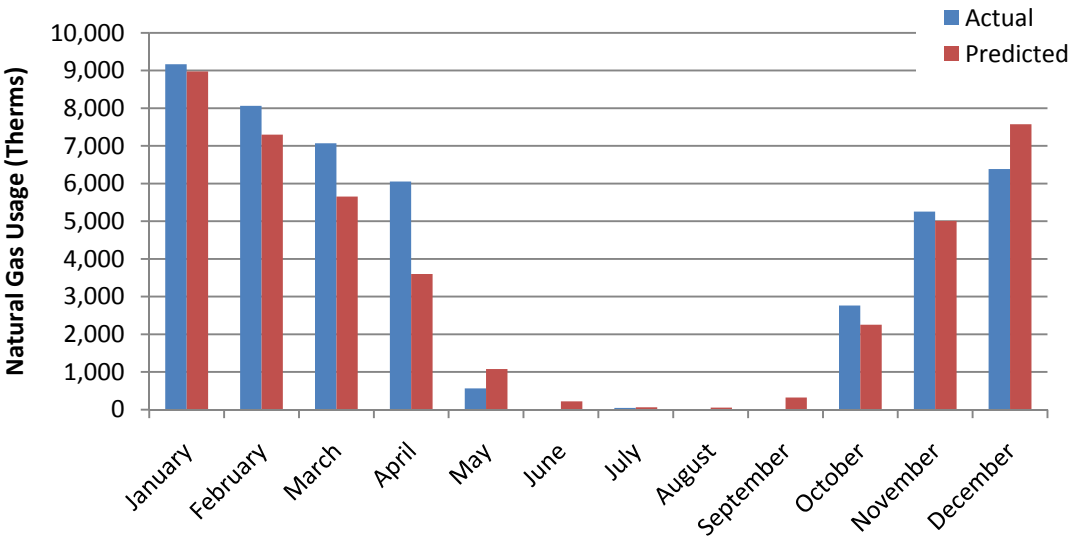


Figure 4.2-8: Bee Meadow Elementary School Natural Gas Usage

Currently, the heating system utilizes two (2) Smith cast iron boilers, each with an I=B=R hot water heating capacity of 4,025 MBH. CDM conservatively estimates these boilers to be 80% efficient.

CDM recommends replacing these boilers with high-efficiency, condensing boilers. Based on the building model, and accounting for a 25% safety factor, CDM has calculated a peak heating load of 3,650 MBH. This indicates that the existing boiler system, with a combined capacity of approximately 8,000 MBH may be significantly oversized. Three (3) 2,000 MBH condensing boilers should comfortably account for building peak heating requirements, even in the event that one boiler is offline for maintenance or servicing.

Figure 4.2-9 compares current gas usage with predicted gas usage resulting from a switch to high-efficiency, condensing boilers. Condensing boilers are modeled with a full-load efficiency of ~90% and return water temperature of 100°F.

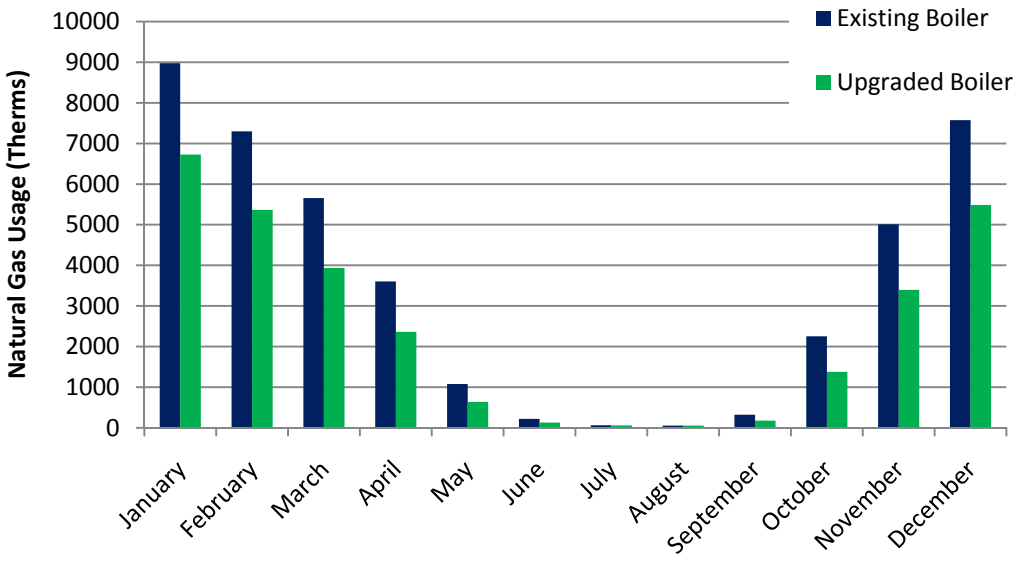


Figure 4.2-9: Bee Meadow Elementary School – Boiler Upgrade - Natural Gas Usage

Fiscal savings from such an upgrade are then identified in Table 4.2-7 below. Lifetime savings calculations for all ECRM's may be found in Appendix J. It's important to note that these are estimates based on building models, and further investigation is warranted before pursuing boiler replacements.

Due to the improved automation and control within modern condensing boilers, their operation and maintenance costs tend to be less than those of typical cast iron boilers. CDM estimates a cast iron boiler will typically cost around $3,500 per year for regular preventative maintenance, whereas a condensing boiler would cost around $2,000 per year. Therefore, replacing the two existing boilers with three condensing boilers should result in an operation and maintenance cost savings of $1,500 per year.

Table 4.2-7: Bee Meadow Elementary School Boiler Upgrade Payback	
Predicted Annual Savings (Therms)	12,398
Total Annual Savings	$19,837
Initial Capital Cost of Upgrade	$171,422
Incentives**	$6,000
Cost of Upgrade	$165,422
Simple Payback	**8.3**
Lifetime Energy Savings (24 years)*	$603,472
Annual Maintenance Cost Savings (AMCS)	$1,500
Annual Return on Investment (AROI)	8.73%
Internal Rate of Return (IRR)	12.43%
Net Present Value (NPV)	$331,746

*Assumes 2% yearly inflation on natural gas costs
**Incentives, per New Jersey Clean Energy Program, are $1.00 per MBH

The hot water circulation pumps are currently set to provide a constant flow through the hot water system when in operation. The Board has expressed interest in variable speed control for the hot water circulation pumps. Varying the flow in the hot water system to match heating requirements can provide significant electricity savings, as the pumps are no longer consistently running at full speed. Table 4.2-8 provides anticipated savings associated with the implementation of variable speed drives for all pumps. CDM anticipates no maintenance cost savings associated with variable speed drives.

Table 4.2-8: Bee Meadow School Variable Speed Hot Water Pump Payback	
Predicted Annual Savings (kWh)	14,790
Electricity-related Savings	$2,588
Predicted Annual Savings (Therms)	-1,164
Gas-related Savings	-$1,862
Total Annual Savings	$726
Initial Capital Cost of Upgrade	$29,993
Incentives**	$0
Cost of Upgrade	$29,993
Simple Payback	**41.3**
Lifetime Energy Savings (15 years)*	$15,934
Annual Maintenance Cost Savings (AMCS)	$0
Annual Return on Investment (AROI)	-4.25%
Internal Rate of Return (IRR)	-8.21%
Net Present Value (NPV)	-$19,420

*Assumes 2% yearly inflation on natural gas costs, 3% inflation on electricity costs
**No incentives were noted for variable speed drives on hot water circulation pumps

All major equipment noted during CDM's on site audit is listed in Table 4.2-9 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that only equipment that was observed at the time of the audit is included.

Table 4.2-9 Bee Meadow Elementary School HVAC Equipment Service Lives

Description [Tag ID]	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Air-Cooled Condensing Unit (ACCU)	Roof	102	Lennox	HS29-018-3P	EER ~10	<15	20
ACCU	Roof	115	Lennox	HS29-042-2P	EER ~10	<15	20
ACCU	Roof	113	Evcon	AC042X1021G	EER 9-10	<15	20
ACCU	Roof	113	Evcon	AC042X1021G	EER 9-10	<15	20
ACCU	Roof	106	Evcon	AC042X1021G	EER 9-10	<15	20
ACCU	Roof	104	Evcon	AC042X1021G	EER 9-10	<15	20
ACCU	Roof	103	Evcon	AC042X1021G	EER 9-10	<15	20

Table 4.2-9 Bee Meadow Elementary School HVAC Equipment Service Lives							
RTU	Roof	Main Office	Unknown	DL-10E24QTAAA3C	Unknown	<15	15
RTU	Roof	Cafeteria & Stage	Seasons 4	6MPF24-0544-ER112-11SE	EER 9-10	<15	15
RTU	Roof	Library	Seasons 4	6MJI20-0312-ER054-11SE	EER 9-10	<15	15
RTU	Roof	Library Office Area	Trane	TCC018F100BA	EER ~10	14	15
RTU	Roof	19	Trane	TCC024F100BG	EER ~10	5	15
RTU	Roof	Gym Storage	Trane	TCC024F100BA	EER ~10	14	15
ACCU	Roof	Social Worker Office	EMI	SHC12DA0000AA0A	EER 9-10	<15	20
Boiler, Cast Iron	Boiler Room	Entire Building	Smith	Series 28A-18	80%	<15	35
Boiler, Cast Iron	Boiler Room	Entire Building	Smith	Series 28A-18	80%	<15	35

A domestic water heater inventory may be seen as Table 4.2-10 below.

Table 4.2-10 Bee Meadow Elementary School Domestic Water Heaters						
Location	Make	Storage Capacity (Gallons)	Model Number	Type	Heating Capacity	Observed Condition
Boiler Room	AO Smith	74.5	BT 80 230	Gas	75 MBH	Good
2001 Addition Mechanical Room	AO Smith	74	BT 80 110	Gas	76 MBH	Good

A compressor inventory may be seen as Table 4.2-11 below.

Table 4.2-11 Bee Meadow Elementary School Compressors				
Location	Make	Receiver Capacity (Gallons)	Motor (HP)	Observed Condition
Boiler Room	Curtis	60	3/4 3/4	Good

4.2.3 Salem Drive Elementary School

A model of Salem Drive Elementary School was created in eQuest to predict heating and cooling loads for the building. To calibrate this model, CDM used electricity bills from June, 2008 through December, 2009, and natural gas bills from June, 2008 through October, 2009. Figure 4.2-10 below compares actual monthly electricity usages, with those predicted by the eQuest model. Historical monthly usages were averaged for each month observed over multiple years.

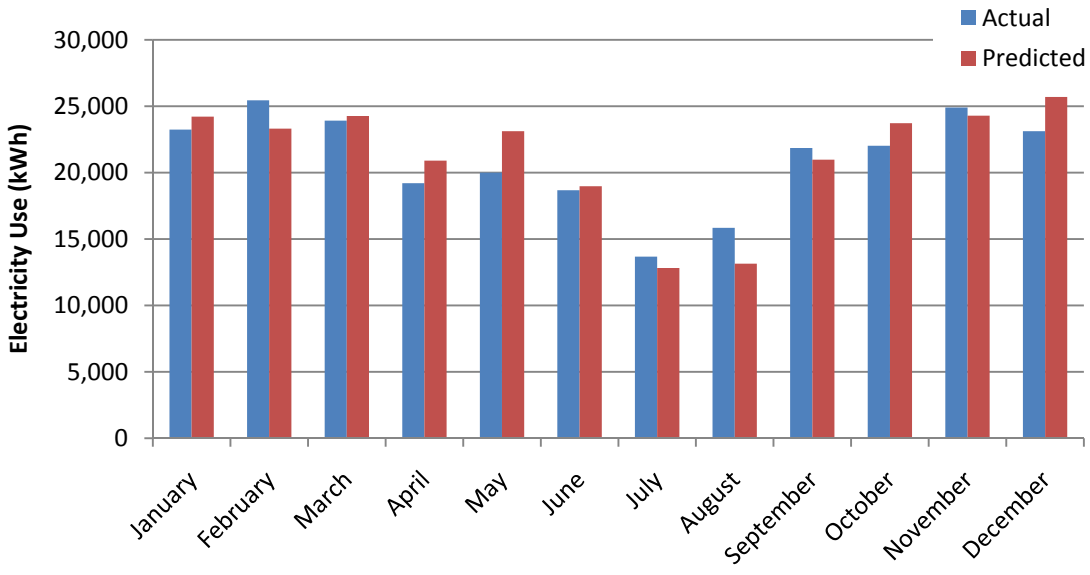


Figure 4.2-10: Salem Drive Elementary School Electricity Usage

Figure 4.2-11 presents an end-usage breakdown to help the Board visualize where CDM anticipates the electricity is ultimately being used. It should be noted that these are only estimated usages based on information gathered during CDM's field audit.

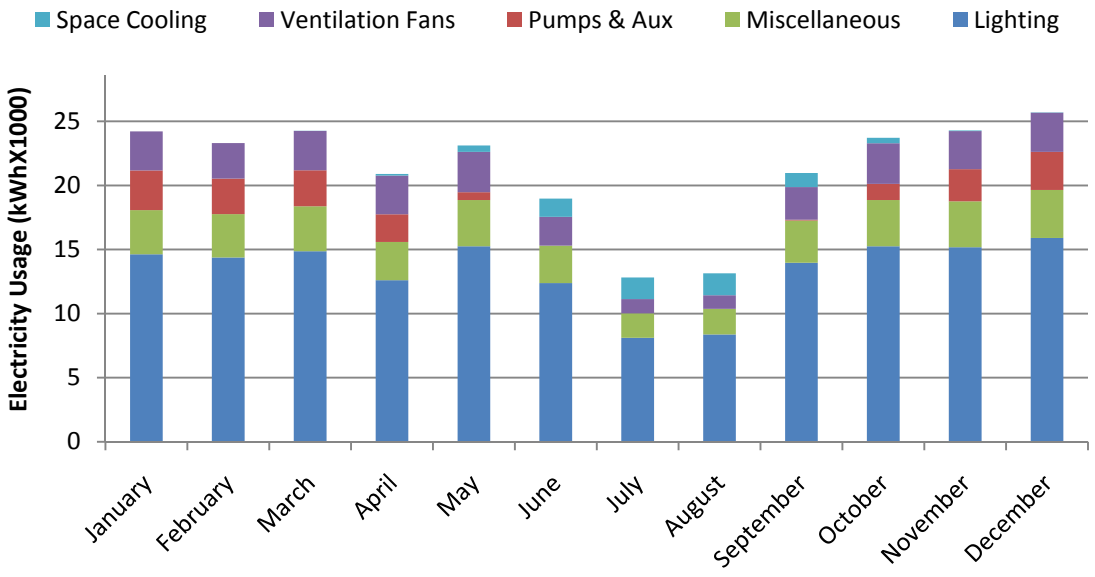


Figure 4.2-11: Salem Drive Elementary School Electricity Usage Breakdown

Figure 4.2-12 below compares actual natural gas usage to model-predicted natural gas use.

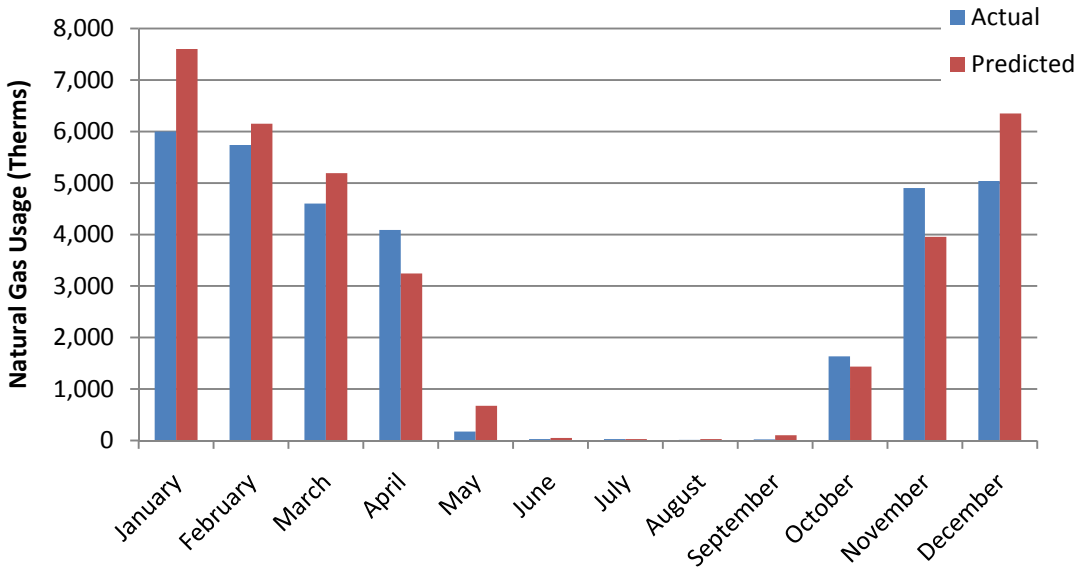


Figure 4.2-12: Salem Drive Elementary School Natural Gas Usage

Currently, the heating system utilizes two (2) Smith cast iron boilers, each with an I=B=R hot water heating capacity of 2,172 MBH. CDM conservatively estimates these boilers to be 80% efficient.

CDM recommends replacing these boilers with high-efficiency, condensing boilers. Based on the building model, and accounting for a 25% safety factor, CDM has

calculated a peak heating load of 2,900 MBH. This indicates that the existing boiler system is likely appropriately sized. Two (2) 2,000 MBH condensing boilers should comfortably account for building peak heating requirements.

Figure 4.2-13 compares current gas usage with predicted gas usage resulting from a switch to high-efficiency, condensing boilers. Condensing boilers are modeled with a full-load efficiency of ~90% and return water temperature of 100°F.

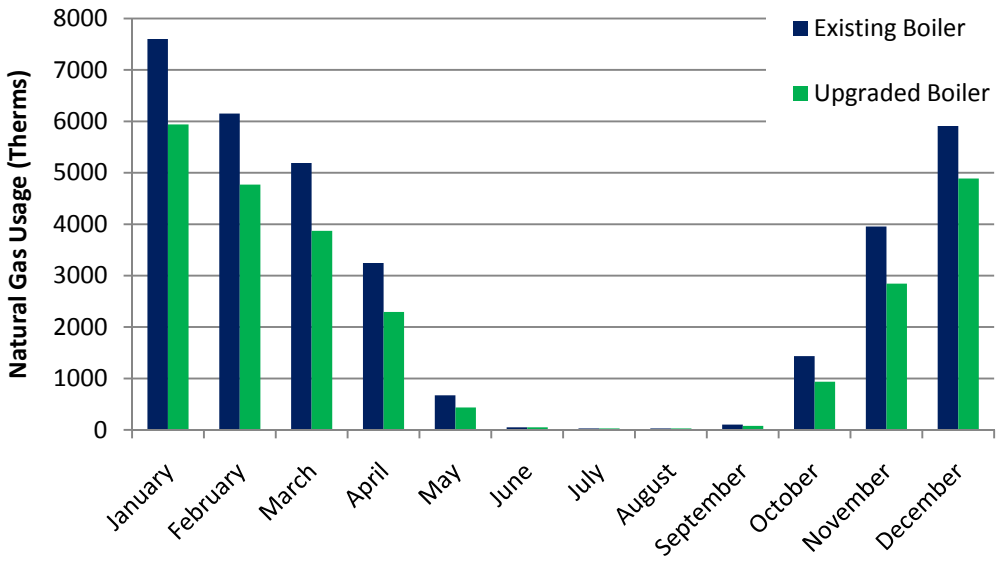


Figure 4.2-13: Salem Drive Elementary School – Boiler Upgrade - Natural Gas Usage

Fiscal savings from such an upgrade are then identified in Table 4.2-12 below. Lifetime savings calculations for all ECRM's may be found in Appendix J. It's important to note that these are estimates based on building models, and further investigation is warranted before pursuing boiler replacements.

Due to the improved automation and control within modern condensing boilers, their operation and maintenance costs tend to be less than those of typical cast iron boilers. CDM estimates a cast iron boiler will typically cost around $3,500 per year for regular preventative maintenance, whereas a condensing boiler would cost around $2,000 per year. Therefore, replacing the two existing boilers with three condensing boilers should result in an operation and maintenance cost savings of $3,000 per year.

Table 4.2-12: Salem Drive Elementary School Boiler Upgrade Payback	
Predicted Annual Savings (Therms)	8,648
Total Annual Savings	$13,837
Initial Capital Cost of Upgrade	$114,281
Incentives**	$4,000
Cost of Upgrade	$110,281
Simple Payback	**8.0**

Table 4.2-12: Salem Drive Elementary School Boiler Upgrade Payback	
Lifetime Energy Savings (24 years)*	$420,941
Annual Maintenance Cost Savings (AMCS)	$3,000
Annual Return on Investment (AROI)	11.10%
Internal Rate of Return (IRR)	15.54%
Net Present Value (NPV)	$282,033

*Assumes 2% yearly inflation on natural gas costs
**Incentives, per New Jersey Clean Energy Program, are $1.00 per MBH

The hot water circulation pumps are currently set to provide a constant flow through the hot water system when in operation. The Board has expressed interest in variable speed control for the hot water circulation pumps. Varying the flow in the hot water system to match heating requirements can provide significant electricity savings, as the pumps are no longer consistently running at full speed. Table 4.2-13 provides anticipated savings associated with the implementation of variable speed drives for all pumps. CDM anticipates no maintenance cost savings associated with variable speed drives.

Table 4.2-13: Salem Drive Elementary School Variable Speed Hot Water Pump Payback	
Predicted Annual Savings (kWh)	6,310
Electricity-related Savings	$1,111
Predicted Annual Savings (Therms)	-281
Gas-related Savings	-$450
Total Annual Savings	$661
Initial Capital Cost of Upgrade	$21,749
Incentives**	$0
Cost of Upgrade	$21,749
Simple Payback	**32.9**
Lifetime Energy Savings (15 years)*	$12,881
Annual Maintenance Cost Savings (AMCS)	$0
Annual Return on Investment (AROI)	-3.63%
Internal Rate of Return (IRR)	-6.07%
Net Present Value (NPV)	-$12,123

*Assumes 2% yearly inflation on natural gas costs, 3% inflation on electricity costs
**No incentives were noted for variable speed drives on hot water circulation pumps

All major equipment noted during CDM's on site audit is listed in Table 4.2-14 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that only equipment that was observed at the time of the audit is included.

Table 4.2-14 Salem Drive Elementary School HVAC Equipment Service Lives							
Description [Tag ID]	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
RTU	Roof	Library	Unknown	Unknown	Unknown	<15	15
RTU [HVAC-3]	Roof	Cafeteria	Trane	YCD1513HABA	EER 12 81% Heating	7	15
RTU [HVAC-4]	Roof	Cafeteria	Trane	YCD1513HABA	EER 12 81% Heating	7	15
Boiler, Cast Iron	Boiler Room	Entire Building	Smith	Series 28A-10	80%	<20	35
Boiler, Cast Iron	Boiler Room	Entire Building	Smith	Series 28A-10	80%	<20	35

A domestic water heater inventory may be seen as Table 4.2-15 below.

Table 4.2-15 Salem Drive Elementary School Domestic Water Heaters						
Location	Make	Storage Capacity (Gallons)	Model Number	Type	Heating Capacity	Observed Condition
Storage Closet	AO Smith	74	BT 80 110	Gas	76 MBH	Good
Boiler Room	AO Smith	48	BT 65 106	Gas	57 MBH	Good

A compressor inventory may be seen as Table 4.2-16 below.

Table 4.2-16 Salem Drive Elementary School Compressors				
Location	Make	Receiver Capacity (Gallons)	Motor (HP)	Observed Condition
Boiler Room	Curtis	60	3/4 3/4	Good

4.2.4 Mountview Road Elementary School

A model of Mountview Road Elementary School was created in eQuest to predict heating and cooling loads for the building. To calibrate this model, CDM used electricity bills from June, 2008 through December, 2009, and natural gas bills from June, 2008 through November, 2009. Figure 4.2-14 below compares actual monthly

electricity usages, with those predicted by the eQuest model. Historical monthly usages were averaged for each month observed over multiple years.

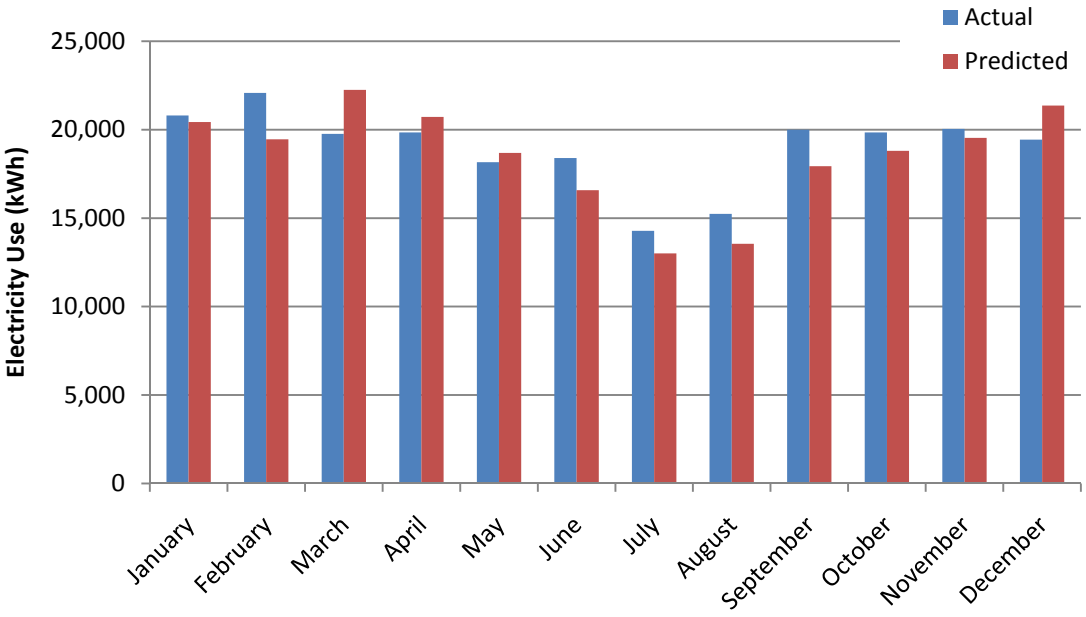


Figure 4.2-14: Mountview Road Elementary School Electricity Usage

Figure 4.2-15 presents an end-usage breakdown to help the Board visualize where CDM anticipates the electricity is ultimately being used. It should be noted that these are only estimated usages based on information gathered during CDM's field audit.

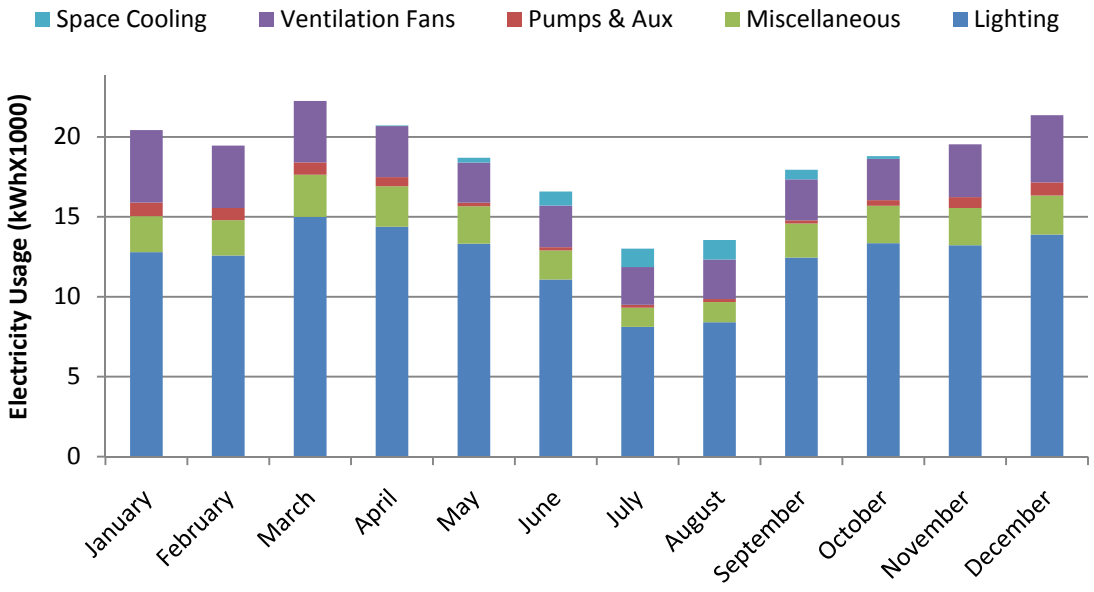


Figure 4.2-15: Mountview Road Elementary School Electricity Usage Breakdown

Figure 4.2-16 below compares actual natural gas usage to model-predicted natural gas use.

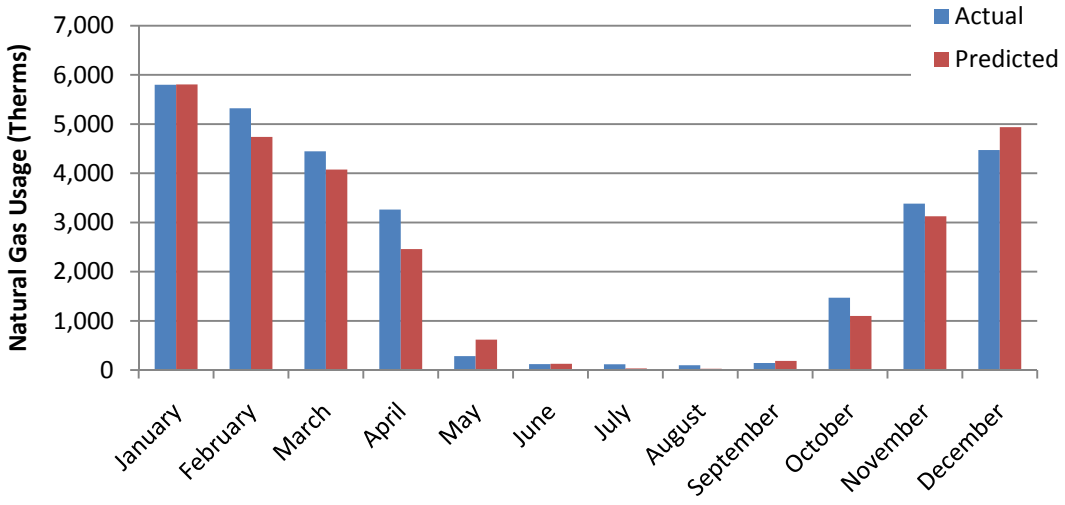


Figure 4.2-16: Mountview Road Elementary School Natural Gas Usage

Currently, the heating system utilizes two (2) Smith cast iron boilers, each with an I=B=R hot water heating capacity of 2,403 MBH. CDM conservatively estimates these boilers to be 80% efficient.

CDM recommends replacing these boilers with high-efficiency, condensing boilers. Based on the building model, and accounting for a 25% safety factor, CDM has calculated a peak heating load of 3,100 MBH. This indicates that the existing boiler system is likely appropriately sized. Two (2) 2,000 MBH condensing boilers should comfortably account for building peak heating requirements.

Figure 4.2-17 compares current gas usage with predicted gas usage resulting from a switch to high-efficiency, condensing boilers. Condensing boilers are modeled with a full-load efficiency of ~90% and return water temperature of 100°F.

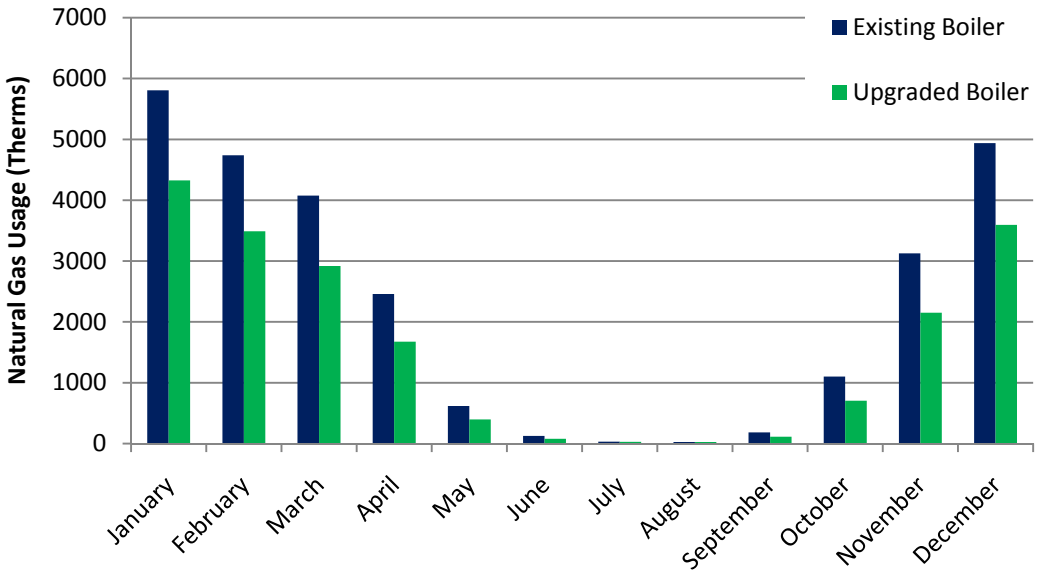


Figure 4.2-17: Mountview Road Elementary School – Boiler Upgrade - Natural Gas Usage

Fiscal savings from such an upgrade are then identified in Table 4.2-17 below. Lifetime savings calculations for all ECRM's may be found in Appendix J. It's important to note that these are estimates based on building models, and further investigation is warranted before pursuing boiler replacements.

Due to the improved automation and control within modern condensing boilers, their operation and maintenance costs tend to be less than those of typical cast iron boilers. CDM estimates a cast iron boiler will typically cost around $3,500 per year for regular preventative maintenance, whereas a condensing boiler would cost around $2,000 per year. Therefore, replacing the two existing boilers with three condensing boilers should result in an operation and maintenance cost savings of $3,000 per year.

Table 4.2-17: Mountview Road Elementary School Boiler Upgrade Payback	
Predicted Annual Savings (Therms)	7,731
Total Annual Savings	$12,370
Initial Capital Cost of Upgrade	$114,281
Incentives**	$4,000
Cost of Upgrade	$110,281
Simple Payback	**8.9**
Lifetime Energy Savings (24 years)*	$376,318
Annual Maintenance Cost Savings (AMCS)	$3,000
Annual Return on Investment (AROI)	9.77%
Internal Rate of Return (IRR)	13.82%
Net Present Value (NPV)	$247,846

*Assumes 2% yearly inflation on natural gas costs
**Incentives, per New Jersey Clean Energy Program, are $1.00 per MBH

The hot water circulation pumps are currently set to provide a constant flow through the hot water system when in operation. The Board has expressed interest in variable speed control for the hot water circulation pumps. Varying the flow in the hot water system to match heating requirements can provide significant electricity savings, as the pumps are no longer consistently running at full speed. Table 4.2-18 provides anticipated savings associated with the implementation of variable speed drives for all pumps. CDM anticipates no maintenance cost savings associated with variable speed drives.

Table 4.2-18: Mountview Road Elementary School Variable Speed Hot Water Pump Payback	
Predicted Annual Savings (kWh)	3,060
Electricity-related Savings	$548
Predicted Annual Savings (Therms)	-149
Gas-related Savings	-$238
Total Annual Savings	$310
Initial Capital Cost of Upgrade	$23,794
Incentives**	$0
Cost of Upgrade	$23,794
Simple Payback	**76.8**
Lifetime Energy Savings (15 years)*	$6,076
Annual Maintenance Cost Savings (AMCS)	$0
Annual Return on Investment (AROI)	-5.36%
Internal Rate of Return (IRR)	-13.47%
Net Present Value (NPV)	-$19,279

*Assumes 2% yearly inflation on natural gas costs, 3% inflation on electricity costs
**No incentives were noted for variable speed drives on hot water circulation pumps

All major equipment noted during CDM's on site audit is listed in Table 4.2-19 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that only equipment that was observed at the time of the audit is included.

Table 4.2-19 Mountview Road Elementary School HVAC Equipment Service Lives

Description [Tag ID]	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
RTU	Roof	Cafeteria	Trane	YCD151C3HABA	EER 12	7	15
RTU	Roof	Cafeteria	Trane	YCD151C3HABA	EER 12	7	15
RTU	Roof	Media Center	Trane	YCD151C3HABA	EER 12	7	15
RTU	Roof	Media Center	Trane	YCD151C3HABA	EER 12	7	15
Boiler, Cast Iron	Boiler Room	Entire Building	Smith	Series 28A-11	80%	17	35
Boiler, Cast Iron	Boiler Room	Entire Building	Smith	Series 28A-11	80%	17	35

A domestic water heater inventory may be seen as Table 4.2-20 below.

Table 4.2-20 Mountview Road Elementary School Domestic Water Heaters

Location	Make	Storage Capacity (Gallons)	Model Number	Type	Heating Capacity	Observed Condition
Boiler Room	Bradford White	75	D75T1253N	Gas	125 MBH	Good
2001 Wing Janitor Closet	AO Smith	74	BT 80 112	Gas	75.1 MBH	Good

A compressor inventory may be seen as Table 4.2-21 below.

Table 4.2-21 Mountview Road Elementary School Compressors

Location	Make	Receiver Capacity (Gallons)	Motor (HP)	Observed Condition
Boiler Room	Honeywell	60	3/4 3/4	Good

4.3 Alternative Energy Sources

4.3.1 Photovoltaic Solar Energy System

Photovoltaic (PV) cells convert energy in sunlight directly into electrical energy through the use of silicon semi conductors, diodes and collection grids. Several PV cells are then linked together in a single frame of module to become a solar panel. PV cells are able to convert the energy from the sun into electricity. The angle of inclination of the PV cells, the amount of sunlight available, the orientation of the panels, the amount of physical space available and the efficiency of the individual panels are all factors that affect the amount of electricity that is generated.

As part of this energy audit, a preliminary engineering feasibility study of the sites outlined above to support solar generation facilities was completed consisting of the following tasks:

a. Site Visit by our engineers.

b. Satellite Image Analysis and Conceptual design and layout of the photovoltaic system

c. Design and construction cost estimates

d. Determine a preliminary design for the size and energy production of the solar system.

The total unobstructed available area of each section of the roof with southern exposure was evaluated. It is important to note the following:

1. The structural integrity of the roofs was not confirmed during our site visit. The high school may require some degree of roofing work prior to the implementation of a solar system.

2. In the case of the flat areas, the PV system sizing and kWh production was calculated assuming the installation of a crystalline module facing south direction (220 Degree Azimuth) and tilted approximately 20 degrees to allow better rain water shedding and snow melting. Please note that the kWh production as well as system size may differ significantly based on final panel tilt selected during the RFP and design phase.

3. Blended electric rates were used based on actual utility bills and were applied for the facility.

The following is a preliminary study on the feasibility of installing a PV solar system at the four Schools to generate a portion of the facility's electricity requirements. The system is designed to offset the electric purchased from the local utility and not as a backup or emergency source of power.

In order to determine the best location for the installation of the PV solar system, a satellite image analysis and site walkthrough of the buildings was performed. As per the Scope of Work, only the building roofs were considered for PV installation.

Also, as part of our assessment we investigated possible locations for electrical equipment that need to be installed such as combiner boxes, disconnect switches and DC to AC inverters. Consideration was also given to locations of interconnection between the solar system and building's electrical grid.

4.3.1.1 Hanover Township Schools

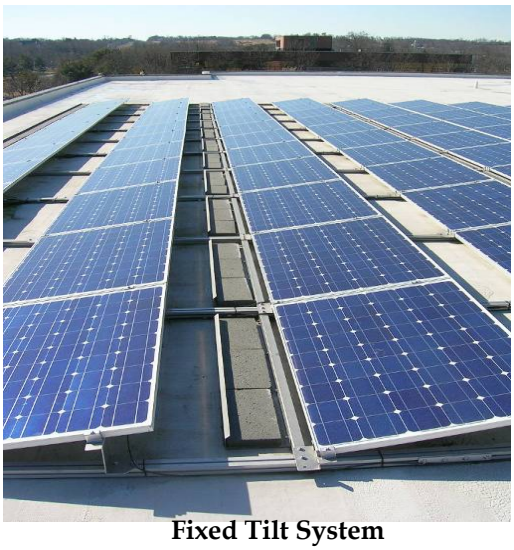
Based on satellite image analysis the roofs of the four Schools are similar and will be described as a typical condition in this Section. The roofs are flat with a very few obstructions such as exhaust fans, rooftop HVAC units, and electrical and gas piping. There is a minimal amount of shading on the roofs from adjacent foliage that would need to be addressed during the design phase of the project. The structural integrity of the roofs was not confirmed although a visual inspection revealed no leaks or major defects. The structural integrity of the roofs and the existence of a warranty shall be confirmed prior to the implementation of a PV system.

The Project Team conducted both a facility walkthrough and a satellite image analysis and based on the estimated total available areas we calculated the installation of a system rated per School to be at approximately:

Memorial Junior School: 670 kW (dc)
Bee Meadow Elementary School: 440 kW (dc)
Salem Drive Elementary School: 200 kW (dc)
Mountview Road Elementary School: 180 kW (dc)

Electrical Service

The interconnection point for the PV system will require a modification or replacement of the existing service entrance equipment wherein the PV system feeder connections will have to be made after the main circuit breaker, and protective relaying will also have to be implemented. Preferably the AC inverter should be installed in close proximity to the service entrance equipment, but in the case of this building, there is little to no available space, and the inverter should be installed outside on a concrete pad in a weather proof enclosure. AC wiring would run from the inverters into the connection point(s) at the service entrance equipment. Any connection points would have to meet NEC and local utility requirements. Further investigation and verification of existing electrical equipment would be required prior to implementation of a PV system.



Fixed Tilt System

4.3.1.2 Basis for Design and Calculations

The most common roof mounted system is referred to as a ("fixed tilt") system typically mounted to a metal rack that can be fixed at a specific angle. There are also ("tracking systems") or movable along one or two axes to follow the position of the sun during the day. For a roof-mounted PV system, tracking systems are very rarely installed and are usually used for ground-mounted systems only, as they require more complex racks and higher maintenance costs. For the "fixed" system, the tilt is determined based on the following factors: geographical location, total targeted kWh production, seasonal electricity requirements and weather conditions such as wind. Ideally, the module tilt for Central to Western New Jersey should be 25-35 degrees with an azimuth as close as possible to 180 (south); however, our experience has shown that PV systems are typically installed at a tilt of 20 degrees or lower in order to avoid any issues with wind and to maximize total system size

The type of PV panels and equipment used to mount the system shall be determined based on the wind conditions and structural integrity of the roof determined during the design phase of the project. In general, penetration/tie-down systems, non-penetrating ballasted type systems, or a combination of the two should be considered.

Calculation of PV System Yield

An industry accepted software package, PV Watts was used to calculate projected annual electrical production of the crystalline silicon PV system in its first year, as summarized in Table 4.3-1. The system was design to provide maximum kWh

production based on available roof space. We assumed a solar rating of 4.60 kWh/m^2 per day.

Table 4.3-1 System Summary

Site	Est. Area (ft^2)	kWh	Annual Energy Savings	Est. Annual SREC	Lifetime Energy Savings (25 Years)*	Annual Return On Investment (AROI)	Net Present Value (NPV)	Internal Rate of Return (IRR)
Memorial Junior School	67,000	821,152	$141,238	$517,685	$5,149,437	4.6%	$860,535	4.2%
Bee Meadow Elementary School	44,000	539,264	$94,371	$339,972	$3,440,705	4.5%	$550,060	4.2%
Salem Drive Elementary School	20,000	245,120	$43,141	$154,533	$1,572,893	4.2%	$157,533	3.7%
Mountview Road Elementary School	18,000	220,608	$39,443	$139,079	$1,437,319	4.2%	$139,511	3.7%

*3% yearly inflation on electricity costs

*Refer to Appendix E & J for solar financial calculations

Total Costs

It should be noted that construction costs are only estimates based on historic data compiled from similar installations, and engineering opinion. Additional engineering and analysis is required to confirm the condition of the roofs, structural integrity of the roofs, the system type, sizing, costs and savings. Budget costs assume existing roofs are structurally sound, do not need to be replaced, and can accommodate a solar system. For illustration purposes, a draft financial analysis pro forma is attached outlining all project costs and revenues.

Table 4.3-2
Budgetary Installation Costs

Memorial Junior School	$7,662,500
Bee Meadow Elementary School	$5,075,000
Salem Drive Elementary School	$2,375,000
Mountview Road Elementary School	$2,150,000

As stated above the estimated installation costs are based on significant experience with the pricing of solar installations in New Jersey, and are intended to provide the District with a realistic budget cost. A typical solar installation can vary in cost from $7.00 - $10.00 per watt depending on size, complexity of the system, labor rates, etc. Approximately 60-70% of that number is material costs while the balance is labor, engineering, etc. Like any installation, certain conditions can affect a price upward or downward. For purposes of this analysis the estimated installation cost does not include any roofing or structural work which may be required to maintain warranties or for additional structural support. We have included a budget of $9/watt for the solar system installation with an additional estimated budget of $100,000 for potential electric service work.

Refer to Section 7 for discussion on Solar Renewable Energy Certificates and other financing options for solar projects. The financial model in Appendix E provides an annual forecast illustration of project revenues and costs for 25 years.

4.3.2 Ground Source Heat Pump Systems

Geothermal systems utilize the constant temperature of the earth throughout the year (at depths from 5 ft. to 1,000 ft. the earth temperature remains at 53 deg. F) as the primary source of energy for the heating/cooling and domestic hot water production. Additionally, since the earth is maintained at a constant temperature from heat absorbed from the sun this energy is considered a "renewable resource," and therefore is not as reliant on existing supplies of fossil fuels

Even though this application requires significantly higher up-front costs, it has several advantages over conventional HVAC systems such as substantially lower operating and maintenance costs. The life span of the system is longer than conventional heating and cooling systems. Most loop fields are warranted for 25 to 50 years and are expected to last at least 50 to 100 years. However it is important to note that geothermal systems are more difficult to install in existing facilities and require higher capital cost due to having to complete significant infrastructure changes. Therefore, installation of a geothermal system is not recommended at any of the Hanover Schools at this point.

4.3.3 Wind Power Generation

On-site wind power generation typically utilizes a form of turbine, which is rotated with the flow of wind across it, this rotational force powers a generator, producing DC electricity. The DC electricity is then converted into AC electricity, which can be used for commercial power, or can be fed back into the power grid, reducing the overall electric demand. The size of the turbine is proportional to the amount of wind and concurrently the amount of energy it can produce. An ideal location for a wind turbine is 20 feet above any surrounding object within a 250 foot radius. In general this relates to a property size of one acre or more.

CDM has determined that it is tentatively feasible for the Hanover Township Public Schools to install a wind turbine energy system at the Schools in this report. This is primarily due to 22.9 year payback for averaged wind speeds. However, this

feasibility study was included in the audit report for the purpose of illustrating pre-incentive costs. There are many other incentives that could possibly provide additional funding which would reduce the payback period.

Because the Schools do not have a large area for installation of a larger wind turbine at any of the locations surveyed for the audit, a 10kW wind turbine was chosen. A turbine of this size could be installed in most locations. For the purpose of this feasibility analysis, CDM is recommending payback for 1-10kW wind turbine. Depending on area available, and funding, the School's may choose to install more than 1 wind turbine on the premises.

Utilizing 3Tier's FirstLook online wind mapping tool, it was determined that the local average wind speeds for Hanover Township ranged from 8.1mph to 11.6mph, or 3.6m/s to 5.2m/s at 80 meters above the ground. In general, around 9mph of average wind speed, as determined over the course of a year, is necessary to "fuel" the turbine. These values fall within the range of feasibility for installation of a new wind turbine system.

For the purposes of this feasibility analysis, CDM chose a 10kW Bergey wind turbine. This turbine size is used most often for small commercial applications. Power Curve data was determined through the use of the product specification sheets on vendor websites, and vendor provided tools. Actual turbine size, height, location, and manufacturer should be determined upon design of a wind turbine system.

The estimated wind speed data, associated wind probability distribution function (weibull value), turbulence losses, and other relevant data were then incorporated into Bergey's Wind Cad program to estimate the annual output for the wind turbine. Refer to Appendix K for Wind Cad Modeling.

In order to determine simple payback analysis of the proposed wind turbine, CDM used the vendor pricing information located on the Bergey Wind Turbine website (www.bergey.com), for more information on wind turbine cost estimation refer to Appendix H. By installing the proposed wind turbine, a School will offset between $841.30 and $2,431.70 per year in utility costs based on the minimum and maximum average local wind speeds and the average utility price of 0.1755 of the Schools. In addition, Renewable Energy Credits (REC's) are obtainable for renewable power and incentives are available through the Renewable Energy Incentive Program (REIP); refer to Section 7 for a more in depth explanation.

This simple payback calculation takes into account the incentive provided for wind turbines through the REIP program. For the first 16,000 kWh of production, the incentive is $3.20/kWh. For production between 16,000 kWh – 750,000 kWh the REIP program incentive is $0.50/kWh. CDM used this incentive as an upfront deduction from the Engineer's Opinion of Probable Cost. In addition, in order to benefit from the REIP incentive, the Township must purchase a wind turbine on the approved NJ Clean Energy list. CDM chose the Bergey wind turbine for this analysis as it is approved by the NJ Clean Energy program and is the appropriate size for smaller

commercial installations and the limited area available on the site. Refer to the NJ Clean Energy website for more information.

Table 4.3-1 includes a simple payback analysis for the installation of a wind turbine energy system at any School audited in this report. Refer to Appendix L for a more detailed wind turbine financing spreadsheet, including utility cost avoidance and REC's.

Table 4.3-1: Simple Payback Analysis for Wind Turbine Energy System

Parameter	Wind Turbine (Minimum Average Site Wind Speed – 8.1 mph)	Wind Turbine (Maximum Average Site Wind Speed – 11.6 mph)	Wind Turbine (Average Site Wind Speed – 9.9 mph)
Engineer's Opinion of Probable Cost	$68,489.69	$68,489.69	$68,489.69
Renewable Energy Incentive Program**	$15,341.00	$44,339.00	$28,109.00
Total Cost	$53,148.69	$24,150.69	$40,380.69
1st Year Production	4,794 kWh	13,846 kWh	8,784 kWh
Annual Estimated Electric Savings	$841.30	$2,431.70	$1,541.6
Annual Estimated REC Revenue	$120.00	$346.00	$220.00
Project Simple Payback	**55.3 Years**	**8.7 Years**	**22.9 Years**
Annual Return On Investment (AROI)	-2.2%	7.5%	0.4%
Lifetime Energy Savings (15 years)**	$29,240.92	$84,518.19	$53,581.13
Internal Rate of Return (IRR)	-3.0%	13.1%	3.1%
Net Present Value (NPV)	-$30,747	$40,598	$667

*Refer to Appendix K for Wind Cad Modeling

**REIP incentive is calculated for only the first year and is applied as a deduction.

Based on the simple payback model, summarized in Table 4.3-1, it would benefit the Township to further investigate the installation of a wind energy system for the School's in this report. This is primarily based on the initial upfront capital investment required for a wind turbine energy system installation and the 22.9 year average wind speed payback period. It is recommended that the Township pursue a wind feasibility study to investigate actual wind conditions for the area. This will lead to more precise results and a determination can be made if wind as renewable energy is actually feasible. Other options such as Power Purchase Agreements are potentially available as well to help finance the project. This technology is constantly changing and will most likely continue to lower in price.

It should be noted that CDM used only REC values, utility cost avoidance factors, and the REIP incentive in determining simple payback periods. As stated above, other incentives and financial programs such as Power Purchase Agreements are available

to help finance this installation. For example, if a Power Purchase Agreement is completed, the private company financing the project would benefit from the 30% tax credit. Other incentives such as CREB's and first year usage incentives could be available to the Authority in lowering the payback period. Refer to *www.dsireusa.org* for an extensive listing of possible incentives for the New Jersey area.

It should also be noted that the wind turbine represented above is for feasibility purposes only. If the Authority decides to install a wind turbine, different mounting heights, turbine sizes, and manufacturers should be considered. In addition, permits may be required for installation according to local zoning laws. The FAA must also be notified in order to give clearance for the tower, and for installation of aviation safety lights if necessary.

4.4 Additional Measures

As discussed in Section 2, it may be possible to reduce the plug load of the schools even further with the implementation of smart strips and energy star appliances. Smart Strips save energy by electronically unplugging all of the devices that are plugged into the "Automatically Switched outlets" when the device plugged into the control outlet is turned off. It is important to note that CDM is not suggesting that computers be plugged into the automatically switched off outlets, as there would be potential for the computers to be shut off mid-operation. There are a vast amount of computer peripherals that are typically left on after a computer is shut off, including monitors, scanners, printers and DSL/Cable modems. These peripherals can be plugged into the automatic outlets.

As an example, a computer room contains 30 computers and 4 printers. A standard Smart Strip has one 'control' outlet, six (6) outlets that are automatically switched off when the control device is and three (3) outlets that are always hot. An example of how the Township can implement the use of Smart Strips within this classroom is to plug a computer into the control outlet, five (5) monitors and a personal printer (8 W in standby mode) into the automatic outlets and three (3) computers into the always hot outlets. An LCD monitor can use up to 34W; in standby mode the monitor utilizes 1 – 2W. A CRT monitor typically utilizes around 75W. The following table 4.4-1 summarizes the payback of a Smart Strip, assuming 5 LCD monitors and 1 printer are automatically powered down that would otherwise been left on 8 hours/day and in standby mode 16 hours/day, 5 days/week for 9 months. In an average computer classroom, this example and energy savings can be recognized three or four times.

Table 4.4-1: Simple Payback

Smart Strip Classroom Application Example	
Predicted Annual Savings – 5 LCD monitors, 1 printer (kWH)	611
Total Annual Savings	$103
Initial Capital Cost	$40
Simple Payback (months)	**3.5**

Smart Strip Classroom Application Example	
Lifetime Energy Savings (15 years)	**$1,915**
Net Present Value (NPV)	**$1,189**

The following Table 4.4-2 summarizes other applications for the Smart Strip that may be applicable throughout the building:

Table 4.4-2 Applications for Smart Strips

Control Outlet	Switched Outlets
Computer	Monitors, printers, scanners, lamps
TV	VCR, DVD player, cable box
Lamp	Stereo, space heater

It was also noted that the School District consider the implementation of Energy Star appliances. This is recommended on an 'as-needed' basis.

In addition to replacing old appliances with Energy Star appliances, the following two maintenance procedures can work to save the energy consumed by the refrigerators. One is cleaning dirty condenser coils, twice a year. A refrigerator's condenser coils and cooling fins are located either under the unit behind a grille in the front or on the back of the appliance. The coils can be cleaned with a brush or vacuum cleaner hose. The second source of wasted energy associated with a refrigerator is the door seal. Realigning the door or replacing a no longer airtight door seal will work to improve energy efficiency.

It may also be considered that the 'Vending Misers' be purchased and utilized for vending machines throughout the school. A 'Vending Miser' powers down a vending machine when the surrounding area is unoccupied and automatically repowers when the area is occupied, utilizing an infrared sensor. Similarly to occupancy sensors on lighting fixtures; however, the vending miser also monitors the ambient temperature while the vending machine is powered down and uses this as sort of an internal thermostat to power up the machine and ensure that the drinks remain cold. The implementation of a 'Vending Miser' also reduces maintenance costs and extends the life of the machine, by reducing the number of compressor cycles. A 'Vending Miser' is a $180 investment, but has been found to reduce power consumption of a cold drink vending machine by an average of 46%.

Section 5
Evaluation of Energy Purchasing and Procurement Strategies

5.1 Energy Deregulation

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law, the deregulation of the market, allowed all consumers to shop for their electric supplier. The intent was to create a competitive market for electrical energy supply. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party supplier. Energy deregulation in New Jersey increased the energy buyers' options by separating the function of electricity distribution from that of electricity supply.

Jersey Central Power and Light (JCP&L) is currently the generator and supplier of electrical energy for the Township. Energy deregulation creates the opportunity to choose your electric generation supplier. The benefit of this is the ability to choose a supplier based on what is important to you, for example, lowest rate or how the electric generation supply is produced.

To sell electric generation service in New Jersey, electric power suppliers must be licensed by the New Jersey Board of Public Utilities (NJ BPU). They must also be registered with the local public utility (JCP&L) to sell electric service in that utility's service areas. The following suppliers are licensed with the NJ BPU and are registered to sell electric service in the JCP&L service territory:

- Amerada Hess Corp
- BOC Energy Services
- Con Edison Solutions, Inc.
- Constellation New Energy, Inc.
- Direct Energy, LLC.
- First Energy Solutions Corp.
- Glacial Energy
- Integrys Energy Service
- Liberty Power
- Pepco Energy Services, Inc.
- PP&L Energy Plus, LLC.
- Reliant Energy Solutions East, LLC.
- Sempra Energy Solutions
- South Jersey Energy
- Strategic Energy LLC
- Suez Energy Resources NA, Inc
- UGI Energy Services

5.1.1 Alternate Third Party Electrical Energy Supplier

In evaluating the potential for an alternative third party supplier, CDM contacted and requested a proposal for electrical service from Glacial Energy. The objective of which was to get an overall idea of whether or not switching electric energy suppliers is an avenue that should be pursued further to obtain electrical energy cost savings.

Glacial Energy has proposed a flat rate retail cost per kWH over the next 6 or 12 month period the four (4) electric accounts. The proposal is included in Appendix F.

The following table, Table 5.1-1, summarizes the annual cost savings available based on historical energy consumption and the proposed energy rate for a 12 month term. The retail rates used in this analysis represent the baseline generation rates from the two suppliers and do not include any applicable demand charges, societal benefits charges, transmission charges, energy charges, reconciliation charges, transitional assessment charges or system control charges that were included in the aggregate rates presented in Section 3. These baseline generation rates, are used for comparison purposes to identify any potential energy cost savings, as all other applicable charges cannot be avoided by switching suppliers. This summary table, which utilizes the historical electrical energy usage presented in Appendix A, confirms the information and available cost savings presented by Glacial Energy.

Table 5.1-1: Potential Energy Cost Savings with an Alternate Third Party Supplier – Glacial Energy

Service Location	Annual Consumption (kWh)	Projected Annual Cost with JCP&L(@ $0.12283/kWh)	Proposed Annual Cost with Glacial Energy (@ $0.11029/kWh)	Potential Annual Savings ($)
Memorial Junior Middle School	833,600	$102,391	$91,937	$10,454
Bee Meadow Elementary School	514,000	$63,134	$56,689	$6,445
Salem Drive Elementary School	250,960	$28,315	$27,678	$637
Mountview Road Elementary School	230,080	$25,959	$25,375	$584
			Total Potential Annual Savings:	**$18,120**

As energy cost savings are available by switching to a third party supplier, such as Glacial Energy, this is a recommended energy cost savings measure. The estimated

annual cost savings available by switching to Glacial Energy is an 8% savings. CDM recommends that the Township investigate this cost savings opportunity further and compare proposals from alternate third party suppliers to obtain the lowest electrical energy rates available.

5.2 Demand Response Program

Demand Response is a program through which a business can make money on reducing their electricity use when wholesale electricity prices are high or when heavy demand causes instability on the electric grid, which can result in voltage fluctuations or grid failure. Demand Response is an energy management program that compensates the participant for reducing their energy consumption at critical times. Demand Response is a highly efficient and cost effective means of reducing the potential for electrical grid failure and price volatility and is one of the best solutions to the Mid-Atlantic region's current energy challenges.

The program provides at least 2 hours advance notice before curtailment is required. There is typically 1 event a year that lasts about 3 hours in the summer months, when demand for electricity is at its highest.

Participation in Demand Response is generally done through companies known as Curtailment Service Providers, or CSPs, who are members of PJM Interconnection. There is no cost to enroll in the program and participation is voluntary, for instance, you can choose when you want to participate. In most cases, there is no penalty for declining to reduce your electricity use when you're asked to do so. The event is managed remotely by notifying your staff of the curtailment request and then enacting curtailment through your Building Management System. CSPs will share in a percentage of your savings, which may differ among various CSPs, since there may be costs associated with the hardware and /or software required for participation, so it is recommended that a number of CSPs be contacted to review their offers.

Section 6
Ranking of Energy Conservation and Retrofit Measures (ECRM)

6.1 ECRMs

The main objective of this energy audit is to identify potential Energy Conservation and Retrofit Measures and to determine whether or not the identified ECRM's are economically feasible to warrant the cost for planning and implementation of each measure. Economic feasibility of each identified measure was evaluated through a simple payback analysis. The simple payback analysis consists of establishing the Engineer's Opinion of Probable Construction Cost estimates; O&M cost savings estimates, projected annual energy savings estimates and the potential value of New Jersey Clean Energy Rebates or Renewable Energy Credits, if applicable. The simple payback period is then determined as the amount of time (years) until the energy savings associated with each measure amounts to the capital investment cost.

As discussed in Section 3, aggregate unit costs for electrical energy delivery and usage and natural gas delivery and usage, which accounts for all demand and tariff charges at each complex, was determined and utilized in the simple payback analyses.

In general, ECRMs having a payback period of 20 years or less have been recommended and only those recommended ECRMs within Section 4 of the report have been ranked for possible implementation. The most attractive rankings are those with the lowest simple payback period.

Ranking of ECRMs has been broken down into the following categories:

- Lighting Systems
- HVAC Systems
- Alternative Energy Systems

6.1.1 Lighting Systems

Table 6.1-1 includes the recommended ECRMs to provide energy savings for all building lighting systems, which include the installation of energy-efficient luminaires and occupancy sensors. A detailed discussion on building lighting systems is presented in Section 4.1.

Table 6.1-1 Ranking of Energy Savings Measures Summary – Lighting System Retrofits					
Building & Measure	**Engineer's Opinion of Probable Cost**	**Incentives**	**Total Cost**	**Annual Fiscal Savings**	**Simple Payback (Years)**
Mountview Road School – Interior Lighting	$38,679.53	$3,575	$35,104.53	$6,966.04	**5.0**
Bee Meadow School – Interior Lighting	$92,256.59	$5,595	$86,661.59	$14,726.88	**5.9**
Memorial Junior School – Interior Lighting	$104,460.97	$10,360	$94,100.97	$14,993.23	**6.3**
Salem Drive School – Interior Lighting	$46,441.31	$3,345	$43,096.31	$6,808.10	**6.3**
Bee Meadow School – Interior & Exterior Lighting	$173,215.16	$5,595	$167,620.16	$19,521.72	**8.6**
Salem Drive School – Interior & Exterior Lighting	$81,349.56	$3,345	$78,004.56	$8,772.10	**8.9**
Mountview Road School – Interior & Exterior Lighting	$91,041.91	$3,575	$87,466.91	$9,077.44	**9.6**
Memorial Junior School – Interior & Exterior Lighting	$216,468.09	$10,360	$206,108.09	$19,348.49	**10.7**
Bee Meadow School – Exterior Lighting	$80,958.56	$0	$80,958.56	$4,794.88	**16.9**
Salem Drive School – Exterior Lighting	$34,908.25	$0	$34,908.25	$1,964.00	**17.8**
Mountview Road School – Exterior Lighting	$52,362.38	$0	$52,362.38	$2,111.39	**24.8**
Memorial Junior School – Exterior Lighting	$112,007.13	$0	$112,007.13	$4,355.20	**25.7**

6.1.2 HVAC Systems

Table 6.1-2 includes the recommended ECRM to provide energy savings for building HVAC systems, which provide a simple payback of less than 20 years. A detailed discussion on building HVAC systems is presented in Section 4.2.

Table 6.1-2 Ranking of Energy Savings Measures Summary – HVAC System Upgrade					
Building & Measure	**Retrofit Cost**	**Incentives**	**Total Cost**	**Annual Fiscal Savings**	**Simple Payback (Years)**
Salem Drive School – Boiler Upgrade	$114,281	$4,000	$110,281	$13,837	**8.0**
Bee Meadow School – Boiler Upgrade	$171,422	$6,000	$165,422	$19,837	**8.3**
Mountview Road School – Boiler Upgrade	$114,281	$4,000	$110,281	$12,370	**8.9**
Memorial Junior School – Boiler Upgrade	$228,562	$8,000	$220,562	$23,480	**9.4**
Memorial Junior School – Air Source Heat Pumps	$89,090	$4,185	$84,905	$8,070	**10.5**

6.1.3 Alternative Energy Systems

Implementation of solar and wind energy generation systems have been evaluated to determine the economic feasibility for furnishing and installing such systems for Hanover Township. Based on the simple payback modeling performed, it would benefit the Township to further investigate installing the solar and wind energy generation systems. This is primarily based on an acceptable payback period.

Two major factors influencing the projects' financial evaluation is the variance of the prevailing energy market conditions and Renewable Energy Credit (REC) rates, with the largest impact to the simple payback model being the Solar Renewable Energy Credit (SREC) credit pricing.

Table 6.1-4, includes a ranking of the alternative energy system ECRMs evaluated for Hanover Township Public Schools.

Table 6.1-4 Ranking of Energy Savings Measures Summary – Alternative Energy Systems				
Building & Measure	**Engineer's Opinion of Probable Cost**	**Annual REC Credit**	**Annual Fiscal Savings**	**Simple Payback (Years)**
Memorial Junior School	$7,662,500	$517,685	$141,238	**11.6**
Bee Meadow School	$5,075,000	$339,972	$94,371	**11.7**
Salem Drive School	$2,375,000	$154,533	$43,141	**12.0**
Mountview Road School	$2,150,000	$139,079	$39,422	**12.0**

Table 6.1-4 Ranking of Energy Savings Measures Summary – Alternative Energy Systems				
Building & Measure	**Engineer's Opinion of Probable Cost**	**Annual REC Credit**	**Annual Fiscal Savings**	**Simple Payback (Years)**
Wind Turbine Installation (Average Site Wind Speed)	$40,380	$220	$1,541	**22.9**

Section 7
Grants, Incentives and Funding Sources

7.1 Renewable Energy

7.1.1 Renewable Energy Certificates (NJ BPU)

As part of New Jersey's Renewable Portfolio Standards (RPS), electric suppliers are required to have an annually-increasing percentage of their retail sales generated by renewable energy. Electric suppliers fulfill this obligation by purchasing renewable energy certificates (RECs) from the owners of solar generating systems. One REC is created for every 1,000 kWh (1 MWh) of renewable electricity generated. Although solar systems generate electricity and SRECs in tandem, the two are independent commodities and sold separately. The RPS, and creation of RECs, is intended to provide additional revenue flow and financial support for renewable energy projects in New Jersey. Class I RECs, which include electricity generation from wind, wave, tidal, geothermal and sustainable biomass typically trade at around $25/MWh. RECs generated from solar electricity, or SRECs, trade at $550/MWh due to supplemental funding from NJ PBU. The supplemental funding will decrease over time to $350/MWh.

7.1.2 Clean Energy Solutions Capital Investment Loan/Grant (NJ EDA)

NJ EDA in cooperation with NJ DEP is offering interest-free loans and grants for energy efficiency, combined heat and power (CHP) and renewable energy projects with total project capital equipment costs of at least $1 million. The interest-free loans are available for up to $5 million, a portion of which may be issued as a grant. The most recent round was closed as of October 2009, but new CESCI program updates will be posted at www.njeda.com. For additional information, contact CESCI@njeda.com or call 866-534-7789.

7.1.3 Renewable Energy Incentive Program (NJ BPU)

The Renewable Energy Incentive Program (REIP) provides rebates for installing solar, wind, and sustainable biomass systems in Smart Growth regions. Rebates of $1.00 per watt are available for solar electricity projects up to 50 kW in capacity. Wind systems can receive rebates up to $3.20 per expected kWh produced. Sustainable biomass rebates start at $4.00 per watt installed with a maximum incentive amount of 30 percent of project costs. REIP will give out $53.25 million in rebates from 2009 - 2012. Project owners must complete the Pay for Performance Program, Direct Install or Local Municipal audit, or the rebate will be reduced by $0.10 per watt. For more information on REIP, please see www.njcleanenergy.com.

7.1.4 Grid Connected Renewables Program (NJ BPU)

The New Jersey Grid Connected Renewables Program offers competitive incentives for wind and sustainable biomass electricity generation projects larger than 1 Megawatt (MW). Applications for the most recent round of funding, which totaled $6

million, were due January 8, 2010. Requests for Proposals (RFPs) for the next round will be posted at www.njcleanenergy.com and www.state.nj.us/bpu. A total of roughly $16 million is available for incentives under this program during 2010. Most of the incentives offered under this program will take the form of a payment for energy production ($/MWh) once the project is operating. Incentives range up to $58.49/MWh for publicly-owned wastewater biogas projects. Up to 10% of the incentive may be requested in the form of a lump grant to cover up-front costs such as financing fees, interconnection fees, project design, permitting, and construction costs.

7.1.5 Utility Financing Programs

All four Electric Distribution Companies (EDCs) in New Jersey have developed long term contracting or financing programs for the development of solar energy systems. In all of the programs, Solar Renewable Energy Credits (SRECs) generated by the solar energy systems will be sold at auction to energy suppliers who are required to purchase a certain quantity of SRECs to meet their Renewable Portfolio Standard requirements.

7.1.6 Renewable Energy Manufacturing Incentive (NJ BPU)

New Jersey's Renewable Energy Manufacturing Incentive (REMI) program provides rebates to purchase and install solar panels, inverters, and racking systems manufactured in New Jersey. Rebates for panels start at $0.25 per watt and rebates for racking systems and inverters start at $0.15 per watt for solar projects up to 500 kW in capacity. To be eligible for REMI, applicants must apply to either the Renewable Energy Incentive Program (REIP) or the SREC Registration Program (SRP).

7.1.7 PSE&G Solar Loan Program

Public Service Electric and Gas (PSE&G) of New Jersey will offer $143 million in loans to their customers for solar electric systems in 2009-2010. Their Solar Loan program will provide 15-year loans at an interest rate of 11.3092% to cover 40-60% of the cost of solar systems 500 kW in capacity or less. PSE&G customers may repay the loan through cash payments or by signing over their Solar Renewable Energy Certificates (SRECs) to PSE&G. Loan applications are scheduled to be accepted on a quarterly basis. For more information, call 973-430-8460.

7.1.8 Clean Renewable Energy Bonds (IRS)

CREBs are 0% interest bonds typically issued for up to approximately $3.0 million administered by the Internal Revenue Service (IRS). Last year, $2.2 billion in CREBs was allocated to municipal entities to fund 610 renewable energy projects, including anaerobic digestion. IRS has been allocating funding for CREBs annually since 2005. Last year, IRS solicited applications starting in April, which were due in August. The IRS is expected to receive additional funding for CREBs and release another round of solicitations in 2010.

7.1.9 Qualified Energy Conservation Bonds (IRS)

These IRS 0% interest bonds are very similar to CREBs except they are allocated based on state and county population. New Jersey was allocated $90 million as part of the ARRA stimulus fund. QECBs are typically distributed through municipal bond banks or state economic development agencies.

7.1.10 Global Climate Change Mitigation Incentive Fund (US EDA)

The Economic Development Agency (part of the U.S. Department of Commerce) administers the GCCMIF to public works projects that reduce greenhouse gas emissions and creates new jobs. In FY 2009, $15 million was allocated to the fund, and additional funding is expected to be allocated in FY 2010. Applications are due on a rolling basis. The program does not have a maximum grant amount but does limit the grant to 50 percent of the project cost.

7.1.11 Private Tax-Exempt Financing

Similar to traditional municipal bond financing, there are many private financial service companies that offer a myriad of options for tax-exempt financing of municipal projects. The providers of these services suggest that this capital can be offered at competitive rates in an expedited timeframe and with fewer complications when compared to traditional municipal financing methods. Though these factors would need to be compared on a case-by-case basis, the one distinct advantage to private financing on the current project would likely be the flexibility to structure payments to meet budget needs with consideration given to the terms and conditions of existing loan and/or bond agreements. For example, this mechanism could be used to limit the initial debt payments when the current bond debt is the greatest and the operations savings of the project has yet to be fully realized. It should also be noted that, in many cases, the construction and long term financing can be rolled into a single private financing agreement. Also, in some instances, equipment manufacturers have the ability to offer competitive financing terms (e.g. Siemens Financial Services Corporation), though financing from these sources is generally contingent upon a substantial portion of the project cost (~20% to 30%) being for their respective equipment.

7.1.12 Performance Based Contracts (ESCOs)

A second financing alternative for a project of this nature would be to enter into a Performance Based Contract with an Energy Services Company (ESCO). The premise of this type of contract is that it requires no initial municipal capital contributions in order to implement the project - instead relying on future operations cost savings and/or energy production, to fund the annual payments. Prior to entering into an agreement for the funding of the project, an ECSO would perform an energy audit and/or conceptual studies to confirm future energy cost savings or energy production inherent with the projects implementation and operation. The contract would then be formulated based on some measurable parameter(s) (sludge reduction, energy

production, etc) which would be verified by measurement throughout the contract duration. The savings in energy costs or energy production would then be used to pay back the capital investment of the project over the contract time period (typically on the order of 10-years or less). The ESCO would guarantee the agreed upon energy savings or energy production. If the project does not meet energy savings or production commitments, the ESCO pays the owner the equivalent difference.

With this funding alternative, the ownership and operation of the facility would be maintained by the original owner. A performance contract may also include ESCO operation and maintenance of the energy-related facilities if that were deemed appropriate. Significant ESCO's with experience in this area include Siemens Building Technologies, Chevron and Johnson Controls. CDM has functioned in several roles on performance based contracts including being the owner's representative and, on different contracts, providing design-build services (as a subcontractor to the ECSO). We can provide additional experience-based information upon request.

7.1.13 Power Purchase Agreements (SPCs)

More commonly referred to as a Build-Own-Transfer (BOT) agreement in the Water/Wastewater industry, a Power Purchase Agreement (PPA) also delivers a project with no initial capital contribution by the original owner. In this model, a Special Purpose Company (SPC) created by a developer, would own the energy production facilities. Within the framework of a PPA, a SPC will typically lease property from the owners for construction and operation of the new facilities. The funding and construction of the new facilities would be performed by the SPC who would then own and operate the facilities for the duration of the contract (typically 20 to 30 years). Throughout that period of time, the original owner would purchase power from the SPC at a pre-negotiated rate which would take into account the initial capital cost, operation and maintenance of the constructed facility, ancillary benefits of the project and investor returns on investment. For renewable energy, financial incentives may enable this financing approach to compete favorably with utility power tariffs. Incentives include state and local tax credits, renewable energy credits, and Federal energy production tax credits or energy investment tax credits. It is expected that a number of experienced companies and developers may be interested in a PPA for New Jersey municipal renewable energy projects.

7.2 Energy Efficiency

7.2.1 Introduction

New Jersey's Clean Energy Program (NJ CEP) promotes increased energy efficiency and the use of clean, renewable sources of energy including solar, wind, geothermal, and sustainable biomass. The results for New Jersey are a stronger economy, less pollution, lower costs, and reduced demand for electricity. NJCEP offers financial incentives, programs, and services for residential, commercial, and municipal customers.

NJCEP reduces the need to generate electricity and burn natural gas which eliminates the pollution that would have been caused by such electric generation or natural gas usage. The benefits of these programs continue for the life of the measures installed, which on average is about 15 years. Thus, the public receives substantial environmental and public health benefits from programs that also lower energy bills and benefit the economy.

7.2.2 New Jersey Smart Start Buildings Program (NJ BPU)

The New Jersey Smart Start Buildings Program offers rebate incentives for several qualifying equipment such as high efficient premium motors and lighting, and lighting controls.

Incentive information and incentive calculation worksheets are provided for the various new equipment installation identified in this report and are included in Appendix G.

7.2.3 Pay for Performance Program (NJ BPU)

Another program offered through the New Jersey Smart Start Program, is the Pay for Performance Program. Commercial, industrial and institutional buildings are eligible for participation if not already receiving Energy Efficiency and Conservation Block Grants.

Incentives are available for buildings that are able to present an Energy Reduction Plans that reduce the building's current energy consumption by 15% or more, in addition to incentives for installing the recommended measures and incentives for presenting the energy savings in a post-construction benchmarking report. No more than 50% of the total energy savings may be derived from lighting retrofits. In addition, the total energy savings of 15% may not come from the implementation of one energy savings measure. The incentive structure is provided in Appendix G.

The recommended ECRM's presented in this report are expected to warrant participation in this program.

7.2.4 Direct Install (NJ BPU)

Owners of existing small to mid-size commercial and industrial facilities with a peak electric demand that did not exceed 200 kW in any of the preceding 12 months are eligible to participate in Direct Install. Buildings must be located in New Jersey and served by one of the state's public, regulated electric or natural gas utility companies.

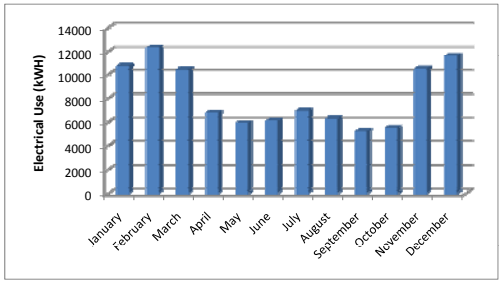
This program will cover up to 80% of the retro-fitting costs associated with the use of new energy efficient equipment. Lighting, HVAC, refrigeration, motors, natural gas systems, and variable frequency drives are covered under the Direct Install program.

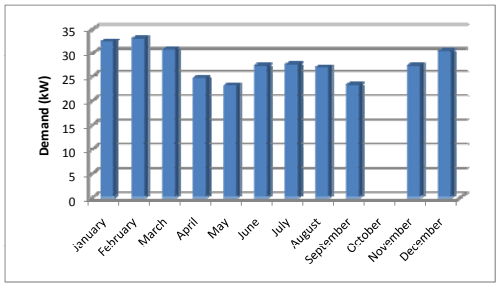
APPENDIX A

UTILITY BILL INFORMATION

Electric Bills - DPW						
			Account # 1000056283979			
Comments	Month	Year	JCP&L Charges	kWH	Cost Per KWH	Measured Demand
	December	2006	$1,403.60	10480	$0.13	32.8
	January	2007	$1,384.28	10,320	$0.13	31.6
	February	2007	$1,814.63	14,040	$0.13	34.0
	March	2007	$1,297.90	10,080	$0.13	29.2
	April	2007	$918.22	6,960	$0.13	23.6
	May	2007	$957.40	5,840	$0.16	24.4
	June	2007	$1,055.55	5,640	$0.19	28.8
	July	2007				
	August	2007				
	September	2007	$822.95	5,440	$0.15	24.0
	October	2007				
	November	2007				
	December	2007	$1,756.85	11,720	$0.15	28.0
	January	2008	$1,700.74	11,120	$0.15	33.2
from spreadsheet provided, not actual bill	February	2008	$1,810.08	12,080	$0.15	
from spreadsheet provided, not actual bill	March	2008	$1,606.26	11,200	$0.14	
	April	2008	$1,002.56	6,640	$0.15	25.6
	May	2008	$998.55	5,720	$0.17	21.6
from spreadsheet provided, not actual bill	June	2008	$1,225.70	6,480	$0.19	
	July	2008	$1,410.60	7,600	$0.19	28.0
from spreadsheet provided, not actual bill	August	2008	$1,102.95	5,760	$0.19	
	September	2008				
from spreadsheet provided, not actual bill	October	2008	$906.88	5,480	$0.17	
	November	2008	$1,627.44	10,520	$0.15	27.2
	December	2008	$2,026.40	12,680	$0.16	30.4
	January	2009				
	February	2009	$1,784.88	10,920	$0.16	32.0
	March	2009	$1,622.58	10,000	$0.16	32.4
	April	2009				
	May	2009	$1,166.81	6,200	$0.19	23.2
	June	2009	$1,150.90	6,200	$0.19	25.6
	July	2009	$1,178.09	6,320	$0.19	26.8
	August	2009	$1,250.86	6,840	$0.18	26.8
	September	2009	$812.62	4,760	$0.17	22.4
	October	2009				
	November	2009				

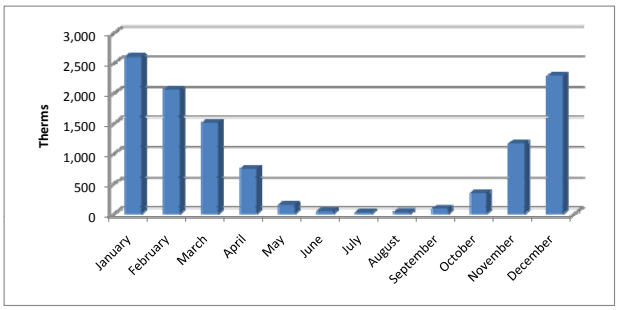
Month	Average Use (KWH)	Average Demand (KW)
January	10720	32
February	12347	33
March	10427	31
April	6800	25
May	5920	23
June	6107	27
July	6960	27
August	6300	27
September	5227	23
October	5480	
November	10520	27
December	11627	30
Total	**98433**	





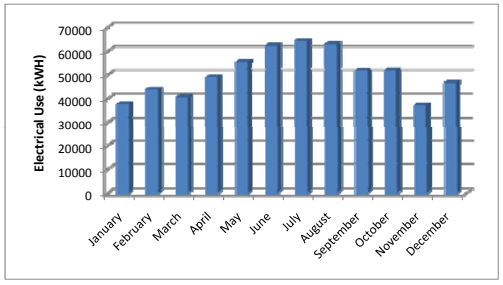
Natural Gas Bills - DPW						
NJNG Account #22-0009-3099-52, Meter# 00522745						
Date	Year	Use (Therms)	Total Charge	Cost/Therm	Month	Adjusted Monthly Usage
Jan 17 - Feb 20	2007	3121.07	$4,022.02	$1.29	January	
Feb 20 - Mar 20	2007	2125.20	$2,932.59	$1.38	February	
Mar 20 - May 17	2007	1140.70	$1,608.03	$1.41	March	
	2007				April	
	2007				May	
	2007				June	
	2007				July	
	2007				August	
	2007				September	
	2007				October	
	2007				November	
	2007				December	
Jan 17 - Feb 20	2008	2223.60	$3,176.99	$1.43	January	2,224
Feb 20 - Mar 18	2008	1518.65	$2,313.84	$1.52	February	1,989
Mar 18 - May 19	2008	1002.82	$1,699.90	$1.70	March	1,347
	2008	116.96	$232.00		April	708
May 19 - July 22	2008	86.98	$197.12	$2.27	May	107
	2008				June	58
July 22 - Aug 18	2008	30.46	$68.54	$2.25	July	10
Aug 18 - Sept 12	2008	1.05	$13.69		August	21
Sept 12 - Oct 17	2008	75.35	$138.43	$1.84	September	26
Oct 17 - Nov 17	2008	877.72	$1,337.37	$1.52	October	343
	2008	1744.77	$2,444.77	$1.40	November	1,167
Dec 18 - Jan 19	2008	3360.47	$4,428.51	$1.32	December	2,283
Jan 19 - Feb 19	2009	2194.69	$2,638.82	$1.20	January	2,972
Feb 19 - Mar 18	2009	1983.37	$2,188.99	$1.10	February	2,124
Mar 18 - Apr 21	2009	1046.00	$1,194.61	$1.14	March	1,671
Apr 21 - May 22	2009	282.12	$454.14	$1.61	April	791
May 22 - June 19	2009	16.67	$211.32		May	194
Jun 19 - Jul 18	2009	37.54	$231.91		June	24
Jul 18 - Aug 17	2009	29.16	$223.55		July	35
Aug 17 - Sept 21	2009	52.06	$241.76		August	37
Sep 21 - Oct 21	2009	320.38	490.00	$1.53	September	142

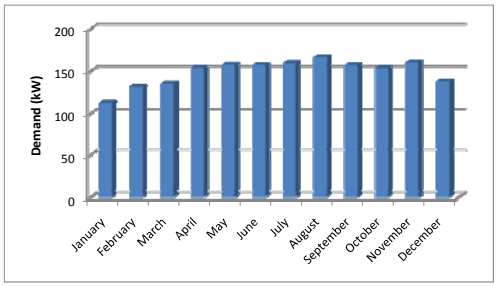
Month	Average Therm Usage
January	2,598
February	2,056
March	1,509
April	749
May	150
June	41
July	22
August	29
September	84
October	343
November	1,167
December	2,283



Electric Bills - Library						
			Account # 100007439795			
Comments	Month	Year	JCP&L Charges	kWH	Cost Per KWH	Measured Demand
	December	2006				
	January	2007	$4,722.25	35,520	$0.13	102.0
	February	2007	$6,223.69	49,120	$0.13	101.1
	March	2007	$5,544.90	42,360	$0.13	136.4
	April	2007	$6,319.50	48,280	$0.13	155.4
	May	2007	$8,686.14	55,440	$0.16	170.2
	June	2007				
	July	2007	$11,582.95	67,960	$0.17	
	August	2007	$10,885.57	63,240	$0.17	177.0
	September	2007	$7,963.44	56,680	$0.14	154.5
	October	2007	$8,239.32	58,600	$0.14	155.0
	November	2007	$3,952.88	26,680	$0.15	182.2
	December	2007	$5,990.86	45,640	$0.13	
	January	2008	$6,292.40	40,520	$0.16	135.4
	February	2008	$6,297.13	40,320	$0.16	148.0
	March	2008	$5,994.71	41,440	$0.14	118.7
	April	2008	$7,327.74	50,320	$0.15	151.6
	May	2008	$8,742.37	51,720	$0.17	151.8
	June	2008	$11,808.18	67,080	$0.18	153.8
	July	2008	$11,296.50	63,720	$0.18	157.6
	August	2008	$10,512.42	59,040	$0.18	161.2
	September	2008	$8,852.83	57,720	$0.15	156.2
	October	2008	$7,171.85	45,320	$0.16	153.0
	November	2008	$7,309.05	47,720	$0.15	138.0
	December	2008	$5,602.17	33,040	$0.17	128.8
	January	2009	$5,985.06	36,720	$0.16	100.9
	February	2009	$7,017.05	42,120	$0.17	146.3
	March	2009	$6,378.68	38,240	$0.17	150.5
	April	2009	$7,820.32	48,200	$0.16	155.6
	May	2009	$10,486.76	59,000	$0.18	151.0
	June	2009	$10,130.81	57,400	$0.18	160.6
	July	2009	$10,662.85	61,080	$0.17	161.4
	August	2009	$11,464.82	66,480	$0.17	161.2
	September	2009	$8,529.68	53,360	$0.16	160.5
	October	2009				
	November	2009				

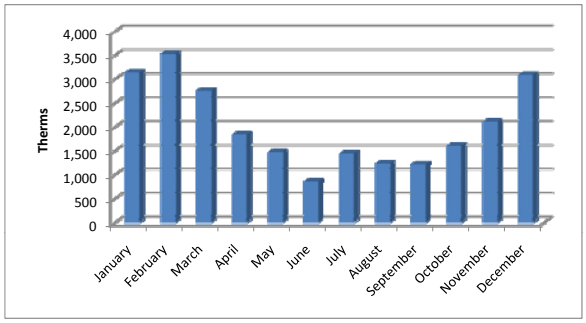
Month	Average Use (KWH)	Average Demand (KW)
January	37587	113
February	43853	132
March	40680	135
April	48933	154
May	55387	158
June	62240	157
July	64253	160
August	62920	166
September	51787	157
October	51960	154
November	37200	160
December	46680	138
Total	**603480**	





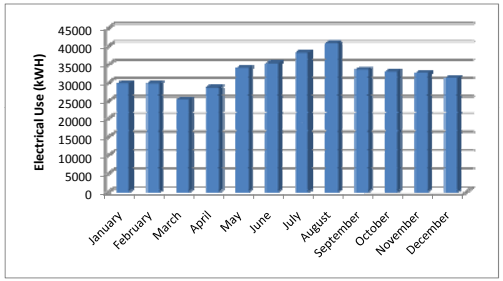
Natural Gas Bills - Library						
NJNG Account #04-1220-8825-13, Meter# 00543815						
Date	Year	Use (Therms)	Total Charge	Cost/Therm	Month	Adjusted Monthly Usage
Dec 21 - Jan 23	2006	3979.24	$4,979.17	$1.25	December	
Jan 23 - Feb 22	2007	4467.91	$5,709.95	$1.28	January	4,142
Feb 22 - Mar 23	2007	3686.88	$5,081.29	$1.38	February	4,208
Mar 23 - Apr 24	2007	864.43	$1,212.25	$1.40	March	2,746
Apr 24 - May 18	2007	3539.29	$4,854.05	$1.37	April	1,756
May 18 - June 22	2007	28.46	$54.47	$1.91	May	2,369
June 22 - July 25	2007	3329.9	$4,407.33	$1.32	June	1,129
July 25 - Aug 21	2007	1303.42	$1,633.60	$1.25	July	2,654
Aug 21 - Sept 21	2007	1754.3	$2,051.05	$1.17	August	1,454
Sept 21 - Oct 22	2007	1677.81	$2,070.83	$1.23	September	1,729
Oct 22 - Nov 17	2007	1770.07	$2,384.20	$1.35	October	1,709
Nov 17 - Dec 21	2007	3601.94	$4,897.81	$1.36	November	2,381
Dec 21 - Jan 18	2007	1996.21	$2,724.96	$1.37	December	3,067
Jan 18 - Feb 22	2008	3253.77	$4,633.79	$1.42	January	2,415
Feb 22 - Mar 19	2008	2923.33	$4,471.00	$1.53	February	3,144
Mar 19 - Apr 23	2008	2559.75	$4,130.35	$1.61	March	2,802
Apr 23 - May 21	2008	143.78	$267.35	$1.86	April	1,754
May 21 - July 22	2008	315.84	$636.32	$2.01	May	201
	2008				June	211
July 22 - Aug 20	2008	1529.9	$2,633.21	$1.72	July	510
Aug 20 - Sept 16	2008	958.83	$1,486.23	$1.55	August	1,340
Sept 16 - Oct 21	2008	1725.35	$2,484.80	$1.44	September	1,214
Oct 21 - Nov 18	2008	1083.87	$1,680.55	$1.55	October	1,512
Nov 18 - Dec 22	2008	3351.19	$4,608.45	$1.38	November	1,840
Dec 22 - Jan 23	2008	2659.71	$3,575.80	$1.34	December	3,121
Jan 23 - Feb 23	2009	3301.56	$3,822.21	$1.16	January	2,874
Feb 23 - Mar 25	2009	3144.98	$3,386.52	$1.08	February	3,249
Mar 25 - Apr 23	2009	1974.64	$2,146.15	$1.09	March	2,755
Apr 23 - May 23	2009	2108.00	$2,192.63	$1.04	April	2,019
May 23 - June 23	2009	1331.15	$1,501.24	$1.13	May	1,849
June 23 - Jul 20	2009	1075.89	$1,305.33	$1.21	June	1,246
Jul 20 - Aug 21	2009	1375.62	$1,563.94	$1.14	July	1,176
	2009				August	917
Sep 23 - Oct 23	2009	2153.95	$2,245.86	$1.04	September	718

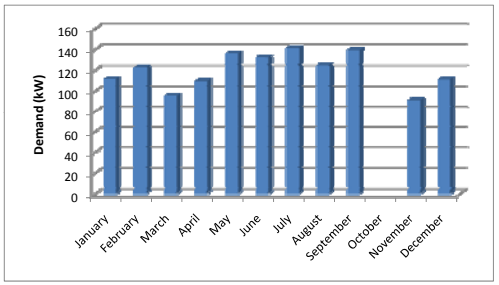
Month	Average Therm Usage
January	3,144
February	3,534
March	2,768
April	1,843
May	1,473
June	862
July	1,447
August	1,237
September	1,220
October	1,610
November	2,110
December	3,094



Electric Bills - Municipal Building						
			Account # 100007989070			
Comments	Month	Year	JCP&L Charges	kWH	Cost Per KWH	Measured Demand
	December	2006	$4,108.07	31,120	$0.13	167.8
	January	2007	$3,728.89	27,680	$0.13	167.8
	February	2007	$4,239.86	32,400	$0.13	167.8
	March	2007	$3,707.21	27,200	$0.14	110.3
	April	2007	$4,019.71	30,080	$0.13	109.6
	May	2007	$5,741.91	34,480	$0.17	152.1
	June	2007	$6,951.93	39,600	$0.18	135.4
	July	2007	$6,909.89	38,240	$0.18	159.1
	August	2007				
	September	2007	$5,383.63	35,600	$0.15	156.1
	October	2007				
	November	2007				
	December	2007	$4,869.10	32,240	$0.15	83.0
	January	2008	$4,572.29	30,160	$0.15	83.6
from spreadsheet provided, not actual bill	February	2008	$4,050.17	26,560	$0.15	
from spreadsheet provided, not actual bill	March	2008	$4,208.51	19,120	$0.22	
	April	2008	$4,149.67	27,280	$0.15	109.6
	May	2008	$5,724.08	32,480	$0.18	128.2
	June	2008	$6,517.92	34,320		
	July	2008	$7,506.98	40,800	$0.18	140.4
	August	2008				
from spreadsheet provided, not actual bill	September	2008	$6,403.47	34,320	$0.19	
from spreadsheet provided, not actual bill	October	2008	$5,271.12	32,960	$0.16	
	November	2008	$5,102.74	32,560	$0.16	91.2
	December	2008	$4,903.03	30,240	$0.16	83.0
	January	2009	$5,083.74	31,280	$0.16	83.7
	February	2009	$4,839.09	30,080	$0.16	77.9
	March	2009	$4,717.67	29,680	$0.16	80.8
	April	2009				
	May	2009	$6,509.36	34,720	$0.19	128.2
	June	2009	$5,899.78	31,840	$0.19	129.5
	July	2009	$6,442.46	35,520	$0.18	124.4
	August	2009	$7,214.45	40,800	$0.18	124.7
	September	2009	$5,094.50	30,640	$0.17	122.6

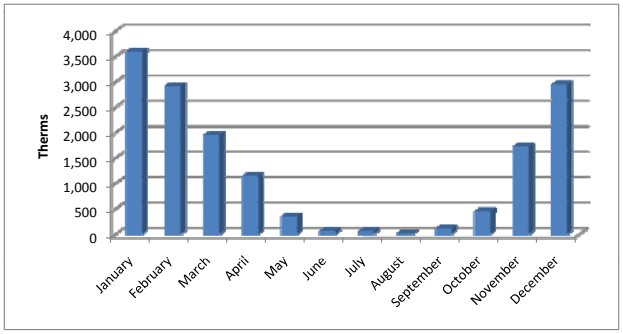
Month	Average Use (KWH)	Average Demand (KW)
January	29707	112
February	29680	123
March	25333	96
April	28680	110
May	33893	136
June	35253	132
July	38187	141
August	40800	125
September	33520	139
October	32960	
November	32560	91
December	31200	111
Total	**391773**	





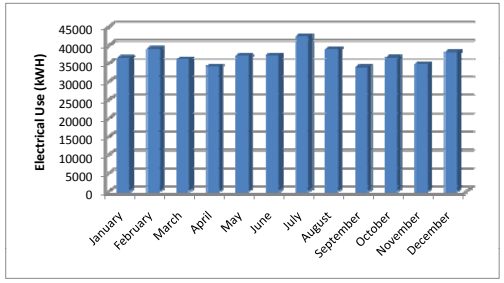
Natural Gas Bills - Municipal Building						
NJNG Account #06-1228-0985-12, Meter# 00535669						
Date	**Year**	**Use (Therms)**	**Total Charge**	**Cost/Therm**	**Month**	**Adjusted Monthly Usage**
Jan 18 - Feb 20	2007	4407.00	$5,633.61	$1.28	January	
Feb 20 - Mar 20	2007	1808.98	$2,498.48	$1.38	February	3,541
Mar 20 - Apr 20	2007	1747.74	$2,437.65	$1.39	March	1,789
Apr 20 - May 18	2007	485.64	$684.88	$1.41	April	1,327
May 18 - June 20	2007	56.68	$93.51	$1.65	May	343
June 20 - July 21	2007	188.43	$265.74	$1.41	June	101
July 21 - Aug 17	2007	3.21	$19.12	$5.96	July	127
Aug 17 - Sept 18	2007	177.69	$222.67	$1.25	August	61
Sept 18 - Oct 18	2007	100.51	$136.94	$1.36	September	152
Oct 18 - Nov 14	2007	976.66	$1,300.72	$1.33	October	393
	2007				November	
	2007				December	
Jan 16 - Feb 20	2008	2791.55	$3,984.61	$1.43	January	
Feb 20 - Mar 19	2008	2333.91	$3,572.58	$1.53	February	2,639
Mar 19 - Apr 21	2008	1298.63	$2,094.50	$1.61	March	1,989
Apr 21 - May 19	2008	664.5	$1,168.17	$1.76	April	1,087
May 19 - June 19	2008	109.66	$218.48	$1.99	May	480
June 19 - July 22	2008	76.92	$167.13	$2.17	June	99
July 22 - Aug 18	2008	3.21	$20.73	$6.46	July	52
Aug 18 - Sept 15	2008	5.34	$23.29	$4.36	August	4
Sept 15 - Oct 17	2008	74.67	$133.59	$1.79	September	28
Oct 17 - Nov 14	2008	1399.76	$2,133.35	$1.52	October	516
	2008	2391.21	$3,380.04	$1.41	November	1,730
Dec 18 - Jan 21	2008	4074.65	$5,395.50	$1.32	December	2,952
Jan 21 - Feb 19	2009	2660.7	$3,259.64	$1.23	January	3,603
Feb 19 - Mar 18	2009	2469.94	$2,780.03	$1.13	February	2,597
Mar 18 - Apr 21	2009	1375.53	$1,611.31	$1.17	March	2,105
Apr 21 - May 22	2009	320.63	$591.49	$1.84	April	1,024
May 22 - June 19	2009	3.19	$301.03	$94.37	May	215
Jun 19 - Jul 17	2009	10.63	$308.28	$29.00	June	6
Jul 17 - Aug 18		5.31	$303.12	$57.08	July	9
Aug 18 - Sep 21		13.80	$310.24	$22.48	August	8
Sep 21 - Oct 21		430.52	$693.17	$1.61	September	153

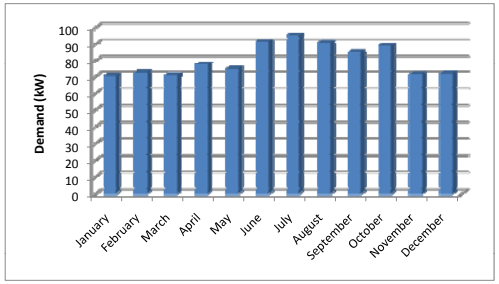
Month	Average Therm Usage
January	3,603
February	2,926
March	1,961
April	1,146
May	346
June	68
July	63
August	24
September	111
October	454
November	1,730
December	2,952



Electric Bills - Public Safety Building						
			Account # 1000043610425			
Comments	Month	Year	JCP&L Charges	kWH	Cost Per KWH	Measured Demand
	December	2006	$4,974.69	39760	$0.13	73.4
	January	2007	$4,603.95	36,160	$0.13	72.4
	February	2007	$5,133.14	40,880	$0.13	72.5
	March	2007	$4,944.71	40,640	$0.12	72.9
	April	2007	$4,451.40	35,800	$0.12	79.0
	May	2007	$5,944.41	40,400	$0.15	74.3
	June	2007	$6,348.23	37,000	$0.17	105.3
	July	2007	$7,335.47	43,840	$0.17	97.9
	August	2007	$6,266.52	37,120	$0.17	90.9
	September	2007	$5,561.47	41,040	$0.14	78.7
	October	2007	$5,102.15	36,640	$0.14	89.3
	November	2007				
	December	2007	$5,483.63	37,400	$0.15	70.0
	January	2008	$5,731.33	39,440	$0.15	71.0
from spreadsheet provided, not actual bill	February	2008	$5,369.55	36,880	$0.15	
from spreadsheet provided, not actual bill	March	2008	$5,436.02	39,360	$0.14	
	April	2008	$4,580.71	32,400	$0.14	76.4
	May	2008	$5,595.89	34,160	$0.16	77.9
from spreadsheet provided, not actual bill	June	2008	$6,398.39	35,680	$0.18	
	July	2008	$7,646.82	43,680	$0.18	94.1
from spreadsheet provided, not actual bill	August	2008	$7,126.78	40,720	$0.18	
from spreadsheet provided, not actual bill	September	2008	$4,901.99	31,880	$0.15	
	October	2008				
	November	2008	$5,239.60	34,680	$0.15	71.4
	December	2008	$5,872.21	37,440	$0.16	72.6
	January	2009	$5,394.61	34,120	$0.16	68.0
	February	2009	$6,164.98	39,400	$0.16	72.5
	March	2009	$4,477.35	28,520	$0.16	69.0
	April	2009				
	May	2009	$6,407.98	37,040	$0.17	72.6
	June	2009	$6,693.65	39,160	$0.17	78.2
	July	2009	$6,898.23	39,760	$0.17	94.1
	August	2009	$6,746.81	39,120	$0.17	90.9
	September	2009	$4,597.74	28,520	$0.16	91.8
	October	2009				
	November	2009				

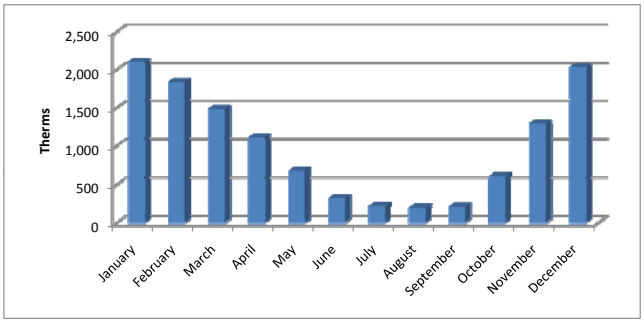
Month	Average Use (KWH)	Average Demand (KW)
January	36573	70
February	39053	73
March	36173	71
April	34100	78
May	37200	75
June	37280	92
July	42427	95
August	38987	91
September	33813	85
October	36640	89
November	34680	71
December	38200	72
Total	**445127**	





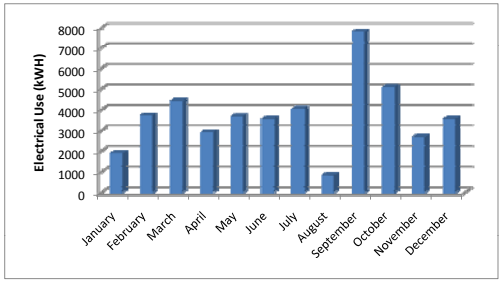
Natural Gas Bills - Public Safety Building						
NJNG Account #22-0007-7102-75, Meter# 00696524						
Date	**Year**	**Use (Therms)**	**Total Charge**	**Cost/Therm**	**Month**	**Adjusted Monthly Usage**
Jan 11 - Feb 13	2007	2242.91	$2,814.08	$1.25	January	
Feb 13 - Mar 15	2007	2237.44	$3,070.51	$1.37	February	2,240
Mar 15 - Apr 16	2007	1530.92	$2,140.78	$1.40	March	1,884
Apr 16 - May 11	2007	567.21	$794.67	$1.40	April	1,049
May 11 - June 14	2007	655.59	$920.79	$1.40	May	611
June 14 - July 18	2007	234.23	$328.54	$1.40	June	445
July 18 - Aug 13	2007	464.38	$597.27	$1.29	July	349
Aug 13 - Sept 13	2007	70.68	$98.75	$1.40	August	268
Sept 13 - Oct 12	2007	359.38	$441.28	$1.23	September	215
Oct 12 - Nov 7	2007	697.69	$913.89	$1.31	October	529
Nov 7 - Dec 13	2007	1936.84	$2,656.99	$1.37	November	1,317
	2007				December	
Jan 15 - Feb 13	2008	1917.57	$2,687.70	$1.40	January	1,918
Feb 13 - Mar 13	2008	1439.6	$2,178.96	$1.51	February	1,679
Mar 13 - Apr 15	2008	1295.64	$2,072.95	$1.60	March	1,368
	2008	818.61	$1,397.39	$1.71	April	1,057
	2008	476.38	$891.77	$1.87	May	647
June 13 - July 15	2008	204.24	$413.34	$2.02	June	340
July 15 - Aug 12	2008	261.67	$497.11	$1.90	July	233
Aug 12 - Sept 9	2008	267.34	$430.21	$1.61	August	265
Sept 9 - Oct 10	2008	342.76	$517.81	$1.51	September	305
Oct 10 - Nov 11	2008	1025.99	$1,581.88	$1.54	October	684
Nov 11 - Dec 12	2008	1509.14	$2,154.41	$1.43	November	1,268
Dec 12 - Jan 14	2008	2553.45	$3,463.43	$1.36	December	2,031
Jan 14 - Feb 12	2009	2013.69	$2,542.49	$1.26	January	2,284
Feb 12 - Mar 12	2009	1188.2	$1,430.91	$1.20	February	1,601
Mar 12 - Apr 15	2009	1232.71	$1,415.16	$1.15	March	1,210
Mar 12 - May 15	2009	1216.72	$1,599.23	$1.31	April	1,225
May 15 - June 15	2009	283.60	$485.66	$1.71	May	750
June 15 - Jul 13	2009	82.76	$304.07	$3.67	June	183
Jul 13 - Aug 12	2009	57.54	$280.60	$4.88	July	70
Aug 12 - Sep 15	2009	49.16	$269.64	$5.48	August	53
Sep 15 - Oct 14	2009	186.03	$392.78	$2.11	September	118

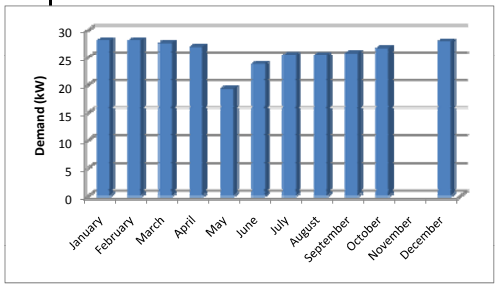
Month	Average Therm Usage
January	2,101
February	1,840
March	1,487
April	1,110
May	670
June	323
July	217
August	195
September	213
October	606
November	1,292
December	2,031



Electric Bills - Youth Center						
			Account # 1000038832836			
Comments	Month	Year	JCP&L Charges	kWH	Cost Per KWH	Measured Demand
	December	2006				
Billed on actual meter reading	January	2007	$297.61	1,600	$0.19	28.7
Billed on actual meter reading	February	2007	$526.55	3,600	$0.15	28.7
Billed on estimate usage	March	2007	$969.74	7,720	$0.13	28.7
Billed on estimate usage	April	2007	$475.81	3,280	$0.15	28.7
Billed on estimate usage	May	2007	$490.11	3,400	$0.14	19.3
Billed on estimate usage	June	2007	$912.82	5,200	$0.18	21.8
Billed on actual meter reading	July	2007	$382.00	1,360	$0.28	26.6
Billed on estimate usage	August	2007	$204.06	360	$0.57	28.1
	September	2007				
Billed on estimate usage	October	2007	$589.61	3,880	$0.15	27.6
	November	2007				
	December	2007				
Billed on estimate usage	January	2008	$379.20	2,000	$0.19	27.6
Billed on estimate usage	February	2008	$640.73	3,960	$0.16	27.6
from spreadsheet provided, not actual bill	March	2008	$675.58	3,690		
from spreadsheet provided, not actual bill	April	2008	$526.28	3,280		
Billed on estimate usage	May	2008	$615.36	3,960	$0.16	19.3
Billed on actual meter reading	June	2008	$505.51	2,120	$0.24	25.8
from spreadsheet provided, not actual bill	July	2008	$1,139.21	6,040		
Billed on estimate usage	August	2008	$318.28	1,000	$0.32	24.1
from spreadsheet provided, not actual bill	September	2008	$1,561.09	8,880		
from spreadsheet provided, not actual bill	October	2008	$1,554.15	8,880		
from spreadsheet provided, not actual bill	November	2008	$527.96	2,680		
Billed on estimate usage	December	2008	$621.01	3,560	$0.17	28.0
Billed on estimate usage	January	2009	$408.47	2,040	$0.20	28.0
Billed on estimate usage	February	2009	$635.38	3,600	$0.18	28.0
Billed on actual meter reading	March	2009	$374.48	1,880	$0.20	26.6
Billed on actual meter reading	April	2009	$464.99	2,200	$0.21	25.2
	May	2009				
Billed on actual meter reading	June	2009	$684.10	3,360	$0.20	23.7
Billed on actual meter reading	July	2009	$900.99	4,720	$0.19	24.3
Billed on estimate usage	August	2009	$334.08	1,120	$0.30	24.1
Billed on actual meter reading	September	2009	$1,200.19	6,760	$0.18	25.8
Billed on actual meter reading	October	2009	$459.11	2,520	$0.18	25.8
	November	2009				

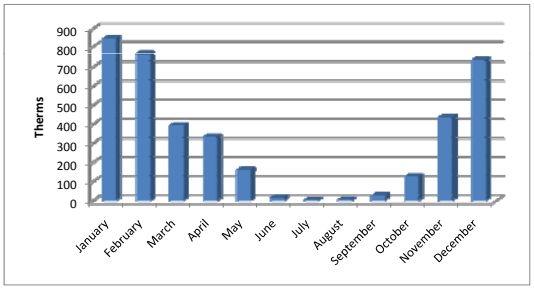
Month	Average Use (KWH)	Average Demand (KW)
January	1880	28
February	3720	28
March	4430	28
April	2920	27
May	3680	19
June	3560	24
July	4040	25
August	827	25
September	7820	26
October	5093	27
November	2680	
December	3560	28
Total	**44210**	





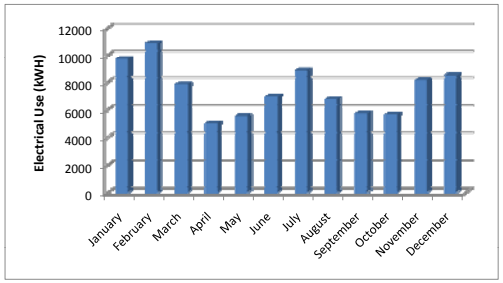
Natural Gas Bills - Youth Center							
NJNG Account #22-0005-6944-27, Meter# 00719452							
Date	Year	Use at Youth Center & Field House (Therms)	Use at Youth Center (65%) (Therms)	Total Charge	Cost/Therm	Month	Adjusted Monthly Usage
Jan 18 - Feb 20	2007	2956.47	1922	$3,814.34	$1.29	January	
Feb 20 - Mar 22	2007	2668.90	1735	$3,698.29	$1.39	February	
Mar 22 - May 19	2007	1125.99	732	$1,587.70	$1.41	March	
	2007					April	
	2007					May	
	2007					June	
	2007					July	
	2007					August	
	2007					September	
	2007					October	
	2007					November	
	2007					December	
Jan 16 - Feb 20	2008	1742	1132	$2,492.18	$1.43	January	
Feb 20 - Mar 19	2008	528.55	344	$820.75	$1.55	February	869
Mar 19 - Apr 21	2008	699.83	455	$1,135.69	$1.62	March	381
Apr 21 - May 16	2008	691.62	450	$1,172.92	$1.70	April	453
May 16 - July 21	2008	67.38	44	$161.86	$2.40	May	314
	2008					June	29
July 21 - Aug 18	2008	11.61	8	$35.47	$3.06	July	3
Aug 18 - Sept 15	2008	5.26	3	$23.18	$4.41	August	6
Sept 15 - Oct 17	2008	42.06	27	$87.27	$2.07	September	11
Oct 17 - Nov 17	2008	499.84	325	$851.30	$1.70	October	127
Nov 17 - Dec 18	2008	1023.95	666	$1,521.04	$1.49	November	438
Dec 18 - Jan 21	2008	1364.57	887	$1,908.39	$1.40	December	739
Jan 21 - Feb 19	2009	1176.94	765	$1,511.32	$1.28	January	846
Feb 19 - Mar 23	2009	700.06	455	$901.43	$1.29	February	662
Mar 23 - Apr 21	2009	488.67	318	$667.85	$1.37	March	409
Apr 21 - May 21	2009	21.00	14	$220.53		April	216
May 21 - June 19	2009	8.37	5	$209.01		May	11
Jul 19 - Jul 17	2009	8.38	5	$209.33		June	5
Jul 17 - Aug 17	2009	8.37	5	$209.22		July	5
Aug 17 - Sep 19	2009	5.23	3	$205.95		August	5
Sep 19 - Oct 21	2009	183.94	120	$370.10	$2.01	September	42

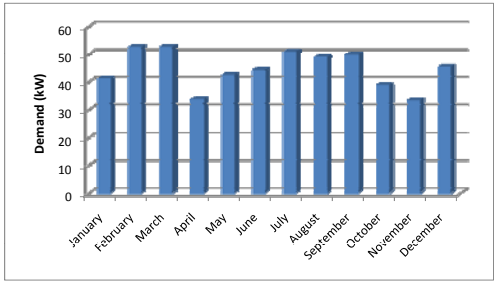
Month	Average Therm Usage
January	846
February	766
March	395
April	335
May	163
June	17
July	4
August	5
September	27
October	127
November	438
December	739



Electric Bills - Senior House						
			Account # 100008645416			
Comments	Month	Year	JCP&L Charges	kWH	Cost Per KWH	Measured Demand
	December	2006	$1,020.80	7,280	$0.14	54.6
	January	2007				
	February	2007	$1,483.59	11,280	$0.13	54.6
	March	2007	$1,077.26	8,000	$0.13	54.6
	April	2007	$955.99	6,880	$0.14	32.1
	May	2007	$1,052.27	5,880	$0.18	39.0
	June	2007	$1,437.58	7,320	$0.20	48.3
	July	2007	$1,596.02	8,240	$0.19	51.0
	August	2007	$1,333.11	6,600	$0.20	49.0
	September	2007	$1,211.00	7,320	$0.17	49.3
	October	2007	$939.19	5,640	$0.17	38.9
	November	2007				
	December	2007	$1,255.69	7,920	$0.16	30.8
	January	2008	$1,383.05	8,960	$0.15	51.0
from spreadsheet provided, not actual bill	February	2008	$1,524.82	10,808	$0.14	
from spreadsheet provided, not actual bill	March	2008	$1,164.10	7,760	$0.15	
	April	2008	$623.01	3,200	$0.19	35.3
	May	2008	$1,054.94	5,360	$0.20	39.0
from spreadsheet provided, not actual bill	June	2008	$1,549.70	7,520	$0.21	
	July	2008	$1,894.89	9,680	$0.20	51.0
	August	2008				
	September	2008				
from spreadsheet provided, not actual bill	October	2008	$1,089.93	5,680	$0.19	
	November	2008	$1,331.53	8,160	$0.16	33.4
	December	2008	$1,674.90	10,320	$0.16	51.1
	January	2009	$1,721.95	10,520	$0.16	31.4
	February	2009	$1,718.03	10,600	$0.16	51.1
	March	2009	$1,293.81	7,840	$0.17	51.1
	April	2009				
	May	2009	$1,245.53	5,480	$0.23	49.4
	June	2009	$1,219.41	6,040	$0.20	40.3
	July	2009	$1,714.65	8,720	$0.20	51.0
	August	2009	$1,419.20	6,960	$0.20	49.0
	September	2009	$901.16	4,160	$0.22	50.4
	October	2009				
	November	2009				

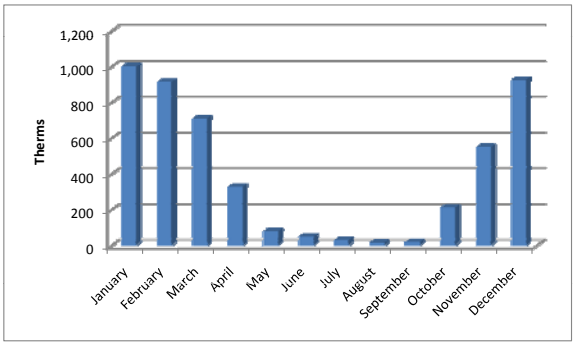
Month	Average Use (KWH)	Average Demand (KW)
January	9740	41
February	10896	53
March	7867	53
April	5040	34
May	5573	42
June	6960	44
July	8880	51
August	6780	49
September	5740	50
October	5660	39
November	8160	33
December	8507	46
Total	**89803**	





Natural Gas Bills - Senior House						
NJNG Account #22-0007-4665-24, Meter# 00696475						
Date	**Year**	**Use (Therms)**	**Total Charge**	**Cost/Therm**	**Month**	**Adjusted Monthly Usage**
Jan 11 - Feb 13	2007	946.49	$1,390.73	$1.47	January	
Feb 13 - Mar 15	2007	908.27	$1,335.18	$1.47	February	927
Mar 15 - Apr 16	2007	552.77	$818.50	$1.48	March	731
Apr 16 - May 11	2007	42.17	$73.37	$1.74	April	297
May 11 - June 14	2007	51.65	$90.16	$1.75	May	47
June 14 - July 18	2007	4.22	$21.24	$5.03	June	28
July 18 - Aug 13	2007	21.11	$42.76	$2.03	July	13
Aug 13 - Sept 14	2007	5.28	$22.77	$4.31	August	13
Sept 14 - Oct 12	2007	27.4	$54.81	$2.00	September	16
Oct 12 - Nov 7	2007	212.16	$317.86	$1.50	October	120
Nov 7 - Dec 13	2007	709.86	$1,041.24	$1.47	November	461
	2007				December	
Jan 15 - Feb 13	2008	925.14	$1,348.51	$1.46	January	925
Feb 13 - Mar 13	2008	694.58	$1,016.19	$1.46	February	810
Mar 13 - Apr 15	2008	567.43	$832.94	$1.47	March	631
	2008	48.28	$81.66	$1.69	April	308
	2008	101.78	$161.80	$1.59	May	75
June 13 - July 15	2008	26.32	$53.04	$2.02	June	64
July 15 - Aug 12	2008	11.61	$31.83	$2.74	July	19
Aug 12 - Sept 9	2008	9.47	$28.75	$3.04	August	11
Sept 9 - Oct 10	2008	34.7	$69.41	$2.00	September	22
Oct 10 - Nov 11	2008	575.61	$929.43	$1.61	October	305
Nov 11 - Dec 12	2008	702.58	$1,130.37	$1.61	November	639
Dec 12 - Jan 14	2008	1152.05	$1,722.55	$1.50	December	927
Jan 14 - Feb 12	2009	1005.79	$1,406.64	$1.40	January	1,079
Feb 12 - Mar 12	2009	1004.75	$1,379.40	$1.37	February	1,005
Mar 12 - Apr 15	2009	533.86	$797.92	$1.49	March	769
Apr 15 - May 15	2009	224.66	$378.45	$1.68	April	379
May 15 - June 15	2009	11.51	$43.11	$3.75	May	118
Jun 15 - Jul 13	2009	98.47	$179.93	$1.83	June	55
Jul 13 - Aug 12	2009	26.15	$66.28	$2.53	July	62
Aug 12 - Sep 15	2009	31.38	$74.77	$2.38	August	29

Month	Average Therm Usage
January	1,002
February	914
March	710
April	328
May	80
June	49
July	31
August	18
September	19
October	212
November	550
December	927



APPENDIX B

STATEMENT OF ENERGY PERFORMANCE

PORTFOLIO MANAGER REFERENCE SHEET

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Memorial Junior Middle School - Hanover Township BOE

Building ID: 2056080
For 12-month Period Ending: September 30, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: February 18, 2010

Facility
Memorial Junior Middle School - Hanover Township BOE
61 Highland Ave
Whippany, NJ 07981

Facility Owner
Hanover Township Board of Education
61 Highland Ave
Whippany , NJ 07981

Primary Contact for this Facility
Roy Aull
61 Highland Ave
Whippany , NJ 07981

Year Built: 1953
Gross Floor Area (ft²): 113,950

Energy Performance Rating[2] (1-100) 20

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	2,831,317
Natural Gas (kBtu)[4]	8,962,381
Total Energy (kBtu)	11,793,698

Energy Intensity[5]

Site (kBtu/ft²/yr)	104
Source (kBtu/ft²/yr)	165

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	908

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	78
National Average Source EUI	125
% Difference from National Average Source EUI	32%
Building Type	K-12 School

Stamp of Certifying Professional

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

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
Matthew Goss
15 British American Blvd
Latham, NY 12110

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Memorial Junior Middle School - Hanover Township BOE	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	61 Highland Ave, Whippany, NJ 07981	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Memorial Junior MS (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	113,950 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	Yes	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	199 (Default)	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	0	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	30 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	12(Optional)	Is this school in operation for at least 8 months of the year?		☐

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

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: FirstEnergy - Jersey Central Power & Lt Co

Fuel Type: Electricity

Meter: G23633058 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
08/09/2009	09/08/2009	63,360.00
07/09/2009	08/08/2009	70,400.00
06/09/2009	07/08/2009	71,680.00
05/09/2009	06/08/2009	61,760.00
04/09/2009	05/08/2009	62,400.00
03/09/2009	04/08/2009	64,960.00
02/09/2009	03/08/2009	77,920.00
01/09/2009	02/08/2009	79,040.00
12/09/2008	01/08/2009	63,520.00
11/07/2008	12/08/2008	82,880.00
10/07/2008	11/06/2008	69,440.00
G23633058 Consumption (kWh (thousand Watt-hours))		**767,360.00**
G23633058 Consumption (kBtu (thousand Btu))		**2,618,232.32**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**2,618,232.32**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Act#66-550-132-08 (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
08/29/2009	09/28/2009	435.10
07/29/2009	08/28/2009	339.71
06/29/2009	07/28/2009	411.06
05/29/2009	06/28/2009	448.33
04/29/2009	05/28/2009	742.59
03/29/2009	04/28/2009	11,055.03
03/01/2009	03/28/2009	12,906.67
01/29/2009	02/28/2009	15,826.25
12/29/2008	01/28/2009	16,389.15
11/29/2008	12/28/2008	12,600.02
10/29/2008	11/28/2008	11,283.85

Act#66-550-132-08 Consumption (therms)	**82,437.76**
Act#66-550-132-08 Consumption (kBtu (thousand Btu))	**8,243,776.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**8,243,776.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?	☐

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

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

Certifying Professional

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

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Memorial Junior Middle School - Hanover Township BOE
61 Highland Ave
Whippany, NJ 07981

Facility Owner
Hanover Township Board of Education
61 Highland Ave
Whippany , NJ 07981

Primary Contact for this Facility
Roy Aull
61 Highland Ave
Whippany , NJ 07981

General Information

Memorial Junior Middle School - Hanover Township BOE	
Gross Floor Area Excluding Parking: (ft^2)	113,950
Year Built	1953
For 12-month Evaluation Period Ending Date:	September 30, 2009

Facility Space Use Summary

Memorial Junior MS	
Space Type	K-12 School
Gross Floor Area(ft^2)	113,950
Open Weekends?	Yes
Number of PCs[d]	199
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	Yes
Percent Cooled	30
Percent Heated	100
Months[o]	12
High School?	No
School District[o]	Hanover Township

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 09/30/2009)	**Baseline** (Ending Date 09/30/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	20	20	75	N/A	50
Energy Intensity					
Site (kBtu/ft²)	104	104	61	N/A	78
Source (kBtu/ft²)	165	165	98	N/A	125
Energy Cost					
$/year	$ 163,814.34	$ 163,814.34	$ 96,769.17	N/A	$ 123,739.18
$/ft²/year	$ 1.44	$ 1.44	$ 0.85	N/A	$ 1.09
Greenhouse Gas Emissions					
$MtCO_2e$/year	908	908	536	N/A	686
$kgCO_2e/ft^2$/year	8	8	5	N/A	6

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

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

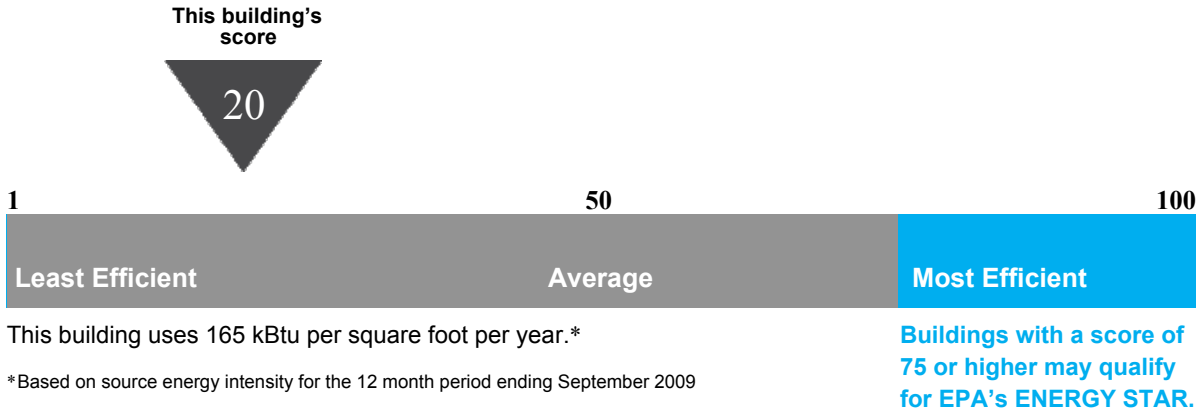
Statement of Energy Performance

2009

Memorial Junior Middle School - Hanover Township BOE
61 Highland Ave
Whippany, NJ 07981

Portfolio Manager Building ID: 2056080

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses 165 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending September 2009

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 02/18/2010

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Bee Meadow Elementary School - Hanover Township BOE

Building ID: 2056110
For 12-month Period Ending: October 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: February 18, 2010

Facility
Bee Meadow Elementary School - Hanover Township BOE
120 Reynolds Ave
Whippany, NJ 07981

Facility Owner
Hanover Township Board of Education
61 Highland Ave
Whippany , NJ 07981

Primary Contact for this Facility
Roy Aull
61 Highland Ave
Whippany , NJ 07981

Year Built: 1974
Gross Floor Area (ft²): 65,467

Energy Performance Rating[2] (1-100) 35

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	1,777,175
Natural Gas (kBtu)[4]	4,285,365
Total Energy (kBtu)	6,062,540

Energy Intensity[5]	
Site (kBtu/ft²/yr)	93
Source (kBtu/ft²/yr)	159

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	499

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison	
National Average Site EUI	81
National Average Source EUI	140
% Difference from National Average Source EUI	14%
Building Type	K-12 School

Stamp of Certifying Professional

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

Certifying Professional
Matthew Goss
15 British American Blvd
Latham, NY 12110

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

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Bee Meadow Elementary School - Hanover Township BOE	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	120 Reynolds Ave, Whippany, NJ 07981	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Bee Meadow ES (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	65,467 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	Yes	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	115 (Default)	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	0	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	40 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	12(Optional)	Is this school in operation for at least 8 months of the year?		☐

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

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: FirstEnergy - Jersey Central Power & Lt Co

Fuel Type: Electricity

Meter: W76165030 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
09/11/2009	10/10/2009	21,800.00
08/11/2009	09/10/2009	47,600.00
07/11/2009	08/10/2009	30,600.00
06/11/2009	07/10/2009	32,800.00
05/11/2009	06/10/2009	30,200.00
04/11/2009	05/10/2009	36,400.00
03/11/2009	04/10/2009	46,600.00
02/11/2009	03/10/2009	49,800.00
01/11/2009	02/10/2009	62,600.00
12/11/2008	01/10/2009	56,400.00
11/08/2008	12/10/2008	62,200.00
W76165030 Consumption (kWh (thousand Watt-hours))		**477,000.00**
W76165030 Consumption (kBtu (thousand Btu))		**1,627,524.00**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**1,627,524.00**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Act#66-575-007-18 (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
09/29/2009	10/28/2009	2,765.00
08/29/2009	09/28/2009	0.00
07/29/2009	08/28/2009	3.00
06/29/2009	07/28/2009	47.00
05/29/2009	06/28/2009	9.00
04/29/2009	05/28/2009	562.00
03/29/2009	04/28/2009	6,054.00
03/01/2009	03/28/2009	7,072.00
01/29/2009	02/28/2009	8,063.00
12/29/2008	01/28/2009	9,170.00
11/29/2008	12/28/2008	6,387.00

Act#66-575-007-18 Consumption (therms)	**40,132.00**
Act#66-575-007-18 Consumption (kBtu (thousand Btu))	**4,013,200.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**4,013,200.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?	☐

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

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

Certifying Professional

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

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Bee Meadow Elementary School - Hanover Township BOE
120 Reynolds Ave
Whippany, NJ 07981

Facility Owner
Hanover Township Board of Education
61 Highland Ave
Whippany , NJ 07981

Primary Contact for this Facility
Roy Aull
61 Highland Ave
Whippany , NJ 07981

General Information

Bee Meadow Elementary School - Hanover Township BOE	
Gross Floor Area Excluding Parking: (ft^2)	65,467
Year Built	1974
For 12-month Evaluation Period Ending Date:	October 31, 2009

Facility Space Use Summary

Bee Meadow ES	
Space Type	K-12 School
Gross Floor Area(ft^2)	65,467
Open Weekends?	Yes
Number of PCs[d]	115
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	Yes
Percent Cooled	40
Percent Heated	100
Months[o]	12
High School?	No
School District[o]	Hanover Township

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 10/31/2009)	**Baseline** (Ending Date 10/31/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	35	35	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	93	93	63	N/A	81
Source (kBtu/ft^2)	159	159	109	N/A	140
Energy Cost					
$/year	$ 100,072.69	$ 100,072.69	$ 68,570.33	N/A	$ 87,687.88
$/$ft^2$/year	$ 1.53	$ 1.53	$ 1.05	N/A	$ 1.34
Greenhouse Gas Emissions					
$MtCO_2e$/year	499	499	342	N/A	437
$kgCO_2e/ft^2$/year	8	8	5	N/A	7

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

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

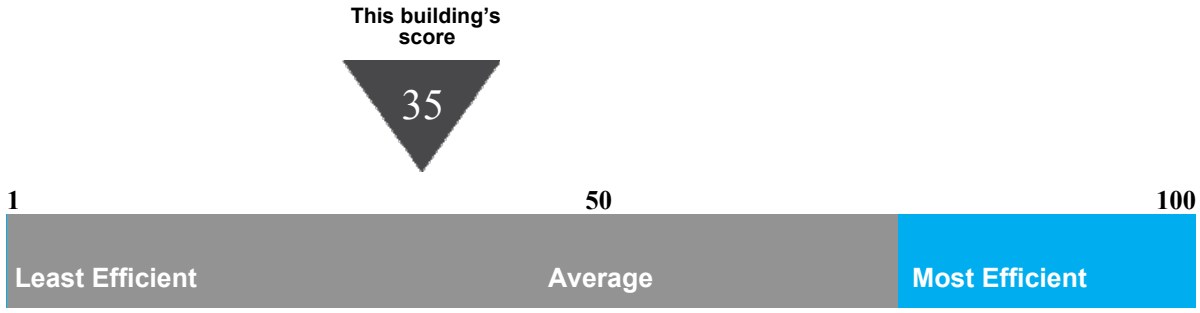
Statement of Energy Performance

2009

Bee Meadow Elementary School - Hanover Township BOE
120 Reynolds Ave
Whippany, NJ 07981

Portfolio Manager Building ID: 2056110

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses 159 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending October 2009

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 02/18/2010

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Salem Drive Elementary School - Hanover Township BOE

Building ID: 2056114
For 12-month Period Ending: September 30, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: February 18, 2010

Facility
Salem Drive Elementary School - Hanover Township BOE
29 Salem Drive
Whippany, NJ 07981

Facility Owner
Hanover Township Board of Education
61 Highland Ave
Whippany , NJ 07981

Primary Contact for this Facility
Roy Aull
61 Highland Ave
Whippany , NJ 07981

Year Built: 1956
Gross Floor Area (ft²): 45,728

Energy Performance Rating[2] (1-100) 49

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	856,562
Natural Gas (kBtu)[4]	3,326,220
Total Energy (kBtu)	4,182,782

Energy Intensity[5]

Site (kBtu/ft²/yr)	91
Source (kBtu/ft²/yr)	139

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	307

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	91
National Average Source EUI	138
% Difference from National Average Source EUI	1%
Building Type	K-12 School

Stamp of Certifying Professional

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

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
Matthew Goss
15 British American Blvd
Latham, NY 12110

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Salem Drive Elementary School - Hanover Township BOE	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	29 Salem Drive, Whippany, NJ 07981	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Salem Drive E.S. (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	45,728 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	Yes	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	80 (Default)	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	0	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	20 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	12(Optional)	Is this school in operation for at least 8 months of the year?		☐

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

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: FirstEnergy - Jersey Central Power & Lt Co

Fuel Type: Electricity

Meter: 100005971146 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
08/09/2009	09/08/2009	16,880.00
07/09/2009	08/08/2009	13,440.00
06/09/2009	07/08/2009	18,440.00
05/09/2009	06/08/2009	20,000.00
04/09/2009	05/08/2009	19,200.00
03/09/2009	04/08/2009	23,920.00
02/09/2009	03/08/2009	25,440.00
01/09/2009	02/08/2009	23,240.00
12/09/2008	01/08/2009	23,120.00
11/07/2008	12/08/2008	25,800.00
10/07/2008	11/06/2008	21,920.00
100005971146 Consumption (kWh (thousand Watt-hours))		**231,400.00**
100005971146 Consumption (kBtu (thousand Btu))		**789,536.80**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**789,536.80**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Act#66-490-703-00 (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
08/28/2009	09/27/2009	12.15
07/28/2009	08/27/2009	4.40
06/28/2009	07/27/2009	30.81
05/28/2009	06/27/2009	16.50
04/28/2009	05/27/2009	174.69
03/28/2009	04/27/2009	4,087.63
02/28/2009	03/27/2009	4,602.53
01/28/2009	02/27/2009	5,739.08
12/28/2008	01/27/2009	5,999.17
11/28/2008	12/27/2008	5,037.89
10/28/2008	11/27/2008	4,902.96

Act#66-490-703-00 Consumption (therms)	**30,607.81**
Act#66-490-703-00 Consumption (kBtu (thousand Btu))	**3,060,781.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**3,060,781.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?	☐

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

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

Certifying Professional

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

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Salem Drive Elementary School - Hanover Township BOE
29 Salem Drive
Whippany, NJ 07981

Facility Owner
Hanover Township Board of Education
61 Highland Ave
Whippany , NJ 07981

Primary Contact for this Facility
Roy Aull
61 Highland Ave
Whippany , NJ 07981

General Information

Salem Drive Elementary School - Hanover Township BOE	
Gross Floor Area Excluding Parking: (ft^2)	45,728
Year Built	1956
For 12-month Evaluation Period Ending Date:	September 30, 2009

Facility Space Use Summary

Salem Drive E.S.	
Space Type	K-12 School
Gross Floor Area(ft^2)	45,728
Open Weekends?	Yes
Number of PCs[d]	80
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	Yes
Percent Cooled	20
Percent Heated	100
Months[o]	12
High School?	No
School District[o]	Hanover Township

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 09/30/2009)	**Baseline** (Ending Date 09/30/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	49	49	75	N/A	50
Energy Intensity					
Site (kBtu/ft²)	91	91	71	N/A	91
Source (kBtu/ft²)	139	139	108	N/A	138
Energy Cost					
$/year	$ 52,795.32	$ 52,795.32	$ 40,986.07	N/A	$ 52,408.60
$/ft²/year	$ 1.15	$ 1.15	$ 0.89	N/A	$ 1.14
Greenhouse Gas Emissions					
$MtCO_2e$/year	307	307	238	N/A	305
$kgCO_2e/ft^2$/year	7	7	5	N/A	7

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

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

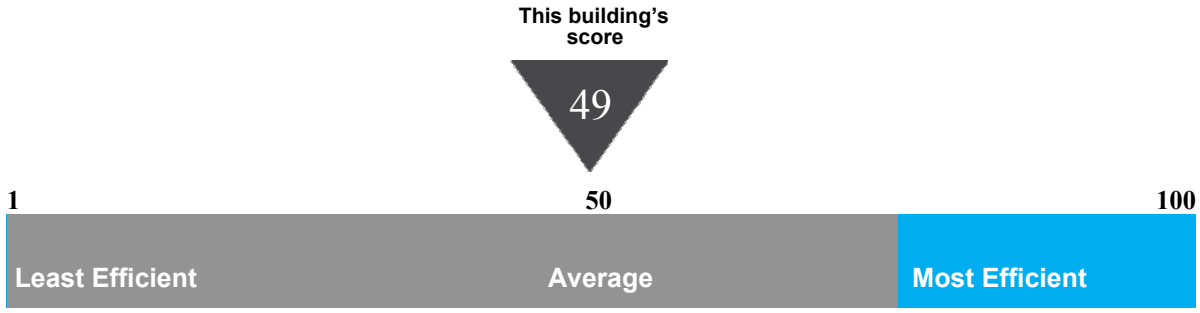
Statement of Energy Performance

2009

Salem Drive Elementary School - Hanover Township BOE
29 Salem Drive
Whippany, NJ 07981

Portfolio Manager Building ID: 2056114

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses 139 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending September 2009

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 02/18/2010

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Mountview Road Elementary School - Hanover Tonwnship BOE

Building ID: 2056120
For 12-month Period Ending: November 30, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: February 18, 2010

Facility
Mountview Road Elementary School - Hanover Tonwnship BOE
30 Mountview Road
Morris Plains, NJ 07950

Facility Owner
Hanover Township Board of Education
61 Highland Ave
Whippany , NJ 07981

Primary Contact for this Facility
Roy Aull
61 Highland Ave
Whippany , NJ 07981

Year Built: 1958
Gross Floor Area (ft²): 47,587

Energy Performance Rating[2] (1-100) 68

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	784,878
Natural Gas (kBtu)[4]	2,891,230
Total Energy (kBtu)	3,676,108

Energy Intensity[5]

Site (kBtu/ft²/yr)	77
Source (kBtu/ft²/yr)	119

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	273

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	92
National Average Source EUI	141
% Difference from National Average Source EUI	-16%
Building Type	K-12 School

Stamp of Certifying Professional

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

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
Matthew Goss
15 British American Blvd
Latham, NY 12110

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Mountview Road Elementary School - Hanover Tonwnship BOE	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	30 Mountview Road, Morris Plains, NJ 07950	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Mountview Road E.S. (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	47,587 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	Yes	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	83 (Default)	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	0	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	30 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	12(Optional)	Is this school in operation for at least 8 months of the year?		☐

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

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: FirstEnergy - Jersey Central Power & Lt Co

Fuel Type: Electricity

Meter: G23633058 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
10/04/2009	11/03/2009	20,240.00
09/04/2009	10/03/2009	19,760.00
08/04/2009	09/03/2009	17,200.00
07/04/2009	08/03/2009	15,200.00
06/04/2009	07/03/2009	18,240.00
05/04/2009	06/03/2009	18,160.00
04/04/2009	05/03/2009	19,840.00
03/04/2009	04/03/2009	19,760.00
02/04/2009	03/03/2009	22,080.00
01/04/2009	02/03/2009	20,800.00
12/04/2008	01/03/2009	19,440.00
G23633058 Consumption (kWh (thousand Watt-hours))		**210,720.00**
G23633058 Consumption (kBtu (thousand Btu))		**718,976.64**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**718,976.64**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Act#65-588-375-01 (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
11/01/2009	11/30/2009	3,381.60
10/01/2009	10/31/2009	1,470.38
09/01/2009	09/30/2009	143.22
08/01/2009	08/31/2009	96.94
07/01/2009	07/31/2009	116.74
06/01/2009	06/30/2009	120.91
05/01/2009	05/31/2009	283.25
04/01/2009	04/30/2009	3,263.70
03/01/2009	03/31/2009	4,445.14
02/01/2009	02/28/2009	5,320.99
01/01/2009	01/31/2009	5,798.42

12/01/2008	12/31/2008	4,471.01
Act#65-588-375-01 Consumption (therms)		**28,912.30**
Act#65-588-375-01 Consumption (kBtu (thousand Btu))		**2,891,230.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**2,891,230.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

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

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

Certifying Professional

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

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Mountview Road Elementary School - Hanover Tonwnship BOE
30 Mountview Road
Morris Plains, NJ 07950

Facility Owner
Hanover Township Board of Education
61 Highland Ave
Whippany , NJ 07981

Primary Contact for this Facility
Roy Aull
61 Highland Ave
Whippany , NJ 07981

General Information

Mountview Road Elementary School - Hanover Tonwnship BOE	
Gross Floor Area Excluding Parking: (ft^2)	47,587
Year Built	1958
For 12-month Evaluation Period Ending Date:	November 30, 2009

Facility Space Use Summary

Mountview Road E.S.	
Space Type	K-12 School
Gross Floor Area(ft^2)	47,587
Open Weekends?	Yes
Number of PCs[d]	83
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	Yes
Percent Cooled	30
Percent Heated	100
Months[o]	12
High School?	No
School District[o]	Hanover Township

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 11/30/2009)	**Baseline** (Ending Date 11/30/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	68	68	75	N/A	50
Energy Intensity					
Site (kBtu/ft²)	77	77	72	N/A	92
Source (kBtu/ft²)	119	119	110	N/A	141
Energy Cost					
$/year	$ 49,976.75	$ 49,976.75	$ 46,392.66	N/A	$ 59,325.15
$/ft²/year	$ 1.05	$ 1.05	$ 0.97	N/A	$ 1.25
Greenhouse Gas Emissions					
$MtCO_2e$/year	273	273	253	N/A	324
$kgCO_2e/ft^2$/year	6	6	6	N/A	7

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

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

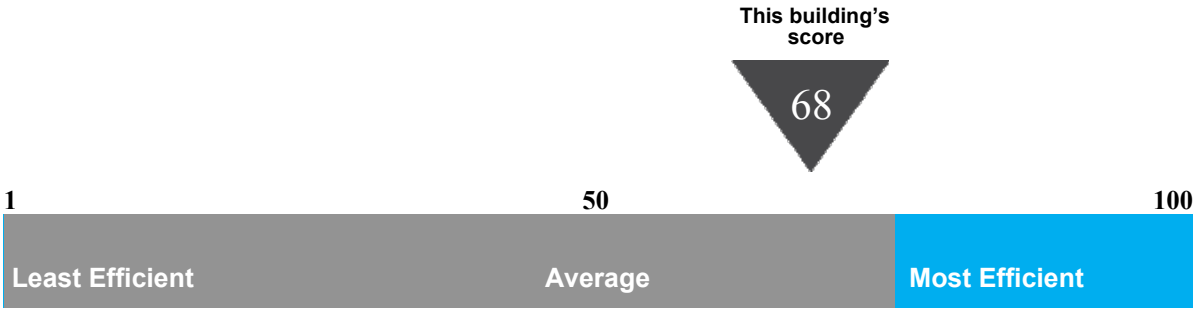
Statement of Energy Performance

2009

Mountview Road Elementary School - Hanover Tonwnship BOE
30 Mountview Road
Morris Plains, NJ 07950

Portfolio Manager Building ID: 2056120

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses 119 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending November 2009

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

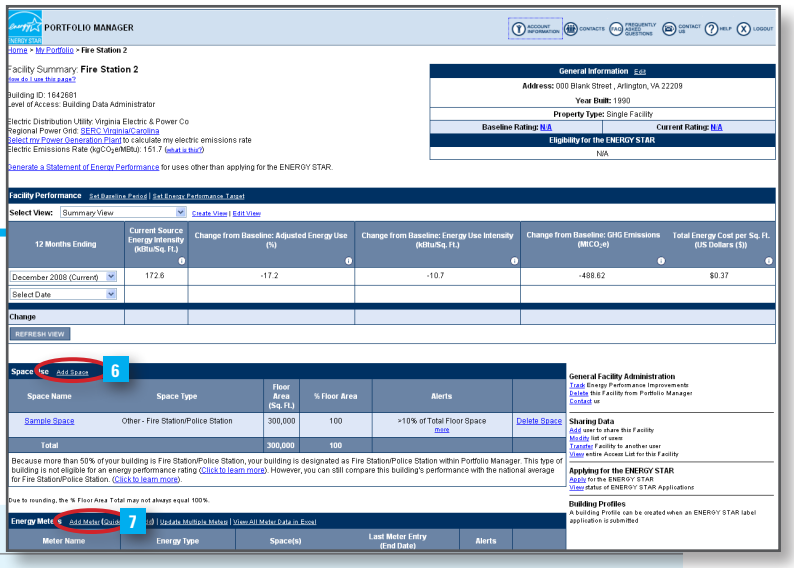
Date of certification

EPA United States Environmental Protection Agency

Date Generated: 02/18/2010

PORTFOLIO MANAGER QUICK REFERENCE GUIDE

Portfolio Manager is an interactive energy management tool that allows you to track and assess energy and water consumption across your entire portfolio of buildings in a secure online environment. Use this Quick Reference Guide to identify opportunities for energy efficiency improvements, track your progress over time, and verify results.

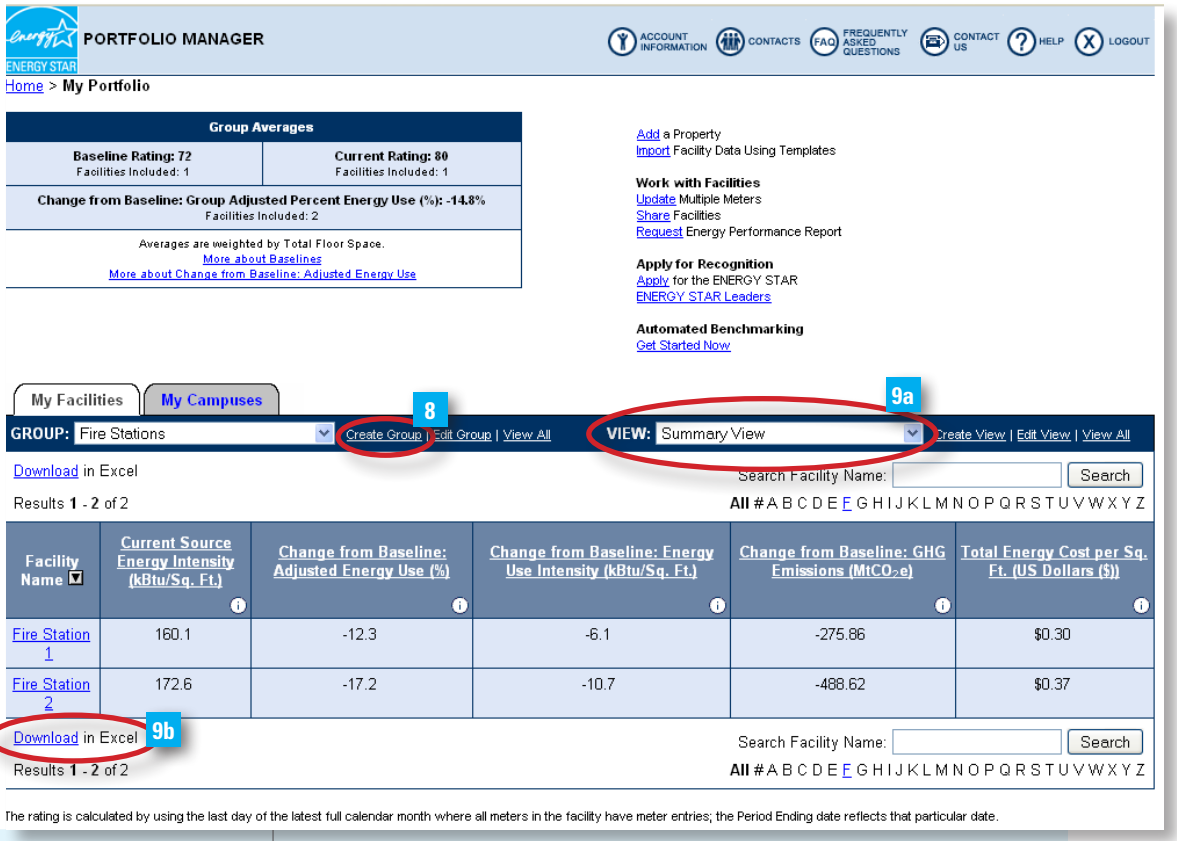


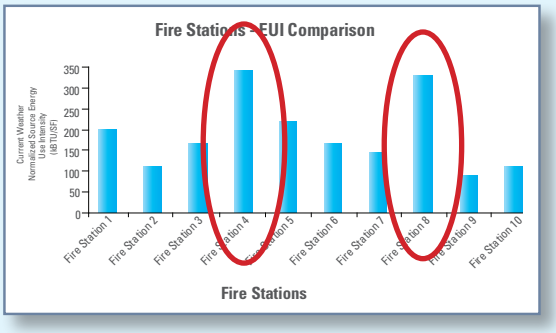
IDENTIFY ENERGY EFFICIENCY PROJECTS

Use Portfolio Manager to identify under-performing buildings to target for energy efficiency improvements and establish baselines for setting and measuring progress for energy efficiency improvement projects over time.

STEP	ACTIVITY	ACTION
1	Access Portfolio Manager. (step not shown)	Visit **www.energystar.gov/benchmark**. Scroll down to the **Login** section on the right-hand side in the middle of the page.
2	Access your account: (step not shown) • Create a new account. • Login to an existing account.	• Click **REGISTER,** and follow instructions. • Enter user name and password, and click **LOGIN**.
3	Review system updates and enter account. (step not shown)	Click **ACCESS MY PORTFOLIO**, located below **Welcome to Portfolio Manager**.
4	Add a new facility. (step not shown)	Click **ADD** a Property, located in the upper right portion of the screen.
5	Select property type and enter general facility information. (step not shown)	Select the option that most closely resembles your facility and click **CONTINUE**. Enter general data and click **SAVE**. For more information on facility space types, see: www.energystar.gov/index.cfm?c=eligibility.bus_portfoliomanager_space_types.
6	Enter space use data.	From the **Facility Summary** page, shown above, go to the **Space Use** section, located half way down the page, and click **ADD SPACE**. • Enter a facility name. In the **Select a Space Type** menu, select the appropriate space type(s) for your building. If your space is not listed, select **Other**. Click **CONTINUE**. • Enter building characteristics. Click **SAVE**. Information required for each space type is listed here: www.energystar.gov/index.cfm?c=eligibility.bus_portfoliomanager_space_types. • Repeat steps above to add all major spaces in your facility. Use bulk import service to minimize manual data entry of large sets of facility data (10 or more facilities or campuses are required). • Go back to **My Portfolio** by clicking on the link in the upper left portion of the page. • Click **IMPORT** Facility Data Using Templates, located below **Add a Property**.
7	Enter energy use data.	From the **Facility Summary** page, go to the **Energy Meters** section, located below the **Space Use** section, and click **ADD METER**. • Enter meter name, type, and units. Click **SAVE**. • Enter number of months and start date. Click **CONTINUE**. • Enter energy use and cost for each month. Click **SAVE**. • Repeat for all energy meters and fuel types.

www.energystar.gov/benchmark



STEP	ACTIVITY	ACTION
8	Create custom groups.	Organize facilities into groups (e.g., Fire Stations, Northwest Region). Groups are completely customizable, and each facility may belong to multiple groups. • From the **My Portfolio** page, click **CREATE GROUP**, located directly to the right of the **Group** drop-down menu. • Follow instructions to select buildings and name your group. • Once they have been saved, custom groups will be available in the **Group** drop-down menu.
9	View and interpret results.	Option 1: Go to **My Portfolio** and view all buildings to compare performance metrics. Option 2: Export data to Microsoft® Excel. • On the **My Portfolio** page, select the view, from the **View** drop-down menu that will display the data you wish to export. The **My Portfolio** page will update to display the selected view. (9a) • Select the **DOWNLOAD IN EXCEL** link. A File Download dialog window will open. Follow the steps provided by Excel. (9b) • Use Excel functionality to view building energy performance graphically . The example below shows a comparison of Energy Use Intensity for a portfolio of fire stations, identifying under-performing buildings to target for energy eficiency improvements. 

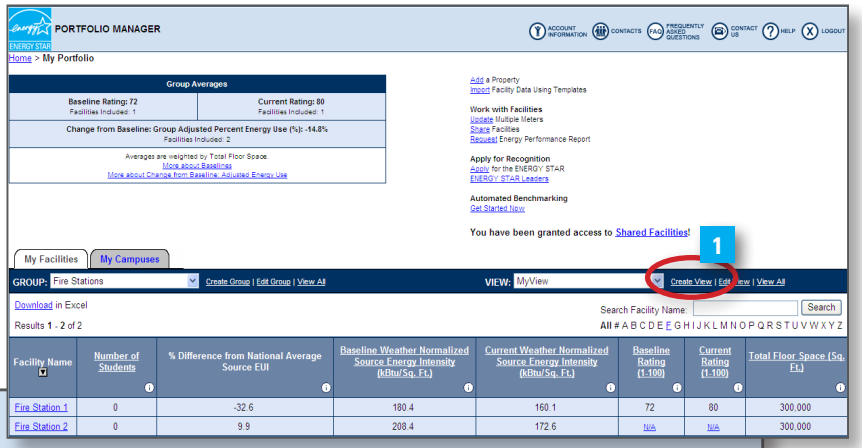
www.energystar.gov/benchmark

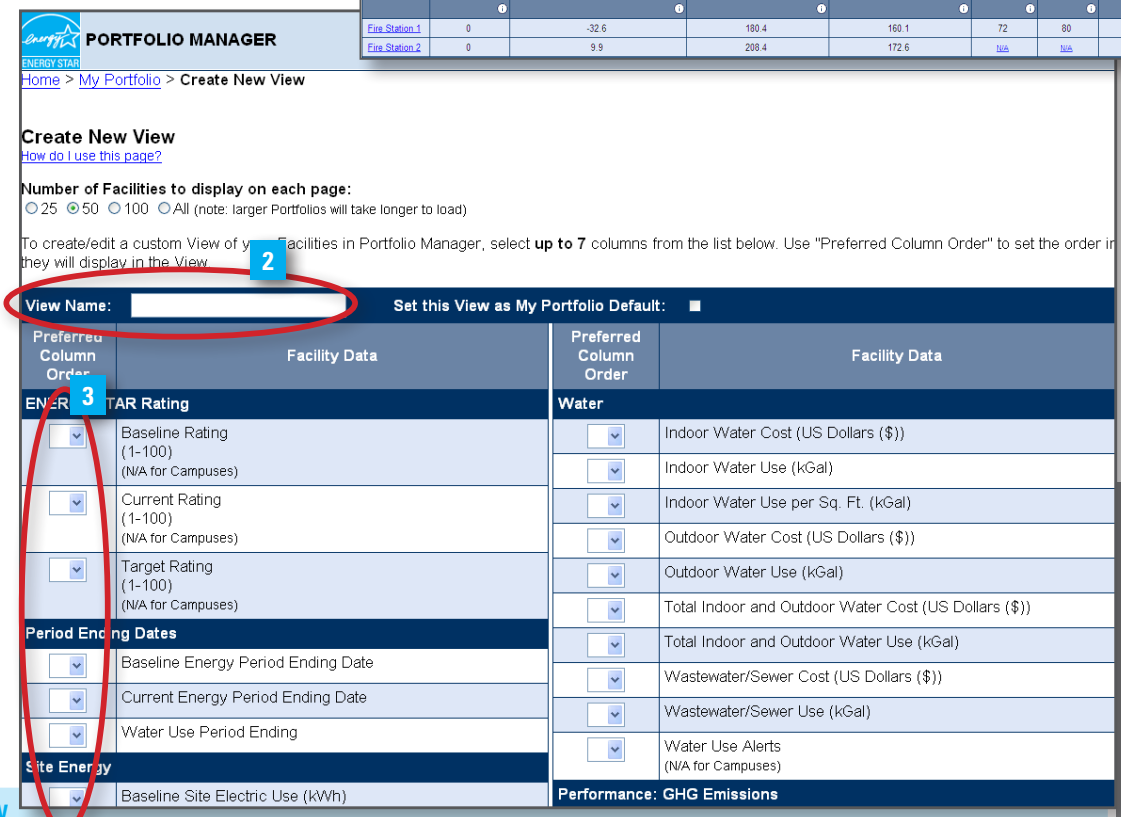
TRACK PROGRESS OVER TIME

Portfolio Manager comes pre-populated with nine standard summary views of facility data, which are displayed on the My Portfolio summary page. These standard views include:

- Summary: Energy Use
- Performance: Green House Gas Emissions
- Performance: Financial
- Performance: Water Use

Additionally, users can create and save custom downloadable views by choosing from more than 70 different metrics. The default view set by the user will display automatically after logging into Portfolio Manager, and data from all views can be exported to Microsoft® Excel.





CREATE A CUSTOM VIEW

STEP	ACTION
1	From the **My Portfolio** page or the **Facility Summary** page, select the **Create View** link, located directly to the right of the **View** drop-down menu.
2	Enter a name for the view. To set as the default view, select the box labeled **Set this View as My Portfolio Default**, located directly to the right of **View Name**. You may include up to 7 (seven) columns in each view.
3	Choose each metric to be included in the view by selecting an order number from the **Preferred Column Order** drop-down menu to the left of the **Facility Data** column.
4	Click **SAVE** at the bottom of the page. You will be returned to the **My Portfolio** page, and your custom view will be available in the **View** drop-down menu. (step not shown)

www.energystar.gov/benchmark

VERIFY AND DOCUMENT RESULTS

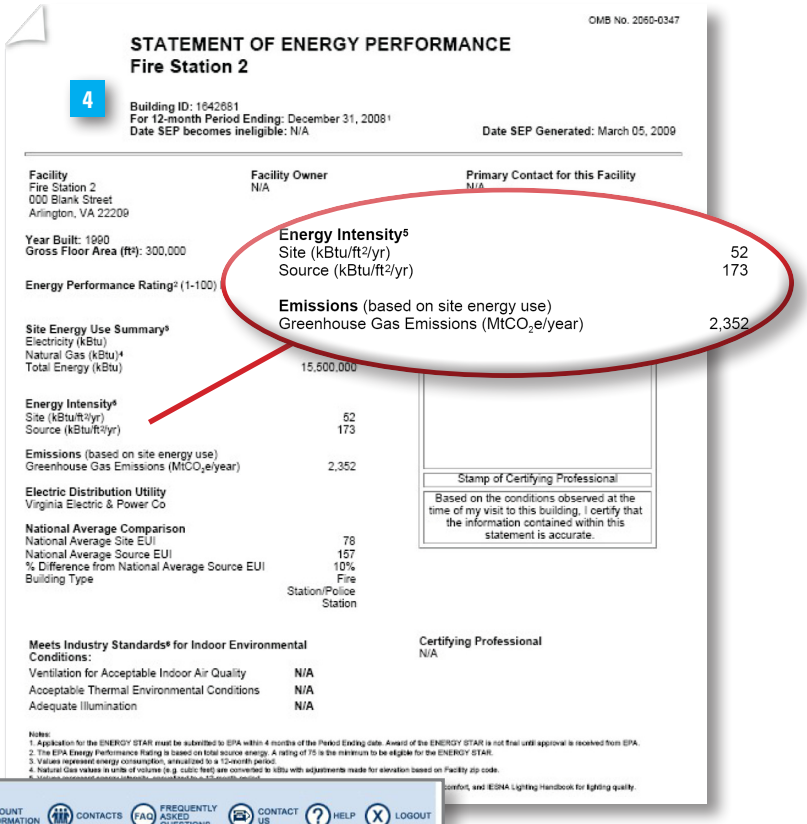
Use Portfolio Manager to quickly and accurately document reductions in energy use, greenhouse gas emissions, water use, and energy costs for an individual building or an entire portfolio. This valuable information can be used to provide a level of transparency and accountability to help demonstrate strategic use of funding.

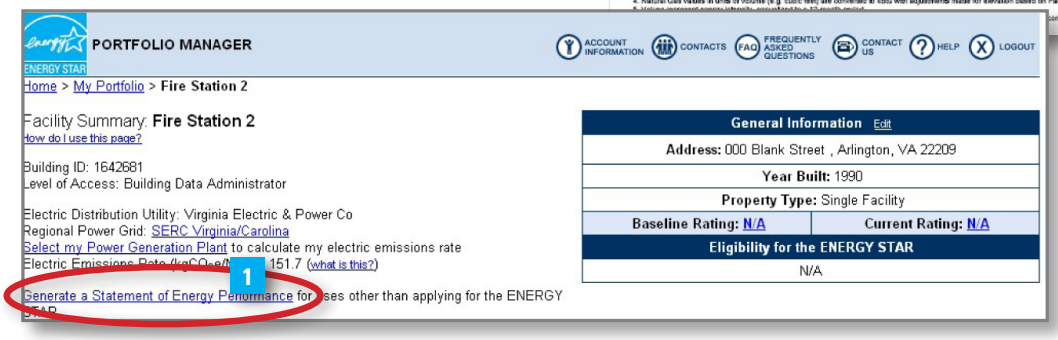
Generate a Statement of Energy Performance that includes valuable information about your building's performance, including:

- Normalized energy use intensity
- National average comparisons
- Greenhouse gas emissions
- Energy performance rating (if available)

In addition, you can also request an Energy Performance Report to see the change in performance over time for selected buildings or an entire portfolio. Available comparative metrics in this report include:

- Normalized energy use intensity
- Total electric use
- Total natural gas use
- Energy performance rating (if available)





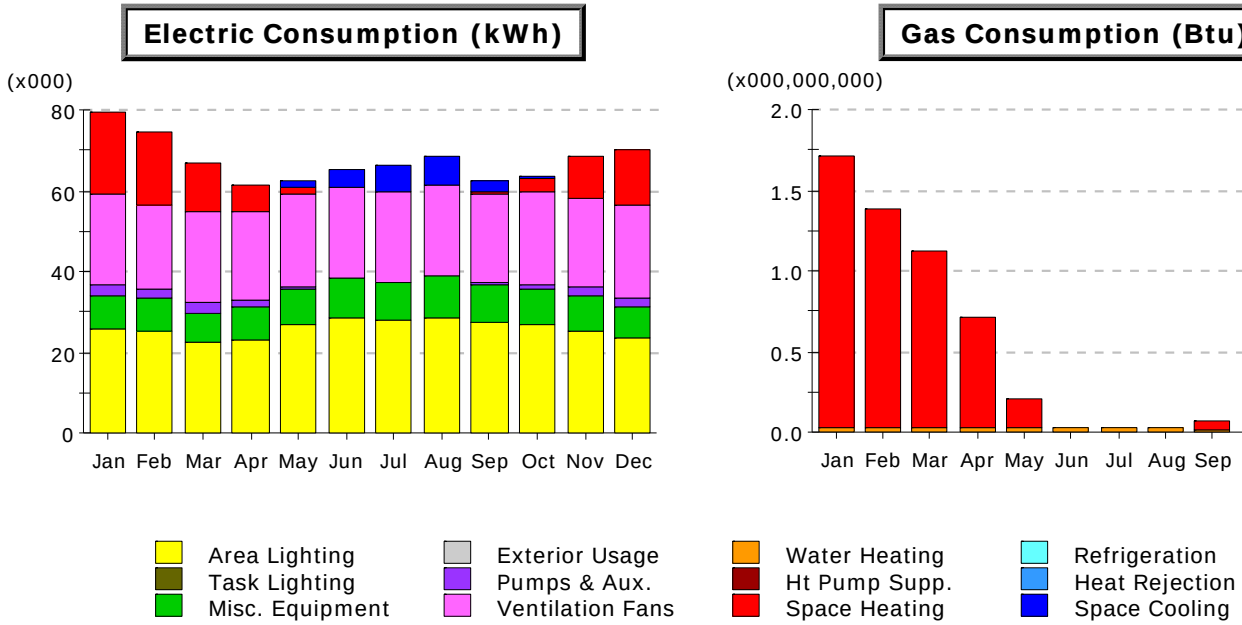
GENERATE A STATEMENT OF ENERGY PERFORMANCE AND AN ENERGY PERFORMANCE REPORT

STEP	ACTION
1	From your selected building's **Facility Summary** page, click **GENERATE A STATEMENT OF ENERGY PERFORMANCE**.
2	On the next page, select a period ending date. (step not shown)
3	Click **GENERATE REPORT,** located in the bottom right corner of the screen. (step not shown)
4	Save the Statement of Energy Performance, accompanying Data Checklist, and Facility Summary that include information on energy use intensity and greenhouse gas emissions.
5	From the **My Portfolio** page, click **REQUEST ENERGY PERFORMANCE REPORT**, located under **Work with Facilities**, which shows reductions in key performance indicators over a user-specified time period. Specify the type of report, the facilities to be included, and the requested report columns. The report will be e-mailed to a user-specified address within one business day. (step not shown)

www.energystar.gov/benchmark

APPENDIX C

eQUEST MODEL RUN SUMMARIES

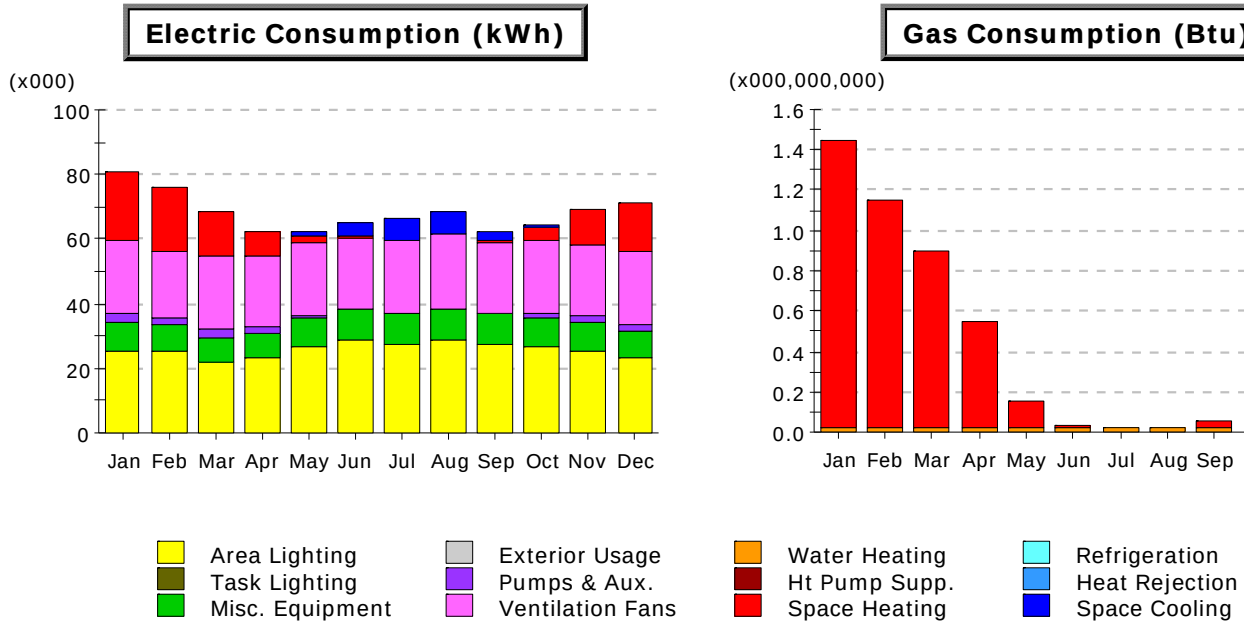


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.00	0.19	1.29	4.33	6.57	6.94	2.87	0.79	0.01	-	23.00
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	20.39	18.24	12.47	6.39	1.83	0.13	0.00	-	0.36	3.34	10.13	13.92	87.19
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	22.66	20.55	22.54	21.87	22.71	22.08	22.75	22.79	22.04	22.71	21.96	22.58	267.23
Pumps & Aux.	2.47	2.22	2.35	1.92	0.71	0.02	-	-	0.12	1.20	2.14	2.43	15.59
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	8.72	8.58	7.56	7.90	9.10	9.83	9.49	9.87	9.44	9.10	8.67	7.94	106.20
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	25.49	25.03	22.21	23.15	26.58	28.61	27.67	28.77	27.52	26.58	25.33	23.30	310.24
Total	79.72	74.62	67.12	61.42	62.22	65.01	66.48	68.37	62.35	63.72	68.24	70.17	809.44

Gas Consumption (Btu x000,000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	1.69	1.36	1.10	0.69	0.19	0.01	-	-	0.05	0.32	0.88	1.39	7.69
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.27
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1.72	1.39	1.12	0.71	0.21	0.03	0.02	0.02	0.07	0.34	0.90	1.41	7.95

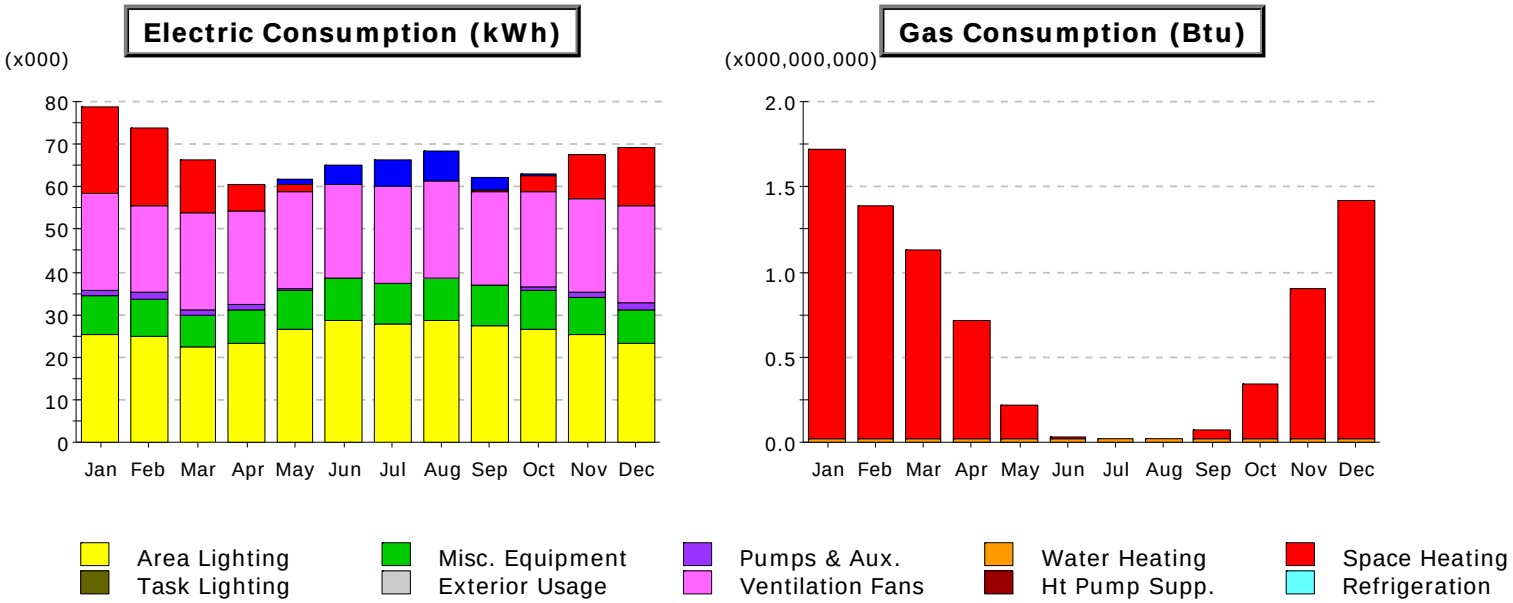


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.00	0.19	1.29	4.33	6.57	6.94	2.87	0.79	0.01	-	23.00
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	21.75	19.42	13.62	7.22	2.08	0.13	0.00	-	0.40	3.78	11.11	15.16	94.67
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	22.66	20.55	22.54	21.87	22.71	22.08	22.75	22.79	22.04	22.71	21.96	22.58	267.23
Pumps & Aux.	2.47	2.22	2.35	1.92	0.71	0.02	-	-	0.12	1.20	2.14	2.43	15.59
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	8.72	8.58	7.56	7.90	9.10	9.83	9.49	9.87	9.44	9.10	8.67	7.94	106.20
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	25.49	25.03	22.21	23.15	26.58	28.61	27.67	28.77	27.52	26.58	25.33	23.30	310.24
Total	81.09	75.80	68.27	62.26	62.47	65.01	66.48	68.37	62.40	64.15	69.23	71.41	816.93

Gas Consumption (Btu x000,000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	1.42	1.13	0.88	0.52	0.13	0.01	-	-	0.03	0.23	0.69	1.14	6.18
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.27
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1.45	1.15	0.90	0.55	0.16	0.03	0.02	0.02	0.05	0.25	0.71	1.16	6.45

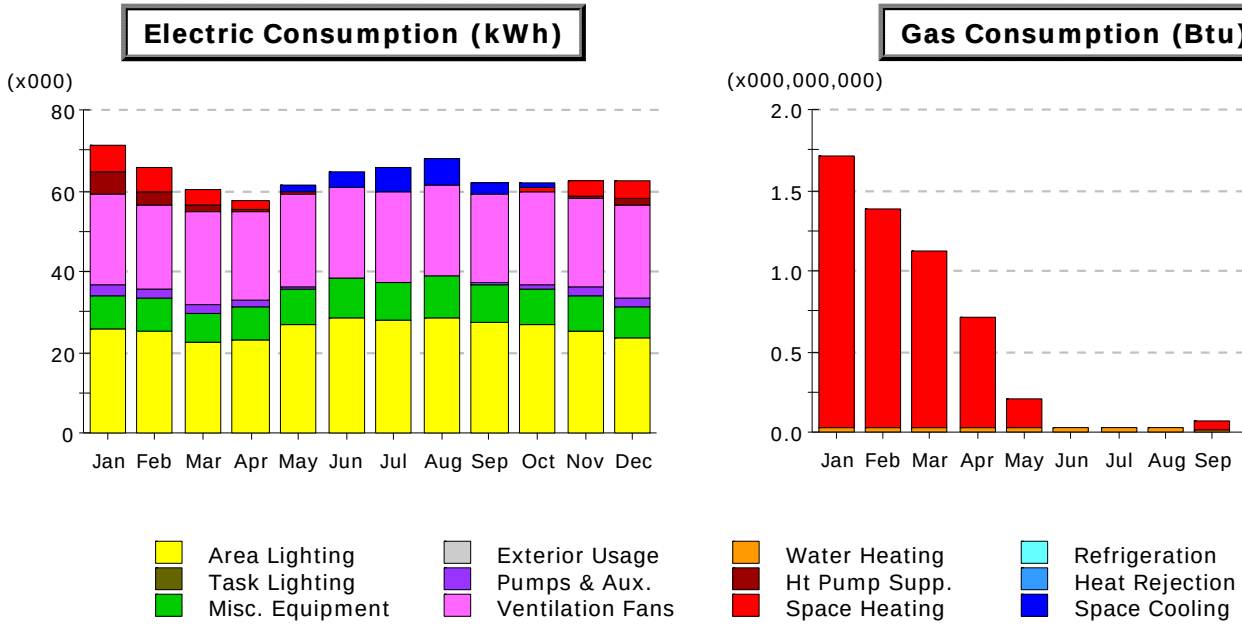


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.00	0.19	1.29	4.33	6.57	6.94	2.87	0.79	0.01	-	23.00
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	20.39	18.24	12.47	6.39	1.83	0.13	0.00	-	0.36	3.34	10.13	13.92	87.19
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	22.66	20.55	22.54	21.87	22.71	22.08	22.75	22.79	22.04	22.71	21.96	22.58	267.23
Pumps & Aux.	1.64	1.46	1.52	1.18	0.38	0.01	-	-	0.06	0.66	1.35	1.58	9.85
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	8.72	8.58	7.56	7.90	9.10	9.83	9.49	9.87	9.44	9.10	8.67	7.94	106.20
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	25.49	25.03	22.21	23.15	26.58	28.61	27.67	28.77	27.52	26.58	25.33	23.30	310.24
Total	78.89	73.86	66.30	60.68	61.89	64.99	66.48	68.37	62.29	63.18	67.45	69.32	803.71

Gas Consumption (Btu x000,000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	1.70	1.36	1.11	0.69	0.19	0.01	-	-	0.05	0.33	0.88	1.40	7.71
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.27
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1.72	1.39	1.13	0.71	0.21	0.03	0.02	0.02	0.07	0.35	0.90	1.42	7.98

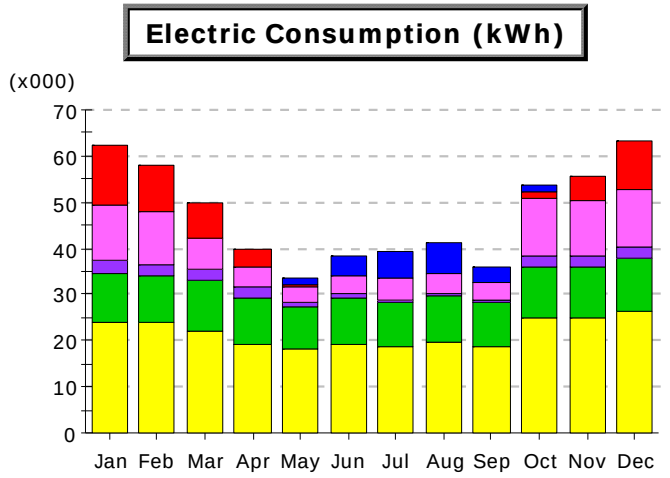


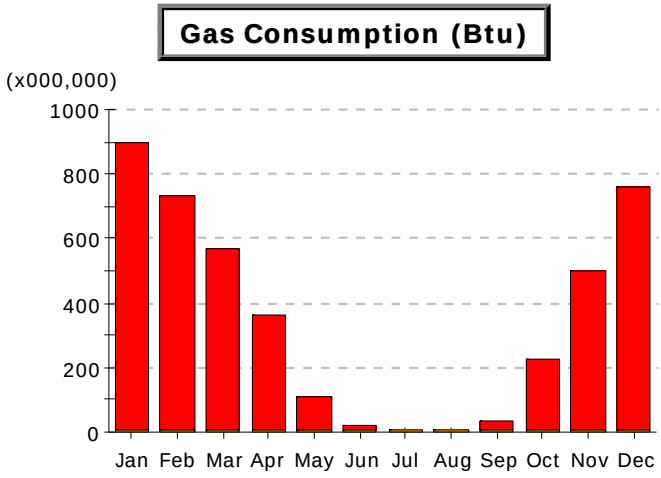
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.00	0.18	1.17	3.89	5.90	6.22	2.59	0.72	0.01	-	20.69
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	6.23	5.89	4.15	2.20	0.77	0.07	0.00	-	0.17	1.30	3.40	4.72	28.92
HP Supp.	5.52	3.38	1.53	0.34	-	-	-	-	-	-	0.67	1.75	13.19
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	22.74	20.62	22.60	21.94	22.78	22.17	22.83	22.87	22.12	22.78	22.03	22.64	268.13
Pumps & Aux.	2.39	2.15	2.29	1.89	0.71	0.02	-	-	0.12	1.18	2.09	2.36	15.20
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	8.72	8.58	7.56	7.90	9.10	9.83	9.49	9.87	9.44	9.10	8.67	7.94	106.20
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	25.49	25.03	22.21	23.15	26.58	28.61	27.67	28.77	27.52	26.58	25.33	23.30	310.24
Total	71.08	65.66	60.34	57.59	61.11	64.60	65.89	67.73	61.97	61.67	62.21	62.72	762.57

Gas Consumption (Btu x000,000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	1.69	1.36	1.10	0.69	0.19	0.01	-	-	0.05	0.32	0.88	1.39	7.69
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.27
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1.72	1.39	1.12	0.71	0.21	0.03	0.02	0.02	0.07	0.34	0.90	1.41	7.95



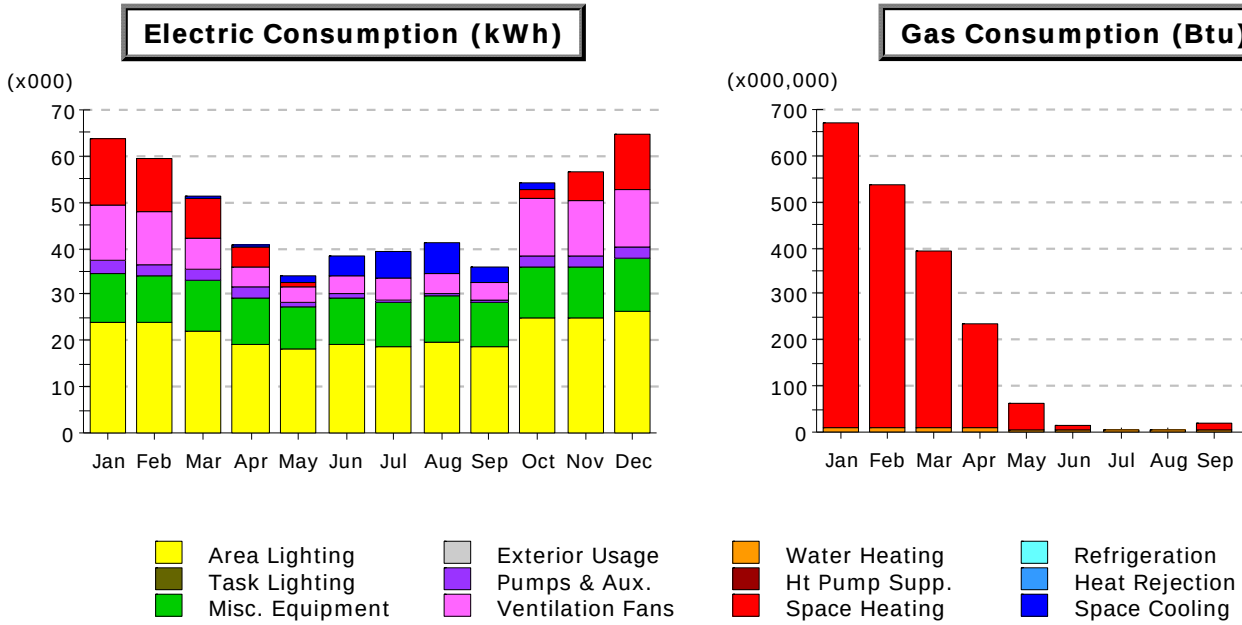


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.04	0.29	1.46	4.49	6.04	6.34	3.23	1.65	0.09	0.02	23.67
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	12.50	10.46	7.81	3.66	0.51	0.01	-	-	0.04	1.21	5.28	10.40	51.87
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	12.33	11.20	6.67	4.63	3.55	4.06	4.35	4.61	3.80	12.38	11.92	12.38	91.89
Pumps & Aux.	2.72	2.44	2.61	2.08	0.93	0.62	0.60	0.62	0.60	2.43	2.52	2.69	20.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	10.50	10.35	10.85	9.98	9.26	9.99	9.65	10.03	9.60	10.97	10.92	11.45	123.55
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	24.08	23.74	22.00	19.37	18.03	19.37	18.76	19.48	18.65	25.16	25.05	26.25	259.93
Total	62.12	58.20	49.98	40.02	33.75	38.54	39.39	41.10	35.91	53.79	55.78	63.19	571.77

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	889.7	721.7	557.4	352.8	101.4	15.9	0.9	-	26.8	218.7	493.7	749.3	4,128.3
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	8.0	8.2	8.3	7.4	6.4	6.3	5.7	5.6	5.4	6.7	7.2	8.2	83.5
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	897.7	729.9	565.7	360.2	107.8	22.2	6.6	5.6	32.1	225.4	500.9	757.5	4,211.7

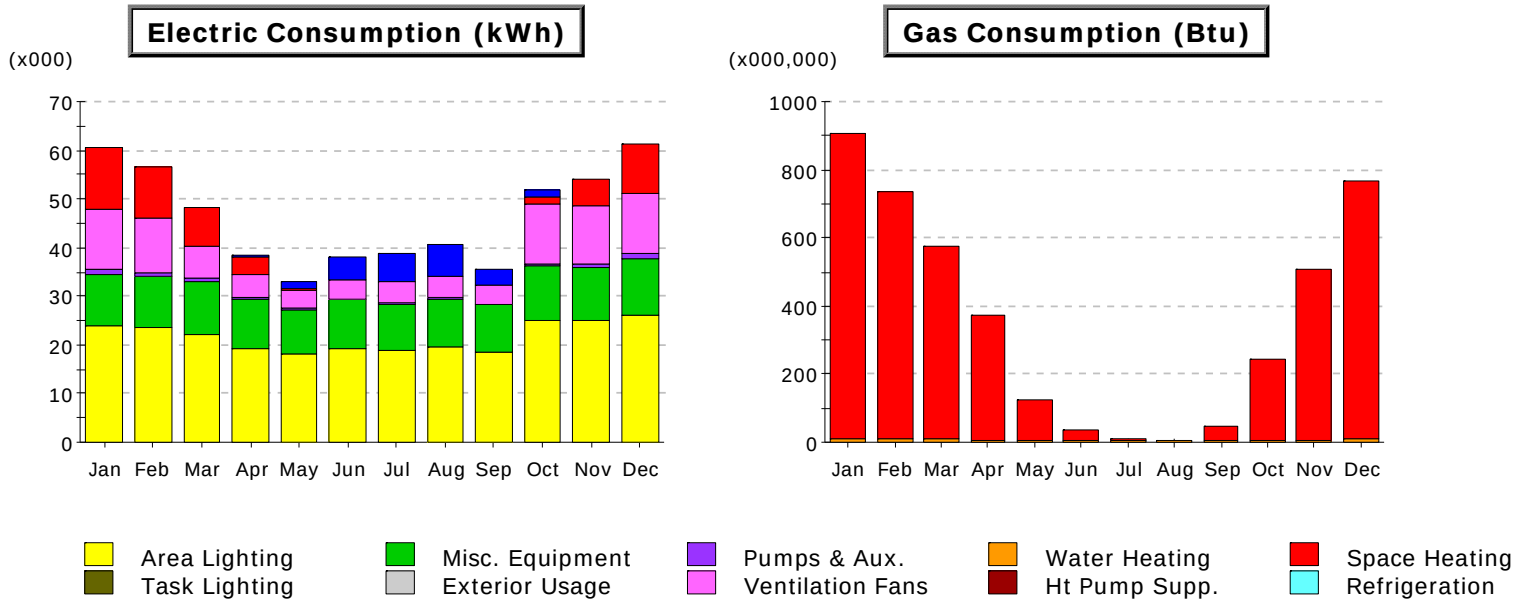


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.04	0.29	1.46	4.49	6.04	6.34	3.23	1.65	0.09	0.02	23.67
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	14.03	11.78	8.89	4.36	0.70	0.03	0.00	-	0.09	1.63	6.29	11.81	59.60
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	12.33	11.20	6.67	4.63	3.55	4.06	4.35	4.61	3.80	12.38	11.92	12.38	91.89
Pumps & Aux.	2.72	2.44	2.61	2.08	0.93	0.62	0.60	0.62	0.60	2.43	2.52	2.69	20.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	10.50	10.35	10.85	9.98	9.26	9.99	9.65	10.03	9.60	10.97	10.92	11.45	123.55
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	24.08	23.74	22.00	19.37	18.03	19.37	18.76	19.48	18.65	25.16	25.05	26.25	259.93
Total	63.66	59.51	51.06	40.72	33.94	38.57	39.39	41.10	35.96	54.22	56.79	64.60	579.51

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	664.8	528.4	385.1	228.8	57.6	6.6	0.3	-	12.3	130.9	332.3	540.7	2,887.8
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	8.0	8.2	8.3	7.4	6.4	6.3	5.7	5.6	5.4	6.7	7.2	8.2	83.5
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	672.9	536.6	393.4	236.3	64.0	12.9	6.0	5.6	17.7	137.7	339.5	548.8	2,971.3

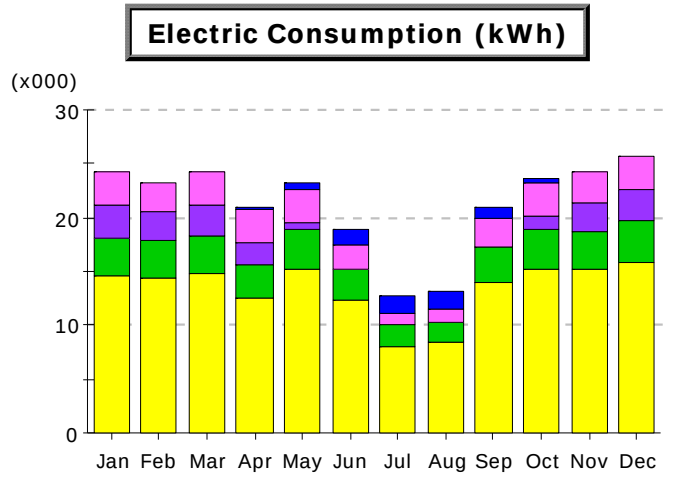


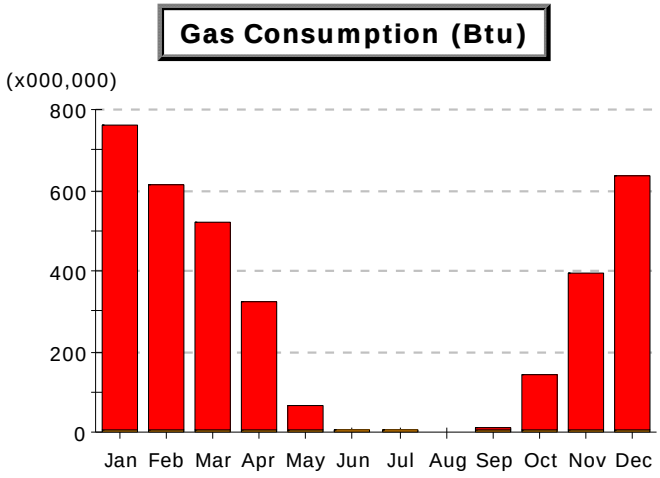
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.04	0.29	1.46	4.49	6.04	6.34	3.23	1.65	0.09	0.02	23.67
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	12.50	10.46	7.81	3.66	0.51	0.01	-	-	0.04	1.21	5.28	10.40	51.87
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	12.33	11.20	6.67	4.63	3.55	4.06	4.35	4.61	3.80	12.38	11.92	12.38	91.89
Pumps & Aux.	1.01	0.90	0.77	0.54	0.18	0.09	0.08	0.08	0.09	0.54	0.83	0.97	6.07
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	10.50	10.35	10.85	9.98	9.26	9.99	9.65	10.03	9.60	10.97	10.92	11.45	123.55
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	24.08	23.74	22.00	19.37	18.03	19.37	18.76	19.48	18.65	25.16	25.05	26.25	259.93
Total	60.41	56.65	48.14	38.48	33.00	38.01	38.87	40.55	35.40	51.91	54.09	61.46	556.98

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	896.7	728.0	567.4	366.5	115.9	27.4	4.9	-	42.2	235.4	503.1	757.0	4,244.6
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	8.0	8.2	8.3	7.4	6.4	6.3	5.7	5.6	5.4	6.7	7.2	8.2	83.5
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	904.7	736.2	575.7	374.0	122.3	33.8	10.6	5.6	47.6	242.1	510.3	765.2	4,328.1



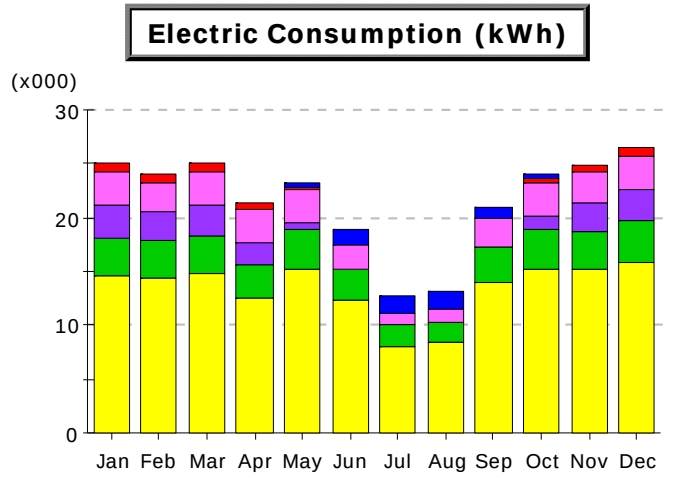


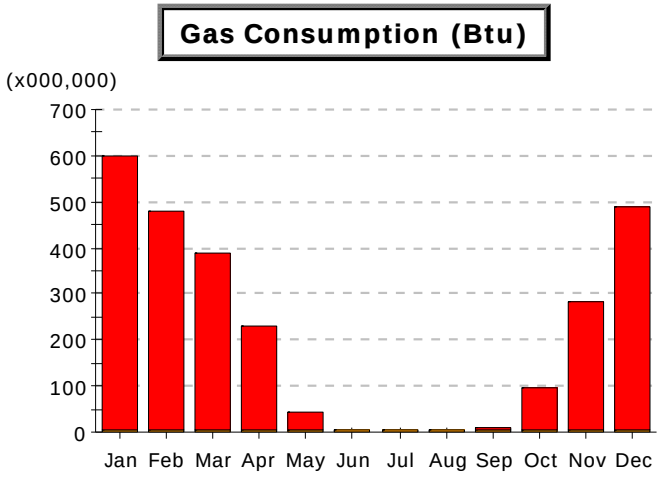
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.01	0.12	0.50	1.43	1.68	1.70	1.10	0.42	0.04	0.02	7.01
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.05	2.77	3.07	3.03	3.15	2.24	1.11	1.07	2.54	3.17	2.98	3.06	31.22
Pumps & Aux.	3.09	2.77	2.81	2.16	0.61	-	-	-	0.06	1.27	2.51	2.97	18.25
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	3.45	3.39	3.51	2.98	3.60	2.93	1.92	1.99	3.30	3.60	3.58	3.75	38.01
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	14.63	14.38	14.87	12.61	15.26	12.38	8.11	8.38	13.97	15.26	15.18	15.90	160.94
Total	24.22	23.32	24.27	20.89	23.13	18.97	12.82	13.13	20.97	23.72	24.29	25.70	255.43

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	753.3	608.2	512.1	318.7	60.7	0.0	0.0	-	5.4	137.7	389.5	628.1	3,413.7
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	6.8	6.9	7.1	5.8	6.7	4.8	2.8	2.7	4.9	5.7	6.1	6.9	67.1
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	760.1	615.1	519.1	324.5	67.3	4.9	2.8	2.7	10.3	143.4	395.6	635.0	3,480.8



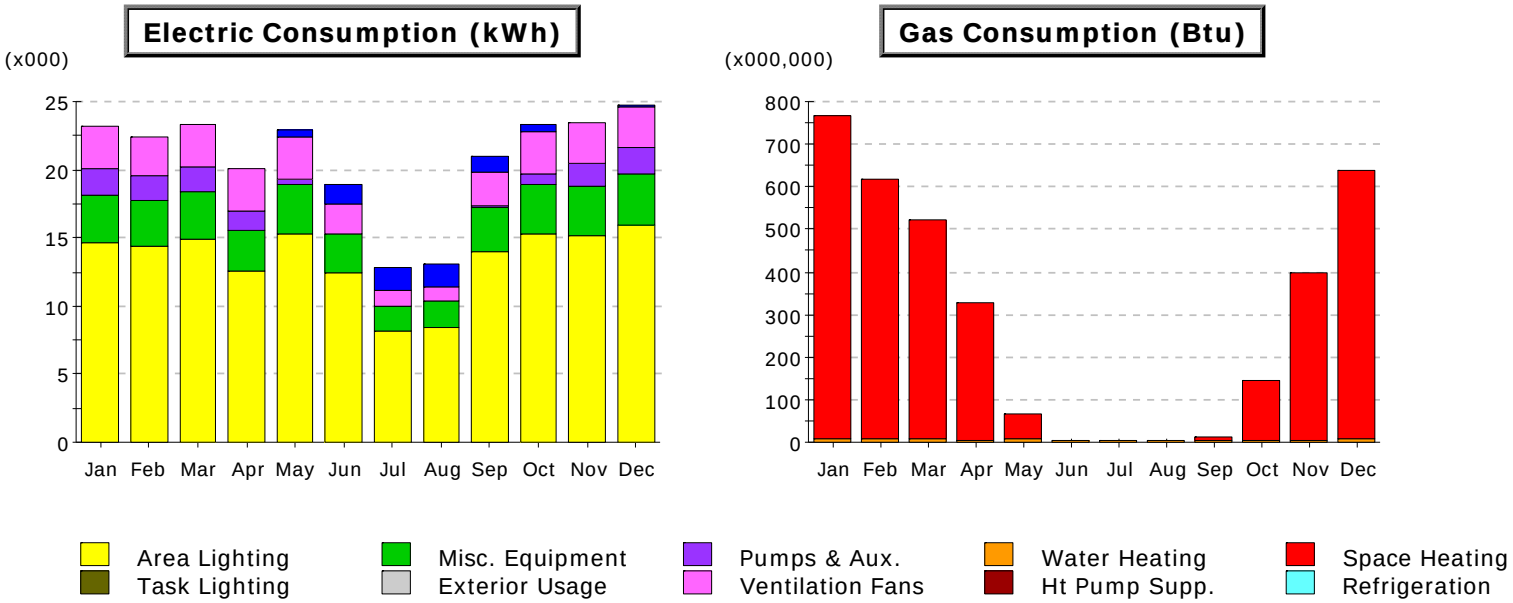


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.01	0.12	0.50	1.43	1.68	1.70	1.10	0.42	0.04	0.02	7.01
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	0.91	0.80	0.78	0.56	0.12	-	-	-	0.01	0.28	0.67	0.85	4.95
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.05	2.77	3.07	3.03	3.15	2.24	1.11	1.07	2.54	3.17	2.98	3.06	31.22
Pumps & Aux.	3.09	2.77	2.81	2.16	0.61	-	-	-	0.06	1.27	2.51	2.97	18.25
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	3.45	3.39	3.51	2.98	3.60	2.93	1.92	1.99	3.30	3.60	3.58	3.75	38.01
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	14.63	14.38	14.87	12.61	15.26	12.38	8.11	8.38	13.97	15.26	15.18	15.90	160.94
Total	25.13	24.11	25.04	21.45	23.24	18.97	12.82	13.13	20.97	23.99	24.96	26.55	260.38

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	594.0	470.2	380.0	223.5	36.8	0.0	0.0	-	2.8	88.1	278.4	481.8	2,555.6
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	6.8	6.9	7.1	5.8	6.7	4.8	2.8	2.7	4.9	5.7	6.1	6.9	67.1
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	600.7	477.1	387.0	229.3	43.5	4.9	2.8	2.7	7.7	93.8	284.5	488.7	2,622.7

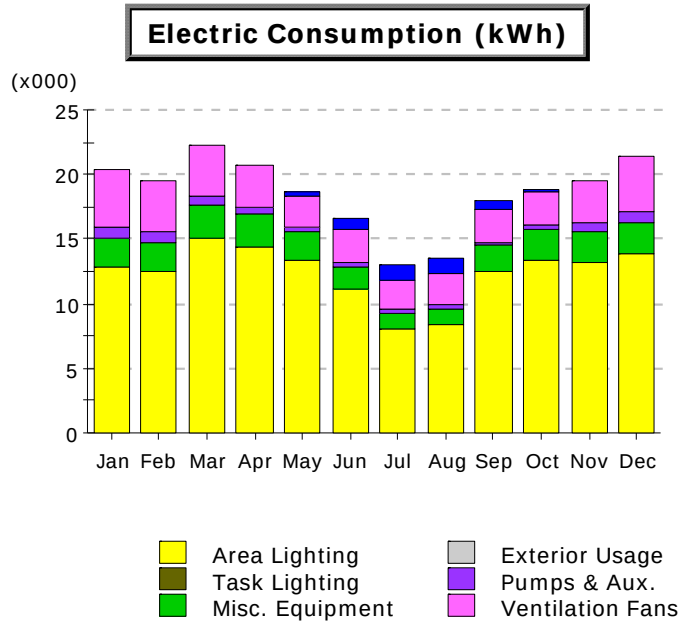


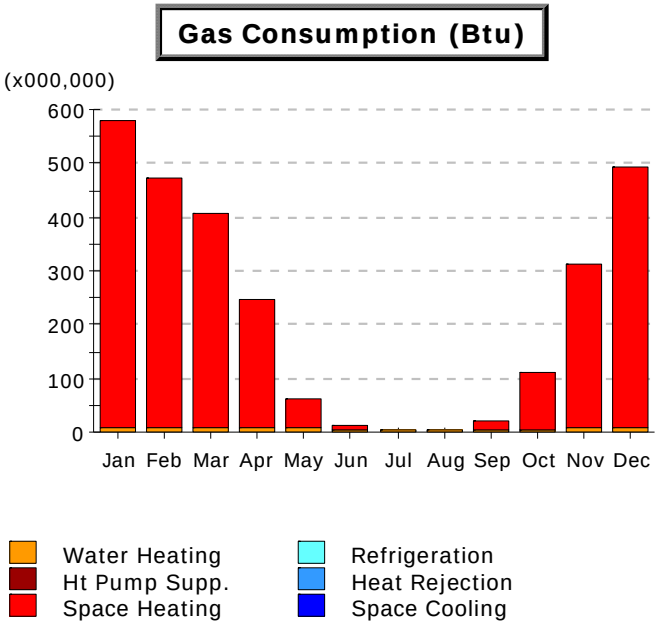
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.01	0.12	0.50	1.43	1.68	1.70	1.10	0.42	0.04	0.02	7.01
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.05	2.77	3.07	3.03	3.15	2.24	1.11	1.07	2.54	3.17	2.98	3.06	31.22
Pumps & Aux.	2.03	1.82	1.84	1.41	0.39	-	-	-	0.04	0.82	1.64	1.95	11.94
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	3.45	3.39	3.51	2.98	3.60	2.93	1.92	1.99	3.30	3.60	3.58	3.75	38.01
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	14.63	14.38	14.87	12.61	15.26	12.38	8.11	8.38	13.97	15.26	15.18	15.90	160.94
Total	23.16	22.36	23.30	20.14	22.91	18.97	12.82	13.13	20.94	23.27	23.42	24.68	249.12

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	758.0	612.4	516.3	322.0	61.6	0.0	0.0	-	5.5	140.1	393.3	632.6	3,441.9
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	6.8	6.9	7.1	5.8	6.7	4.8	2.8	2.7	4.9	5.7	6.1	6.9	67.1
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	764.8	619.3	523.3	327.8	68.3	4.9	2.8	2.7	10.4	145.7	399.4	639.5	3,508.9



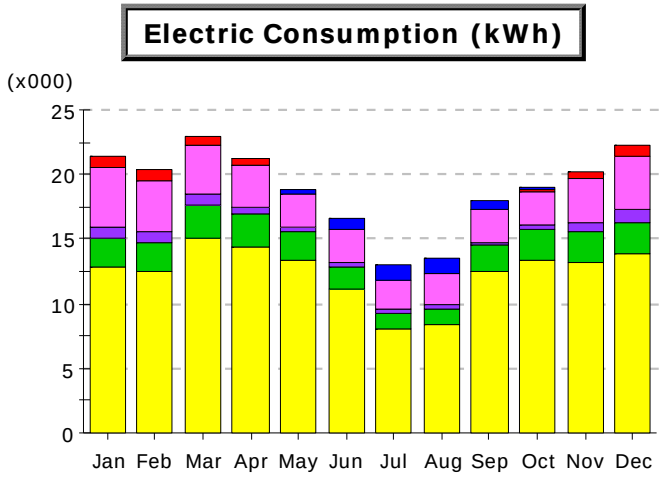


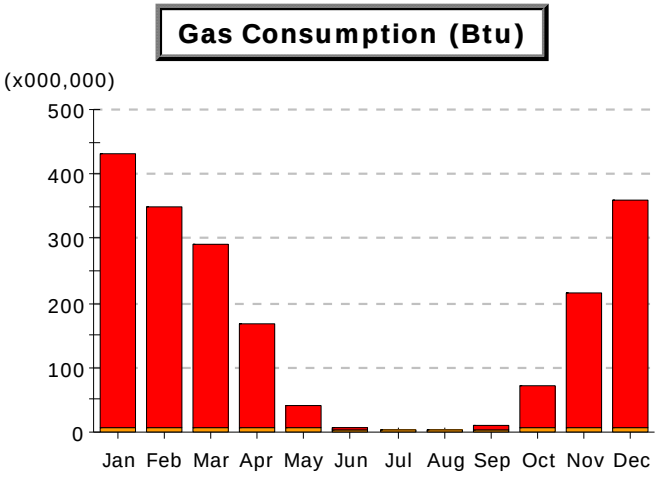
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.00	0.04	0.30	0.88	1.15	1.22	0.60	0.18	0.00	-	4.36
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	4.54	3.91	3.85	3.20	2.51	2.60	2.36	2.47	2.56	2.58	3.31	4.21	38.11
Pumps & Aux.	0.85	0.76	0.77	0.57	0.22	0.20	0.18	0.19	0.20	0.35	0.68	0.82	5.79
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	2.25	2.21	2.64	2.53	2.34	1.82	1.20	1.26	2.13	2.34	2.33	2.44	25.50
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	12.79	12.58	14.99	14.38	13.32	11.08	8.12	8.41	12.45	13.35	13.22	13.89	148.57
Total	20.42	19.46	22.25	20.72	18.70	16.58	13.01	13.55	17.93	18.80	19.54	21.36	222.34

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	573.6	466.6	399.0	237.9	54.9	8.0	0.5	-	13.5	104.2	306.4	486.8	2,651.4
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	7.0	7.1	8.5	8.0	6.9	4.7	2.7	2.6	5.0	5.9	6.3	7.1	71.8
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	580.6	473.8	407.5	245.9	61.7	12.7	3.2	2.6	18.5	110.1	312.6	493.9	2,723.2



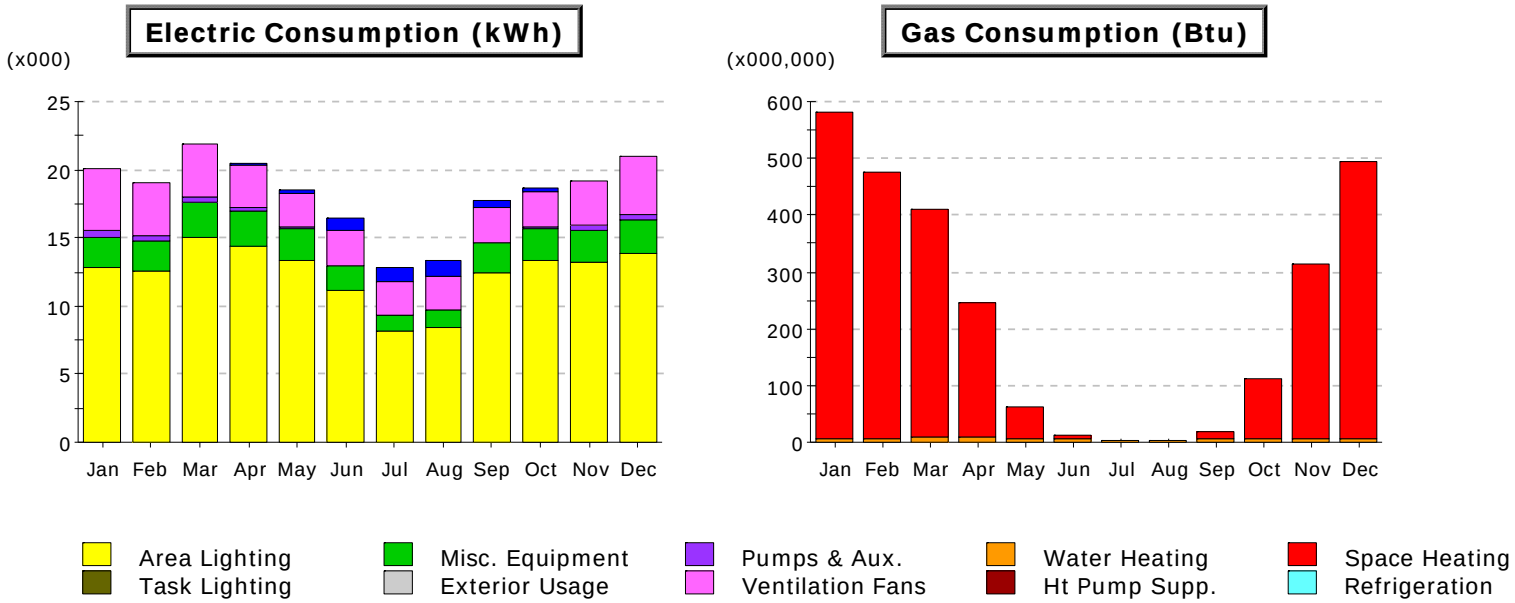


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.00	0.04	0.30	0.88	1.15	1.22	0.60	0.18	0.00	-	4.36
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	0.89	0.74	0.65	0.41	0.09	0.01	0.00	-	0.02	0.17	0.55	0.80	4.33
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	4.54	3.91	3.85	3.20	2.51	2.60	2.36	2.47	2.56	2.58	3.31	4.21	38.11
Pumps & Aux.	0.95	0.85	0.86	0.64	0.25	0.22	0.20	0.21	0.22	0.39	0.76	0.91	6.47
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	2.25	2.21	2.64	2.53	2.34	1.82	1.20	1.26	2.13	2.34	2.33	2.44	25.50
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	12.79	12.58	14.99	14.38	13.32	11.08	8.12	8.41	12.45	13.35	13.22	13.89	148.57
Total	21.41	20.29	22.99	21.19	18.82	16.62	13.04	13.58	17.98	19.02	20.17	22.25	227.35

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	425.5	341.8	283.3	159.4	33.0	3.2	0.2	-	6.3	64.6	208.8	352.4	1,878.3
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	7.0	7.1	8.5	8.0	6.9	4.7	2.7	2.6	5.0	5.9	6.3	7.1	71.8
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	432.5	348.9	291.8	167.4	39.8	7.8	2.8	2.6	11.3	70.5	215.1	359.5	1,950.1



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.00	0.04	0.30	0.88	1.15	1.22	0.60	0.18	0.00	-	4.36
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	4.54	3.91	3.85	3.20	2.51	2.60	2.36	2.47	2.56	2.58	3.31	4.21	38.11
Pumps & Aux.	0.45	0.40	0.40	0.29	0.10	0.05	0.04	0.04	0.05	0.16	0.33	0.43	2.73
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	2.25	2.21	2.64	2.53	2.34	1.82	1.20	1.26	2.13	2.34	2.33	2.44	25.50
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	12.79	12.58	14.99	14.38	13.32	11.08	8.12	8.41	12.45	13.35	13.22	13.89	148.57
Total	20.02	19.10	21.88	20.44	18.58	16.43	12.87	13.40	17.78	18.61	19.20	20.97	219.28

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	575.2	468.1	400.4	239.1	56.3	8.9	0.7	-	15.0	106.7	307.7	488.3	2,666.4
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	7.0	7.1	8.5	8.0	6.9	4.7	2.7	2.6	5.0	5.9	6.3	7.1	71.8
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	582.2	475.2	408.9	247.1	63.2	13.5	3.3	2.6	20.0	112.6	314.0	495.5	2,738.1

APPENDIX D

LIGHTING SPREADSHEETS

Appendix D-Lighting Spreadsheet

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Fixtures	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Annual Cost of Energy Existing	Proposed Replacement Solution	Prop. Qty of Fixtures	Prop. Watts	Prop. kW Base	Prop. Oper. Hrs. w/ Sensors	Prop. kWh w/o Sensors	Prop. kWh w/ Sensors	Proposed Occupancy Sensor	Sensor Qtys	Total kWh Saved Lighting Only	kWh Saved Sensors Only	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector	Bulb	Labor	OS Cost	OS Labor	Subtotal	Total
1	Memorial Junior School	001	Memorial Gym	2x2 400W Metal Halide Fixtures	20	9160.0	9.16	2,600	23,816	$ 4,096.35	Replace Metal Halide Fixtures with 6-Lamp Fluorescent Highbay Fixtures	20	4520.0	4.52	2,600	11752	11752	NONE PROPOSED	0	12,064	-	4.64	12,064	$ 2,075.01	168	105	15	0	0	288	5760
2	Memorial Junior School	001	Memorial Gym Storage	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	64.0	0.06	500	32	$ 5.50	NONE PROPOSED	2	64.0	0.06	350	32	22	Automatic Wall Switch Occupancy Sensor	1	-	9.60	-	10	$ 1.65	0	0	65	103	73.5	65	306.5
3	Memorial Junior School	001	Break Room	60W Incandescent Fixture	2	120.0	0.12	2,600	312	$ 53.66	Replace 60W Incandescent Fixture with 13W CFL	2	30.0	0.03	1,820	78	55	Automatic Wall Switch Occupancy Sensor	1	234	23.40	0.09	257	$ 44.27	0	5	20	103	73.5	25	226.5
4	Memorial Junior School	001	Closet	60W Incandescent Fixture	1	60.0	0.06	500	30	$ 5.16	Replace 60W Incandescent Fixture with 13W CFL	1	15.0	0.02	350	8	5	Automatic Wall Switch Occupancy Sensor	1	23	2.25	0.05	25	$ 4.26	0	5	20	103	73.5	25	201.5
5	Memorial Junior School	001	713 Classroom	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	16	496.0	0.50	2,600	1,290	$ 221.81	NONE PROPOSED	16	496.0	0.50	1,820	1290	903	Ceiling Mounted Occupancy Sensor	1	-	386.88	-	387	$ 66.54	0	0	0	63.5	21.5	0	85
6	Memorial Junior School	001	715 Classroom	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	16	496.0	0.50	2,600	1,290	$ 221.81	NONE PROPOSED	16	496.0	0.50	1,820	1290	903	Ceiling Mounted Occupancy Sensor	1	-	386.88	-	387	$ 66.54	0	0	0	63.5	21.5	0	85
7	Memorial Junior School	001	712 Classroom	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	16	496.0	0.50	2,600	1,290	$ 221.81	NONE PROPOSED	16	496.0	0.50	1,820	1290	903	Ceiling Mounted Occupancy Sensor	1	-	386.88	-	387	$ 66.54	0	0	0	63.5	21.5	0	85
8	Memorial Junior School	001	717 Classroom	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	32	992.0	0.99	2,600	2,579	$ 443.62	NONE PROPOSED	32	992.0	0.99	1,820	2579	1805	Ceiling Mounted Occupancy Sensor	1	-	773.76	-	774	$ 133.09	0	0	0	63.5	21.5	0	85
9	Memorial Junior School	001	718 Classroom	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	16	496.0	0.50	2,600	1,290	$ 221.81	NONE PROPOSED	16	496.0	0.50	1,820	1290	903	Ceiling Mounted Occupancy Sensor	1	-	386.88	-	387	$ 66.54	0	0	0	63.5	21.5	0	85
10	Memorial Junior School	001	711 Classroom	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	16	496.0	0.50	2,600	1,290	$ 221.81	NONE PROPOSED	16	496.0	0.50	1,820	1290	903	Ceiling Mounted Occupancy Sensor	1	-	386.88	-	387	$ 66.54	0	0	0	63.5	21.5	0	85
11	Memorial Junior School	001	710 Classroom	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	16	496.0	0.50	2,600	1,290	$ 221.81	NONE PROPOSED	16	496.0	0.50	1,820	1290	903	Ceiling Mounted Occupancy Sensor	1	-	386.88	-	387	$ 66.54	0	0	0	63.5	21.5	0	85
12	Memorial Junior School	001	Boys Bath	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	64.0	0.06	2,600	166	$ 28.62	NONE PROPOSED	2	64.0	0.06	1,820	166	116	Automatic Wall Switch Occupancy Sensor	1	-	49.92	-	50	$ 8.59	0	0	65	103	73.5	65	306.5
13	Memorial Junior School	001	Girls Bath	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	3	96.0	0.10	2,600	250	$ 42.93	NONE PROPOSED	3	96.0	0.10	1,820	250	175	Automatic Wall Switch Occupancy Sensor	1	-	74.88	-	75	$ 12.88	0	0	65	103	73.5	65	371.5
14	Memorial Junior School	001	Custodian Room	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	500	23	$ 3.87	NONE PROPOSED	1	45.0	0.05	350	23	16	Automatic Wall Switch Occupancy Sensor	1	-	6.75	-	7	$ 1.16	0	0	0	103	73.5	0	176.5
15	Memorial Junior School	001	Telephone Booth	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	500	23	$ 3.87	NONE PROPOSED	1	45.0	0.05	500	23	23	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
16	Memorial Junior School	001	613 Classroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	30	1800.0	1.80	2,600	4,680	$ 804.96	NONE PROPOSED	30	1800.0	1.80	1,820	4680	3276	Ceiling Mounted Occupancy Sensor	1	-	1,404.00	-	1,404	$ 241.49	0	0	0	63.5	21.5	0	85
17	Memorial Junior School	001	614 Classroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	36	2160.0	2.16	2,600	5,616	$ 965.95	NONE PROPOSED	36	2160.0	2.16	1,820	5616	3931	Ceiling Mounted Occupancy Sensor	2	-	1,684.80	-	1,685	$ 289.79	0	0	0	127	43	0	170
18	Memorial Junior School	001	614 Classroom	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	2,600	156	$ 26.83	NONE PROPOSED	1	60.0	0.06	2,600	156	156	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
19	Memorial Junior School	001	614 Storage	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	240.0	0.24	500	120	$ 20.64	NONE PROPOSED	4	240.0	0.24	350	120	84	Automatic Wall Switch Occupancy Sensor	1	-	36.00	-	36	$ 6.19	0	0	0	103	73.5	0	176.5
20	Memorial Junior School	001	614 Storage	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	64.0	0.06	500	32	$ 5.50	NONE PROPOSED	2	64.0	0.06	350	32	22	Automatic Wall Switch Occupancy Sensor	1	-	9.60	-	10	$ 1.65	0	0	65	103	73.5	65	306.5
21	Memorial Junior School	001	614 Finishing Room	Surface Mount Fixture w/ 3-13W CFL	2	90.0	0.09	2,600	234	$ 40.25	NONE PROPOSED	2	90.0	0.09	1,820	234	164	Automatic Wall Switch Occupancy Sensor	1	-	70.20	-	70	$ 12.07	0	0	0	103	73.5	0	176.5
22	Memorial Junior School	001	Guidance Main Office	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	240.0	0.24	2,600	624	$ 107.33	NONE PROPOSED	4	240.0	0.24	1,820	624	437	Ceiling Mounted Occupancy Sensor	1	-	187.20	-	187	$ 32.20	0	0	0	63.5	21.5	0	85
23	Memorial Junior School	001	Guidance Office GA	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	2,600	156	$ 26.83	NONE PROPOSED	1	60.0	0.06	1,820	156	109	Automatic Wall Switch Occupancy Sensor	1	-	46.80	-	47	$ 8.05	0	0	0	103	73.5	0	176.5
24	Memorial Junior School	001	Guidance Office GB	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	2,600	156	$ 26.83	NONE PROPOSED	1	60.0	0.06	1,820	156	109	Automatic Wall Switch Occupancy Sensor	1	-	46.80	-	47	$ 8.05	0	0	0	103	73.5	0	176.5
25	Memorial Junior School	001	Guidance Office GC	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 53.66	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Ceiling Mounted Occupancy Sensor	1	-	93.60	-	94	$ 16.10	0	0	0	63.5	21.5	0	85
26	Memorial Junior School	001	Guidance Office GD	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	2,600	156	$ 26.83	NONE PROPOSED	1	60.0	0.06	1,820	156	109	Automatic Wall Switch Occupancy Sensor	1	-	46.80	-	47	$ 8.05	0	0	0	103	73.5	0	176.5
27	Memorial Junior School	001	619 Classroom	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	36	1116.0	1.12	2,600	2,902	$ 499.08	NONE PROPOSED	36	1116.0	1.12	1,820	2902	2031	Ceiling Mounted Occupancy Sensor	2	-	870.48	-	870	$ 149.72	0	0	0	127	43	0	170
28	Memorial Junior School	001	Boiler Room	1X4 Suspended Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	5	300.0	0.30	500	150	$ 25.80	NONE PROPOSED	5	300.0	0.30	350	150	105	Ceiling Mounted Occupancy Sensor	1	-	45.00	-	45	$ 7.74	0	0	65	63.5	21.5	65	410
29	Memorial Junior School	001	620 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 257.59	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 77.28	0	0	65	63.5	21.5	65	1255
30	Memorial Junior School	001	Auditorium	150W Recessed Metal Halide Fixture	20	3800.0	3.80	1,040	3,952	$ 679.74	NONE PROPOSED	20	3800.0	3.80	1,040	3952	3952	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
31	Memorial Junior School	001	Stage	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	8	480.0	0.48	1,040	499	$ 85.86	NONE PROPOSED	8	480.0	0.48	1,040	499	499	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
32	Memorial Junior School	001	Stage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	8	480.0	0.48	1,040	499	$ 85.86	NONE PROPOSED	8	480.0	0.48	1,040	499	499	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	520
33	Memorial Junior School	001	Stage Closet	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	500	23	$ 3.87	NONE PROPOSED	1	45.0	0.05	350	23	16	Automatic Wall Switch Occupancy Sensor	1	-	6.75	-	7	$ 1.16	0	0	0	103	73.5	0	176.5

Appendix D-Lighting Spreadsheet

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Fixtures	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Annual Cost of Energy Existing	Proposed Replacement Solution	Prop. Qty of Fixtures	Prop. Watts	Prop. kW Base	Prop. Oper. Hrs. w/ Sensors	Prop. kWh w/o Sensors	Prop. kWh w/ Sensors	Proposed Occupancy Sensor	Sensor Qtys	Total kWh Saved Lighting Only	kWh Saved Sensors Only	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector	Bulb	Labor	OS Cost	OS Labor	Subtotal	Total
34	Memorial Junior School	001	Stage Halls	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	4	124.0	0.12	2,600	322	$ 55.45	NONE PROPOSED	4	124.0	0.12	2,600	322	322	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
35	Memorial Junior School	001	Stage	60W Incandescent Fixture	1	60.0	0.06	1,050	63	$ 10.84	Replace 60W Incandescent Fixture with 13W CFL	1	15.0	0.02	1,050	16	16	NONE PROPOSED	0	47	-	0.05	47	$ 8.13	0	5	20	0	0	25	25
36	Memorial Junior School	001	Auditorium Storage	60W Incandescent Fixture	2	120.0	0.12	500	60	$ 10.32	Replace 60W Incandescent Fixture with 13W CFL	2	30.0	0.03	350	15	11	Automatic Wall Switch Occupancy Sensor	1	45	4.50	0.09	50	$ 8.51	0	5	20	103	73.5	25	226.5
37	Memorial Junior School	001	Girls Bath	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	240.0	0.24	2,600	624	$ 107.33	NONE PROPOSED	4	240.0	0.24	1,820	624	437	Ceiling Mounted Occupancy Sensor	1	-	187.20	-	187	$ 32.20	0	0	0	63.5	21.5	0	85
38	Memorial Junior School	001	Girls Bath	60W Incandescent Fixture	1	60.0	0.06	2,600	156	$ 26.83	Replace 60W Incandescent Fixture with 13W CFL	1	15.0	0.02	1,820	39	27	Automatic Wall Switch Occupancy Sensor	1	117	11.70	0.05	129	$ 22.14	0	5	20	103	73.5	25	201.5
39	Memorial Junior School	001	Telephone Booth	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	500	23	$ 3.87	NONE PROPOSED	1	45.0	0.05	500	23	23	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
40	Memorial Junior School	001	Roof Access Room	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	32.0	0.03	500	16	$ 2.75	NONE PROPOSED	1	32.0	0.03	350	16	11	Automatic Wall Switch Occupancy Sensor	1	-	4.80	-	5	$ 0.83	0	0	65	103	73.5	65	241.5
41	Memorial Junior School	001	Boys Bath	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	180.0	0.18	2,600	468	$ 80.50	NONE PROPOSED	3	180.0	0.18	1,820	468	328	Ceiling Mounted Occupancy Sensor	1	-	140.40	-	140	$ 24.15	0	0	0	63.5	21.5	0	85
42	Memorial Junior School	001	823 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	15	480.0	0.48	2,600	1,248	$ 214.66	NONE PROPOSED	15	480.0	0.48	1,820	1248	874	Ceiling Mounted Occupancy Sensor	1	-	374.40	-	374	$ 64.40	0	0	65	63.5	21.5	65	1060
43	Memorial Junior School	001	Special Ed. Room	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	10	320.0	0.32	2,600	832	$ 143.10	NONE PROPOSED	10	320.0	0.32	1,820	832	582	Ceiling Mounted Occupancy Sensor	1	-	249.60	-	250	$ 42.93	0	0	65	63.5	21.5	65	735
44	Memorial Junior School	001	Womens Bath	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	3	96.0	0.10	2,600	250	$ 42.93	NONE PROPOSED	3	96.0	0.10	1,820	250	175	Ceiling Mounted Occupancy Sensor	1	-	74.88	-	75	$ 12.88	0	0	65	63.5	21.5	65	280
45	Memorial Junior School	001	Womens Bath	2' 17W T8 Fluorescent Fixture	1	31.0	0.03	2,600	81	$ 13.86	NONE PROPOSED	1	31.0	0.03	2,600	81	81	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
46	Memorial Junior School	001	Mens Bath	2' 17W T8 Fluorescent Fixture	1	31.0	0.03	2,600	81	$ 13.86	NONE PROPOSED	1	31.0	0.03	2,600	81	81	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
47	Memorial Junior School	001	Mens Bath	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	3	96.0	0.10	2,600	250	$ 42.93	NONE PROPOSED	3	96.0	0.10	1,820	250	175	Ceiling Mounted Occupancy Sensor	1	-	74.88	-	75	$ 12.88	0	0	65	63.5	21.5	65	280
48	Memorial Junior School	001	Boiler Room	Surface Mount Fixture w/ 13W CFL	7	105.0	0.11	500	53	$ 9.03	NONE PROPOSED	7	105.0	0.11	500	53	53	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
49	Memorial Junior School	001	Boiler Room	1X4 Suspended Fixtures/1-T8 Lamps/Electronic Ballasts	1	32.0	0.03	500	16	$ 2.75	NONE PROPOSED	1	32.0	0.03	500	16	16	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	65
50	Memorial Junior School	001	Electrical Room	1X4 Suspended Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	500	60	$ 10.32	NONE PROPOSED	2	120.0	0.12	350	60	42	Automatic Wall Switch Occupancy Sensor	1	-	18.00	-	18	$ 3.10	0	0	65	103	73.5	65	306.5
51	Memorial Junior School	001	Electrical Room	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	500	23	$ 3.87	NONE PROPOSED	1	45.0	0.05	500	23	23	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
52	Memorial Junior School	001	Nurse	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	180.0	0.18	2,600	468	$ 80.50	NONE PROPOSED	3	180.0	0.18	1,820	468	328	Ceiling Mounted Occupancy Sensor	1	-	140.40	-	140	$ 24.15	0	0	65	63.5	21.5	65	280
53	Memorial Junior School	001	Nurse	2' 17W T8 Fluorescent Fixture	3	93.0	0.09	2,600	242	$ 41.59	NONE PROPOSED	3	93.0	0.09	2,600	242	242	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
54	Memorial Junior School	001	Closet	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	500	30	$ 5.16	NONE PROPOSED	1	60.0	0.06	350	30	21	Automatic Wall Switch Occupancy Sensor	1	-	9.00	-	9	$ 1.55	0	0	65	103	73.5	65	241.5
55	Memorial Junior School	001	Womens Bath	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	3	96.0	0.10	2,600	250	$ 42.93	NONE PROPOSED	3	96.0	0.10	1,820	250	175	Ceiling Mounted Occupancy Sensor	1	-	74.88	-	75	$ 12.88	0	0	65	63.5	21.5	65	280
56	Memorial Junior School	001	Custodial Closet	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	500	23	$ 3.87	NONE PROPOSED	1	45.0	0.05	350	23	16	Automatic Wall Switch Occupancy Sensor	1	-	6.75	-	7	$ 1.16	0	0	0	103	73.5	0	176.5
57	Memorial Junior School	001	Mens Bath	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	30	960.0	0.96	2,600	2,496	$ 429.31	NONE PROPOSED	30	960.0	0.96	1,820	2496	1747	Ceiling Mounted Occupancy Sensor	1	-	748.80	-	749	$ 128.79	0	0	65	63.5	21.5	65	2035
58	Memorial Junior School	001	Custodial Closet	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	500	23	$ 3.87	NONE PROPOSED	1	45.0	0.05	350	23	16	Automatic Wall Switch Occupancy Sensor	1	-	6.75	-	7	$ 1.16	0	0	0	103	73.5	0	176.5
59	Memorial Junior School	001	618 Classroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	15	1395.0	1.40	2,600	3,627	$ 623.84	NONE PROPOSED	15	1395.0	1.40	1,820	3627	2539	Ceiling Mounted Occupancy Sensor	1	-	1,088.10	-	1,088	$ 187.15	0	0	0	63.5	21.5	0	85
60	Memorial Junior School	001	618 Classroom	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	5	300.0	0.30	2,600	780	$ 134.16	NONE PROPOSED	5	300.0	0.30	2,600	780	780	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
61	Memorial Junior School	001	618 Classroom	2' 32W T8 Fluorescent Fixture	6	360.0	0.36	2,600	936	$ 160.99	NONE PROPOSED	6	360.0	0.36	2,600	936	936	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
62	Memorial Junior School	001	616 Classroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	372.0	0.37	2,600	967	$ 166.36	NONE PROPOSED	4	372.0	0.37	1,820	967	677	Ceiling Mounted Occupancy Sensor	1	-	290.16	-	290	$ 49.91	0	0	0	63.5	21.5	0	85
63	Memorial Junior School	001	616 Classroom	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	32	1920.0	1.92	2,600	4,992	$ 858.62	NONE PROPOSED	32	1920.0	1.92	2,600	4992	4992	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
64	Memorial Junior School	001	Board Of Ed. Hall	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	372.0	0.37	8,736	3,250	$ 558.96	NONE PROPOSED	4	372.0	0.37	8,736	3250	3250	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
65	Memorial Junior School	001	Board of Ed. Office	13W CFL CAN	8	120.0	0.12	2,600	312	$ 53.66	NONE PROPOSED	8	120.0	0.12	1,820	312	218	Ceiling Mounted Occupancy Sensor	1	-	93.60	-	94	$ 16.10	0	0	0	63.5	21.5	0	85
66	Memorial Junior School	001	Superintendent Reception	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	8	744.0	0.74	2,600	1,934	$ 332.72	NONE PROPOSED	8	744.0	0.74	1,820	1934	1354	Automatic Wall Switch Occupancy Sensor	1	-	580.32	-	580	$ 99.82	0	0	0	103	73.5	0	176.5

Appendix D-Lighting Spreadsheet

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Fixtures	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Annual Cost of Energy Existing	Proposed Replacement Solution	Prop. Qty of Fixtures	Prop. Watts	Prop. kW Base	Prop. Oper. Hrs. w/ Sensors	Prop. kWh w/o Sensors	Prop. kWh w/ Sensors	Proposed Occupancy Sensor	Sensor Qtys	Total kWh Saved Lighting Only	kWh Saved Sensors Only	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector	Bulb	Labor	OS Cost	OS Labor	Subtotal	Total
67	Memorial Junior School	001	Superintendent Office	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	6	558.0	0.56	2,600	1,451	$ 249.54	NONE PROPOSED	6	558.0	0.56	1,820	1451	1016	Ceiling Mounted Occupancy Sensor	1	-	435.24	-	435	$ 74.86	0	0	0	63.5	21.5	0	85
68	Memorial Junior School	001	Conference Room	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	4	128.0	0.13	2,600	333	$ 57.24	NONE PROPOSED	4	128.0	0.13	1,820	333	233	Ceiling Mounted Occupancy Sensor	1	-	99.84	-	100	$ 17.17	0	0	65	63.5	21.5	65	345
69	Memorial Junior School	001	Conference Room	60W Incandescent Fixture	8	480.0	0.48	2,600	1,248	$ 214.66	Replace 60W Incandescent Fixture with 13W CFL	8	120.0	0.12	1,820	312	218	Ceiling Mounted Occupancy Sensor	1	936	93.60	0.36	1,030	$ 177.09	0	5	20	63.5	21.5	25	285
70	Memorial Junior School	001	Board of. Ed. Reception	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	240.0	0.24	2,600	624	$ 107.33	NONE PROPOSED	4	240.0	0.24	1,820	624	437	Automatic Wall Switch Occupancy Sensor	1	-	187.20	-	187	$ 32.20	0	0	0	103	73.5	0	176.5
71	Memorial Junior School	001	Main Office	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	24	1440.0	1.44	2,600	3,744	$ 643.97	NONE PROPOSED	24	1440.0	1.44	1,820	3744	2621	Ceiling Mounted Occupancy Sensor	1	-	1,123.20	-	1,123	$ 193.19	0	0	0	63.5	21.5	0	85
72	Memorial Junior School	001	Copy Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	186.0	0.19	2,600	484	$ 83.18	NONE PROPOSED	2	186.0	0.19	1,820	484	339	Ceiling Mounted Occupancy Sensor	1	-	145.08	-	145	$ 24.95	0	0	0	63.5	21.5	0	85
73	Memorial Junior School	001	Office	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	372.0	0.37	2,600	967	$ 166.36	NONE PROPOSED	4	372.0	0.37	1,820	967	677	Automatic Wall Switch Occupancy Sensor	1	-	290.16	-	290	$ 49.91	0	0	0	103	73.5	0	176.5
74	Memorial Junior School	001	Office	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	372.0	0.37	2,600	967	$ 166.36	NONE PROPOSED	4	372.0	0.37	1,820	967	677	Automatic Wall Switch Occupancy Sensor	0	-	290.16	-	290	$ 49.91	0	0	0	0	0	0	0
75	Memorial Junior School	001	Closet	Surface Mount Fixture w/ 13W CFL	1	15.0	0.02	500	8	$ 1.29	NONE PROPOSED	1	15.0	0.02	350	8	5	Automatic Wall Switch Occupancy Sensor	1	-	2.25	-	2	$ 0.39	0	0	0	103	73.5	0	176.5
76	Memorial Junior School	001	Assistant Superintendent Area	Interior Wall Packs (Assume 50w)	3	216.0	0.22	2,600	562	$ 96.60	NONE PROPOSED	3	216.0	0.22	2,600	562	562	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
77	Memorial Junior School	001	Office	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	372.0	0.37	2,600	967	$ 166.36	NONE PROPOSED	4	372.0	0.37	1,820	967	677	Automatic Wall Switch Occupancy Sensor	1	-	290.16	-	290	$ 49.91	0	0	0	103	73.5	0	176.5
78	Memorial Junior School	001	Office	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	372.0	0.37	2,600	967	$ 166.36	NONE PROPOSED	4	372.0	0.37	1,820	967	677	Automatic Wall Switch Occupancy Sensor	1	-	290.16	-	290	$ 49.91	0	0	0	103	73.5	0	176.5
79	Memorial Junior School	001	File Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	372.0	0.37	2,600	967	$ 166.36	NONE PROPOSED	4	372.0	0.37	1,820	967	677	Automatic Wall Switch Occupancy Sensor	1	-	290.16	-	290	$ 49.91	0	0	0	103	73.5	0	176.5
80	Memorial Junior School	001	Storage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	500	60	$ 10.32	NONE PROPOSED	2	120.0	0.12	350	60	42	Automatic Wall Switch Occupancy Sensor	1	-	18.00	-	18	$ 3.10	0	0	65	103	73.5	65	306.5
81	Memorial Junior School	001	Undercabinet	2' 17W T8 Fluorescent Fixture	3	93.0	0.09	2,600	242	$ 41.59	NONE PROPOSED	3	93.0	0.09	2,600	242	242	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
82	Memorial Junior School	001	Storage	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	5	465.0	0.47	500	233	$ 39.99	NONE PROPOSED	5	465.0	0.47	350	233	163	Automatic Wall Switch Occupancy Sensor	1	-	69.75	-	70	$ 12.00	0	0	65	103	73.5	65	501.5
83	Memorial Junior School	001	Storage	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	5	465.0	0.47	500	233	$ 39.99	NONE PROPOSED	5	465.0	0.47	350	233	163	Automatic Wall Switch Occupancy Sensor	1	-	69.75	-	70	$ 12.00	0	0	65	103	73.5	65	501.5
84	Memorial Junior School	001	Storage	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	5	465.0	0.47	500	233	$ 39.99	NONE PROPOSED	5	465.0	0.47	350	233	163	Automatic Wall Switch Occupancy Sensor	1	-	69.75	-	70	$ 12.00	0	0	65	103	73.5	65	501.5
85	Memorial Junior School	001	Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	16	512.0	0.51	8,736	4,473	$ 769.33	NONE PROPOSED	16	512.0	0.51	8,736	4473	4473	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	1040
86	Memorial Junior School	001	510 Classroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	18	1080.0	1.08	2,600	2,808	$ 482.98	NONE PROPOSED	18	1080.0	1.08	1,820	2808	1966	Ceiling Mounted Occupancy Sensor	1	-	842.40	-	842	$ 144.89	0	0	0	63.5	21.5	0	85
87	Memorial Junior School	001	Maintenance Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	26	2418.0	2.42	2,600	6,287	$ 1,081.33	NONE PROPOSED	26	2418.0	2.42	1,820	6287	4401	Ceiling Mounted Occupancy Sensor	1	-	1,886.04	-	1,886	$ 324.40	0	0	0	63.5	21.5	0	85
88	Memorial Junior School	001	Maintenance Reception	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	372.0	0.37	2,600	967	$ 166.36	NONE PROPOSED	4	372.0	0.37	1,820	967	677	Ceiling Mounted Occupancy Sensor	1	-	290.16	-	290	$ 49.91	0	0	0	63.5	21.5	0	85
89	Memorial Junior School	001	Maintainance Director	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	372.0	0.37	2,600	967	$ 166.36	NONE PROPOSED	4	372.0	0.37	1,820	967	677	Ceiling Mounted Occupancy Sensor	1	-	290.16	-	290	$ 49.91	0	0	0	63.5	21.5	0	85
90	Memorial Junior School	001	Kitchen	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	15	1395.0	1.40	2,600	3,627	$ 623.84	NONE PROPOSED	15	1395.0	1.40	2,600	3627	3627	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
91	Memorial Junior School	001	Viking Gym Office	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 53.66	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Automatic Wall Switch Occupancy Sensor	1	-	93.60	-	94	$ 16.10	0	0	0	103	73.5	0	176.5
92	Memorial Junior School	001	Locker Room	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	19	608.0	0.61	2,600	1,581	$ 271.90	NONE PROPOSED	19	608.0	0.61	1,820	1581	1107	Ceiling Mounted Occupancy Sensor	1	-	474.24	-	474	$ 81.57	0	0	65	63.5	21.5	65	1320
93	Memorial Junior School	001	Weight Room	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	4	240.0	0.24	2,600	624	$ 107.33	NONE PROPOSED	4	240.0	0.24	1,820	624	437	Ceiling Mounted Occupancy Sensor	1	-	187.20	-	187	$ 32.20	0	0	0	63.5	21.5	0	85
94	Memorial Junior School	001	Storage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	240.0	0.24	500	120	$ 20.64	NONE PROPOSED	4	240.0	0.24	350	120	84	Automatic Wall Switch Occupancy Sensor	1	-	36.00	-	36	$ 6.19	0	0	65	103	73.5	65	436.5
95	Memorial Junior School	001	820 Classroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	14	840.0	0.84	2,600	2,184	$ 375.65	NONE PROPOSED	14	840.0	0.84	1,820	2184	1529	Ceiling Mounted Occupancy Sensor	1	-	655.20	-	655	$ 112.69	0	0	65	63.5	21.5	65	995
96	Memorial Junior School	001	818 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 257.59	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 77.28	0	0	65	63.5	21.5	65	1255
97	Memorial Junior School	001	819 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 257.59	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 77.28	0	0	65	63.5	21.5	65	1255
98	Memorial Junior School	001	817 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 257.59	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 77.28	0	0	65	63.5	21.5	65	1255
99	Memorial Junior School	001	815 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 257.59	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 77.28	0	0	65	63.5	21.5	65	1255

Appendix D-Lighting Spreadsheet

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Fixtures	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Annual Cost of Energy Existing	Proposed Replacement Solution	Prop. Qty of Fixtures	Prop. Watts	Prop. kW Base	Prop. Oper. Hrs. w/ Sensors	Prop. kWh w/o Sensors	Prop. kWh w/ Sensors	Proposed Occupancy Sensor	Sensor Qtys	Total kWh Saved Lighting Only	kWh Saved Sensors Only	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector	Bulb	Labor	OS Cost	OS Labor	Subtotal	Total
100	Memorial Junior School	001	814 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 257.59	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 77.28	0	0	65	63.5	21.5	65	1255
101	Memorial Junior School	001	812 Classroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	32	1920.0	1.92	2,600	4,992	$ 858.62	NONE PROPOSED	32	1920.0	1.92	1,820	4992	3494	Ceiling Mounted Occupancy Sensor	2	-	1,497.60	-	1,498	$ 257.59	0	0	0	127	43	0	170
102	Memorial Junior School	001	813 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 257.59	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 77.28	0	0	65	63.5	21.5	65	1255
103	Memorial Junior School	001	LDTC	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 53.66	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Ceiling Mounted Occupancy Sensor	1	-	93.60	-	94	$ 16.10	0	0	65	63.5	21.5	65	215
104	Memorial Junior School	001	Girls Bath	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	180.0	0.18	2,600	468	$ 80.50	NONE PROPOSED	3	180.0	0.18	1,820	468	328	Ceiling Mounted Occupancy Sensor	1	-	140.40	-	140	$ 24.15	0	0	0	63.5	21.5	0	85
105	Memorial Junior School	001	Boys Bath	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	180.0	0.18	2,600	468	$ 80.50	NONE PROPOSED	3	180.0	0.18	1,820	468	328	Ceiling Mounted Occupancy Sensor	1	-	140.40	-	140	$ 24.15	0	0	0	63.5	21.5	0	85
106	Memorial Junior School	001	811 Classroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	34	2040.0	2.04	2,600	5,304	$ 912.29	NONE PROPOSED	34	2040.0	2.04	1,820	5304	3713	Ceiling Mounted Occupancy Sensor	2	-	1,591.20	-	1,591	$ 273.69	0	0	0	127	43	0	170
107	Memorial Junior School	001	Technology Room	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	42	2520.0	2.52	2,600	6,552	$ 1,126.94	NONE PROPOSED	42	2520.0	2.52	1,820	6552	4586	Ceiling Mounted Occupancy Sensor	2	-	1,965.60	-	1,966	$ 338.08	0	0	0	127	43	0	170
108	Memorial Junior School	001	Technology Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	32.0	0.03	8,736	280	$ 48.08	NONE PROPOSED	1	32.0	0.03	8,736	280	280	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	65
109	Memorial Junior School	001	Finishing Room	60W Incandescent Fixture	3	180.0	0.18	2,600	468	$ 80.50	Replace 60W Incandescent Fixture with 13W CFL	3	45.0	0.05	1,820	117	82	Ceiling Mounted Occupancy Sensor	1	351	35.10	0.14	386	$ 66.41	0	5	20	63.5	21.5	25	160
110	Memorial Junior School	001	Project Storage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	500	60	$ 10.32	NONE PROPOSED	2	120.0	0.12	350	60	42	Automatic Wall Switch Occupancy Sensor	1	-	18.00	-	18	$ 3.10	0	0	65	103	73.5	65	306.5
111	Memorial Junior School	001	Technology Office	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 53.66	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Ceiling Mounted Occupancy Sensor	1	-	93.60	-	94	$ 16.10	0	0	65	63.5	21.5	65	215
112	Memorial Junior School	001	Technology Director	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	6	186.0	0.19	2,600	484	$ 83.18	NONE PROPOSED	6	186.0	0.19	1,820	484	339	Ceiling Mounted Occupancy Sensor	1	-	145.08	-	145	$ 24.95	0	0	0	63.5	21.5	0	85
113	Memorial Junior School	001	Director Bathroom	60W Incandescent Fixture	4	240.0	0.24	2,600	624	$ 107.33	Replace 60W Incandescent Fixture with 13W CFL	4	60.0	0.06	1,820	156	109	Automatic Wall Switch Occupancy Sensor	1	468	46.80	0.18	515	$ 88.55	0	5	20	103	73.5	25	276.5
114	Memorial Junior School	001	Technology Storage	60W Incandescent Fixture	2	120.0	0.12	500	60	$ 10.32	Replace 60W Incandescent Fixture with 13W CFL	2	30.0	0.03	350	15	11	Ceiling Mounted Occupancy Sensor	1	45	4.50	0.09	50	$ 8.51	0	5	20	63.5	21.5	25	135
115	Memorial Junior School	001	Storage	Surface Mount Fixture w/ 3-13W CFL	6	270.0	0.27	500	135	$ 23.22	NONE PROPOSED	6	270.0	0.27	350	135	95	Ceiling Mounted Occupancy Sensor	1	-	40.50	-	41	$ 6.97	0	0	0	63.5	21.5	0	85
116	Memorial Junior School	001	Storage	60W Incandescent Fixture	1	60.0	0.06	500	30	$ 5.16	Replace 60W Incandescent Fixture with 13W CFL	1	15.0	0.02	350	8	5	Automatic Wall Switch Occupancy Sensor	1	23	2.25	0.05	25	$ 4.26	0	5	20	103	73.5	25	201.5
117	Memorial Junior School	001	Storage	60W Incandescent Fixture	1	60.0	0.06	500	30	$ 5.16	Replace 60W Incandescent Fixture with 13W CFL	1	15.0	0.02	350	8	5	Automatic Wall Switch Occupancy Sensor	1	23	2.25	0.05	25	$ 4.26	0	5	20	103	73.5	25	201.5
118	Memorial Junior School	001	Hall	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	3	93.0	0.09	8,736	812	$ 139.74	NONE PROPOSED	3	93.0	0.09	8,736	812	812	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
119	Memorial Junior School	001	511 Classroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	24	1440.0	1.44	2,600	3,744	$ 643.97	NONE PROPOSED	24	1440.0	1.44	1,820	3744	2621	Ceiling Mounted Occupancy Sensor	2	-	1,123.20	-	1,123	$ 193.19	0	0	0	127	43	0	170
120	Memorial Junior School	001	Cafeteria	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	90	2880.0	2.88	2,600	7,488	$ 1,287.94	NONE PROPOSED	90	2880.0	2.88	2,600	7488	7488	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	5850
121	Memorial Junior School	001	Viking Gym	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	12	720.0	0.72	2,600	1,872	$ 321.98	NONE PROPOSED	12	720.0	0.72	2,600	1872	1872	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
122	Memorial Junior School	001	Viking Gym	2x2 400W Metal Halide Fixtures	40	18320.0	18.32	2,600	47,632	$ 8,192.70	Replace Metal Halide Fixtures with 6-Lamp Fluorescent Highbay Fixtures	40	9040.0	9.04	2,600	23504	23504	NONE PROPOSED	0	24,128	-	9.28	24,128	$ 4,150.02	168	105	15	0	0	288	11520
123	Memorial Junior School	001	Gym Storage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	500	30	$ 5.16	NONE PROPOSED	1	60.0	0.06	350	30	21	Automatic Wall Switch Occupancy Sensor	1	-	9.00	-	9	$ 1.55	0	0	65	103	73.5	65	241.5
124	Memorial Junior School	001	Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	5	160.0	0.16	8,736	1,398	$ 240.41	NONE PROPOSED	5	160.0	0.16	8,736	1398	1398	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	325
125	Memorial Junior School	001	Hall	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	28	1680.0	1.68	8,736	14,676	$ 2,524.35	NONE PROPOSED	28	1680.0	1.68	8,736	14676	14676	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
126	Memorial Junior School	001	Hall	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	32	992.0	0.99	8,736	8,666	$ 1,490.57	NONE PROPOSED	32	992.0	0.99	8,736	8666	8666	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
127	Memorial Junior School	001	821 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 257.59	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 77.28	0	0	65	63.5	21.5	65	1255
128	Memorial Junior School	001	816 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 257.59	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 77.28	0	0	65	63.5	21.5	65	1255
129	Memorial Junior School	001	Hall	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	40	1240.0	1.24	8,736	10,833	$ 1,863.21	NONE PROPOSED	40	1240.0	1.24	8,736	10833	10833	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
130	Memorial Junior School	001	Storage	Surface Mount Fixture w/ 3-13W CFL	9	405.0	0.41	500	203	$ 34.83	NONE PROPOSED	9	405.0	0.41	350	203	142	Ceiling Mounted Occupancy Sensor	1	-	60.75	-	61	$ 10.45	0	0	0	63.5	21.5	0	85
131	Memorial Junior School	001	Hall	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	23	713.0	0.71	8,736	6,229	$ 1,071.35	NONE PROPOSED	23	713.0	0.71	8,736	6229	6229	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
132	Memorial Junior School	001	714 Classroom	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	16	496.0	0.50	2,600	1,290	$ 221.81	NONE PROPOSED	16	496.0	0.50	1,820	1290	903	Ceiling Mounted Occupancy Sensor	1	-	386.88	-	387	$ 66.54	0	0	0	63.5	21.5	0	85

Appendix D-Lighting Spreadsheet

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Fixtures	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Annual Cost of Energy Existing	Proposed Replacement Solution	Prop. Qty of Fixtures	Prop. Watts	Prop. kW Base	Prop. Oper. Hrs. w/ Sensors	Prop. kWh w/o Sensors	Prop. kWh w/ Sensors	Proposed Occupancy Sensor	Sensor Qtys	Total kWh Saved Lighting Only	kWh Saved Sensors Only	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector	Bulb	Labor	OS Cost	OS Labor	Subtotal	Total
133	Memorial Junior School	001	716 Classroom	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	16	496.0	0.50	2,600	1,290	$ 221.81	NONE PROPOSED	16	496.0	0.50	1,820	1290	903	Ceiling Mounted Occupancy Sensor	1	-	386.88	-	387	$ 66.54	0	0	0	63.5	21.5	0	85
134	Memorial Junior School	001	Hall	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	40	4800.0	4.80	8,736	41,933	$ 7,212.44	NONE PROPOSED	40	4800.0	4.80	8,736	41933	41933	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
135	Memorial Junior School	001	Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	28	896.0	0.90	8,736	7,827	$ 1,346.32	NONE PROPOSED	28	896.0	0.90	8,736	7827	7827	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	1820
136	Memorial Junior School	001	Hall	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	63	1953.0	1.95	8,736	17,061	$ 2,934.56	NONE PROPOSED	63	1953.0	1.95	8,736	17061	17061	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
137	Memorial Junior School	001	511 Office	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 53.66	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Ceiling Mounted Occupancy Sensor	1	-	93.60	-	94	$ 16.10	0	0	0	63.5	21.5	0	85
138	Memorial Junior School	001	511 Side Rooms	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	6	192.0	0.19	2,600	499	$ 85.86	NONE PROPOSED	6	192.0	0.19	1,820	499	349	Automatic Wall Switch Occupancy Sensor	1	-	149.76	-	150	$ 25.76	0	0	65	103	73.5	65	566.5
139	Memorial Junior School	001	511 Storage	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	64.0	0.06	500	32	$ 5.50	NONE PROPOSED	2	64.0	0.06	350	32	22	Automatic Wall Switch Occupancy Sensor	1	-	9.60	-	10	$ 1.65	0	0	65	103	73.5	65	306.5
140	Memorial Junior School	001	511 Office	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	64.0	0.06	2,600	166	$ 28.62	NONE PROPOSED	2	64.0	0.06	1,820	166	116	Automatic Wall Switch Occupancy Sensor	1	-	49.92	-	50	$ 8.59	0	0	65	103	73.5	65	306.5
141	Memorial Junior School	001	Faculty Room	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	16	512.0	0.51	2,600	1,331	$ 228.97	NONE PROPOSED	16	512.0	0.51	1,820	1331	932	Ceiling Mounted Occupancy Sensor	1	-	399.36	-	399	$ 68.69	0	0	65	63.5	21.5	65	1125
142	Memorial Junior School	001	822 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	9	288.0	0.29	2,600	749	$ 128.79	NONE PROPOSED	9	288.0	0.29	1,820	749	524	Ceiling Mounted Occupancy Sensor	1	-	224.64	-	225	$ 38.64	0	0	65	63.5	21.5	65	670
143	Memorial Junior School	001	822 Classroom	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	4	124.0	0.12	2,600	322	$ 55.45	NONE PROPOSED	4	124.0	0.12	2,600	322	322	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
144	Memorial Junior School	001	Storage	Surface Mount Fixture w/ 13W CFL	3	45.0	0.05	500	23	$ 3.87	NONE PROPOSED	3	45.0	0.05	350	23	16	Automatic Wall Switch Occupancy Sensor	1	-	6.75	-	7	$ 1.16	0	0	0	103	73.5	0	176.5
145	Memorial Junior School	001	Nurse	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	13	1209.0	1.21	2,600	3,143	$ 540.66	NONE PROPOSED	13	1209.0	1.21	1,820	3143	2200	Ceiling Mounted Occupancy Sensor	1	-	943.02	-	943	$ 162.20	0	0	0	63.5	21.5	0	85
146	Memorial Junior School	001	Nurse	2X2 Fixtures w/ 2-17W T8 Lamps w/ Electronic Ballasts	1	31.0	0.03	2,600	81	$ 13.86	NONE PROPOSED	1	31.0	0.03	2,600	81	81	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
147	Memorial Junior School	001	617 Classroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	12	1116.0	1.12	2,600	2,902	$ 499.08	NONE PROPOSED	12	1116.0	1.12	1,820	2902	2031	Ceiling Mounted Occupancy Sensor	1	-	870.48	-	870	$ 149.72	0	0	0	63.5	21.5	0	85
148	Memorial Junior School	001	615 Classroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	12	1116.0	1.12	2,600	2,902	$ 499.08	NONE PROPOSED	12	1116.0	1.12	1,820	2902	2031	Ceiling Mounted Occupancy Sensor	1	-	870.48	-	870	$ 149.72	0	0	0	63.5	21.5	0	85
149	Memorial Junior School	001	Library Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	4	128.0	0.13	8,736	1,118	$ 192.33	NONE PROPOSED	4	128.0	0.13	8,736	1118	1118	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	260
150	Memorial Junior School	001	Womens Bath	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	64.0	0.06	2,600	166	$ 28.62	NONE PROPOSED	2	64.0	0.06	1,820	166	116	Ceiling Mounted Occupancy Sensor	1	-	49.92	-	50	$ 8.59	0	0	65	63.5	21.5	65	215
151	Memorial Junior School	001	Mens Bath	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	64.0	0.06	2,600	166	$ 28.62	NONE PROPOSED	2	64.0	0.06	1,820	166	116	Ceiling Mounted Occupancy Sensor	1	-	49.92	-	50	$ 8.59	0	0	65	63.5	21.5	65	215
152	Memorial Junior School	001	Library	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	73	4380.0	4.38	2,600	11,388	$ 1,958.74	NONE PROPOSED	73	4380.0	4.38	2,600	11388	11388	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
153	Memorial Junior School	001	Library Office	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	2,600	156	$ 26.83	NONE PROPOSED	1	60.0	0.06	1,820	156	109	Automatic Wall Switch Occupancy Sensor	1	-	46.80	-	47	$ 8.05	0	0	0	103	73.5	0	176.5
154	Memorial Junior School	001	Library Office	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 53.66	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Ceiling Mounted Occupancy Sensor	1	-	93.60	-	94	$ 16.10	0	0	0	63.5	21.5	0	85
155	Memorial Junior School	001	Storage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	500	60	$ 10.32	NONE PROPOSED	2	120.0	0.12	350	60	42	Automatic Wall Switch Occupancy Sensor	1	-	18.00	-	18	$ 3.10	0	0	65	103	73.5	65	306.5
156	Memorial Junior School	001	Kitchen	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	240.0	0.24	2,600	624	$ 107.33	NONE PROPOSED	4	240.0	0.24	2,600	624	624	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
157	Memorial Junior School	001	Kitchen	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	2,600	156	$ 26.83	NONE PROPOSED	1	60.0	0.06	2,600	156	156	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
158	Memorial Junior School	001	Kitchen Office	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	4	240.0	0.24	2,600	624	$ 107.33	NONE PROPOSED	4	240.0	0.24	1,820	624	437	Ceiling Mounted Occupancy Sensor	1	-	187.20	-	187	$ 32.20	0	0	0	63.5	21.5	0	85
159	Memorial Junior School	001	LCR 1	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	240.0	0.24	500	120	$ 20.64	NONE PROPOSED	4	240.0	0.24	350	120	84	Ceiling Mounted Occupancy Sensor	1	-	36.00	-	36	$ 6.19	0	0	0	63.5	21.5	0	85
160	Memorial Junior School	001	LCR 1	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	2,600	156	$ 26.83	NONE PROPOSED	1	60.0	0.06	2,600	156	156	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
161	Memorial Junior School	001	LCR 1 Office	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 53.66	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Automatic Wall Switch Occupancy Sensor	1	-	93.60	-	94	$ 16.10	0	0	0	103	73.5	0	176.5
162	Memorial Junior School	001	610 Classroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	900.0	0.90	2,600	2,340	$ 402.48	NONE PROPOSED	15	900.0	0.90	1,820	2340	1638	Ceiling Mounted Occupancy Sensor	1	-	702.00	-	702	$ 120.74	0	0	0	63.5	21.5	0	85
163	Memorial Junior School	001	Mens Bath	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	3	96.0	0.10	2,600	250	$ 42.93	NONE PROPOSED	3	96.0	0.10	1,820	250	175	Ceiling Mounted Occupancy Sensor	1	-	74.88	-	75	$ 12.88	0	0	65	63.5	21.5	65	280
164	Memorial Junior School	001	Womens Bath	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	3	96.0	0.10	2,600	250	$ 42.93	NONE PROPOSED	3	96.0	0.10	1,820	250	175	Ceiling Mounted Occupancy Sensor	1	-	74.88	-	75	$ 12.88	0	0	65	63.5	21.5	65	280
165	Memorial Junior School	001	Custodial Closet	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	500	23	$ 3.87	NONE PROPOSED	1	45.0	0.05	350	23	16	Automatic Wall Switch Occupancy Sensor	1	-	6.75	-	7	$ 1.16	0	0	0	103	73.5	0	176.5

Appendix D-Lighting Spreadsheet

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Fixtures	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Annual Cost of Energy Existing	Proposed Replacement Solution	Prop. Qty of Fixtures	Prop. Watts	Prop. kW Base	Prop. Oper. Hrs. w/ Sensors	Prop. kWh w/o Sensors	Prop. kWh w/ Sensors	Proposed Occupancy Sensor	Sensor Qtys	Total kWh Saved Lighting Only	kWh Saved Sensors Only	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector	Bulb	Labor	OS Cost	OS Labor	Subtotal	Total
166	Memorial Junior School	001	611 Classroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	900.0	0.90	2,600	2,340	$ 402.48	NONE PROPOSED	15	900.0	0.90	1,820	2340	1638	Ceiling Mounted Occupancy Sensor	1	-	702.00	-	702	$ 120.74	0	0	0	63.5	21.5	0	85
167	Memorial Junior School	001	612 Classroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	900.0	0.90	2,600	2,340	$ 402.48	NONE PROPOSED	15	900.0	0.90	1,820	2340	1638	Ceiling Mounted Occupancy Sensor	1	-	702.00	-	702	$ 120.74	0	0	0	63.5	21.5	0	85
168	Memorial Junior School	001	Aides Room	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	360.0	0.36	2,600	936	$ 160.99	NONE PROPOSED	6	360.0	0.36	1,820	936	655	Ceiling Mounted Occupancy Sensor	1	-	280.80	-	281	$ 48.30	0	0	0	63.5	21.5	0	85
169	Memorial Junior School	001	Main Office	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	720.0	0.72	2,600	1,872	$ 321.98	NONE PROPOSED	12	720.0	0.72	2,600	1872	1872	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
170	Memorial Junior School	001	Kitchen	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	180.0	0.18	2,600	468	$ 80.50	NONE PROPOSED	3	180.0	0.18	1,820	468	328	Ceiling Mounted Occupancy Sensor	1	-	140.40	-	140	$ 24.15	0	0	0	63.5	21.5	0	85
171	Memorial Junior School	001	Kitchen Closet	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	32.0	0.03	500	16	$ 2.75	NONE PROPOSED	1	32.0	0.03	350	16	11	Automatic Wall Switch Occupancy Sensor	1	-	4.80	-	5	$ 0.83	0	0	65	103	73.5	65	241.5
172	Memorial Junior School	001	Fax Room	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 53.66	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Automatic Wall Switch Occupancy Sensor	1	-	93.60	-	94	$ 16.10	0	0	0	103	73.5	0	176.5
173	Memorial Junior School	001	Fax Room	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	32.0	0.03	2,600	83	$ 14.31	NONE PROPOSED	1	32.0	0.03	1,820	83	58	Ceiling Mounted Occupancy Sensor	1	-	24.96	-	25	$ 4.29	0	0	65	63.5	21.5	65	150
174	Memorial Junior School	001	Bathroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	32.0	0.03	2,600	83	$ 14.31	NONE PROPOSED	1	32.0	0.03	1,820	83	58	Automatic Wall Switch Occupancy Sensor	1	-	24.96	-	25	$ 4.29	0	0	65	103	73.5	65	241.5
175	Memorial Junior School	001	Detention Room	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 53.66	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Ceiling Mounted Occupancy Sensor	1	-	93.60	-	94	$ 16.10	0	0	0	63.5	21.5	0	85
176	Memorial Junior School	001	V.P. Reception	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	360.0	0.36	2,600	936	$ 160.99	NONE PROPOSED	6	360.0	0.36	1,820	936	655	Ceiling Mounted Occupancy Sensor	1	-	280.80	-	281	$ 48.30	0	0	0	63.5	21.5	0	85
177	Memorial Junior School	001	V.P. Office	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 53.66	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Ceiling Mounted Occupancy Sensor	1	-	93.60	-	94	$ 16.10	0	0	0	63.5	21.5	0	85
178	Memorial Junior School	001	Principal	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 53.66	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Ceiling Mounted Occupancy Sensor	1	-	93.60	-	94	$ 16.10	0	0	0	63.5	21.5	0	85
179	Memorial Junior School	001	Conference Room	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	240.0	0.24	2,600	624	$ 107.33	NONE PROPOSED	4	240.0	0.24	1,820	624	437	Ceiling Mounted Occupancy Sensor	1	-	187.20	-	187	$ 32.20	0	0	0	63.5	21.5	0	85
180	Memorial Junior School	001	Maintenance Grounds Garage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	7	420.0	0.42	2,600	1,092	$ 187.82	NONE PROPOSED	7	420.0	0.42	1,820	1092	764	Ceiling Mounted Occupancy Sensor	1	-	327.60	-	328	$ 56.35	0	0	65	63.5	21.5	65	540
181	Memorial Junior School	001	Maintenance Grounds Garage	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	240.0	0.24	2,600	624	$ 107.33	NONE PROPOSED	2	240.0	0.24	2,600	624	624	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
182	Memorial Junior School	001	Exit Signs	Exit Sign	35	560.0	0.56	8,736	4,892	$ 841.45	Replace Exit Sign with Energy Efficient LED Exit Sign	35	175.0	0.18	8,736	1529	1529	NONE PROPOSED	0	3,363	-	-	3,363	$ 578.50	0	61	63	0	0	124	4340
183	Memorial Junior School-Exterior	001	Canopy	Exterior Canopy Fixture (Assume 70w)	35	3150.0	3.15	4,000	12,600	$ 2,167.20	Replace Fixture with LED Canopy Light	35	1715.0	1.72	4,000	6860	6860	NONE PROPOSED	0	5,740	-	1.44	5,740	$ 987.28	0	800	134	0	0	934	32690
184	Memorial Junior School-Exterior	001	Wallpacks	Exterior Wall Packs (Assume 150W HPS)	22	4180.0	4.18	4,000	16,720	$ 2,875.84	Replace 150W HPS Fixture with LED Area Light	22	1210.0	1.21	4,000	4840	4840	NONE PROPOSED	0	11,880	-	2.97	11,880	$ 2,043.36	0	800	134	0	0	934	20548
185	Memorial Junior School-Exterior	001	Building Mount	Exterior Fixture - 75W Par Incandescent Fixture	15	1125.0	1.13	4,000	4,500	$ 774.00	Replace Fixture with LED Area Light	8	392.0	0.39	4,000	1568	1568	NONE PROPOSED	0	2,932	-	0.73	2,932	$ 504.30	0	800	134	0	0	934	14010
186	Memorial Junior School-Exterior	001	Parking Lights	Exterior Fixture - 400W High Pressure Sodium	5	2290.0	2.29	4,000	9,160	$ 1,575.52	Replace 400W High Pressure Sodium fixture with LED Area Light	5	1160.0	1.16	4,000	4640	4640	NONE PROPOSED	0	4,520	-	1.13	4,520	$ 777.44	0	2000	134	0	0	2134	10670
187	Mountview School	001	Computer Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	12	1116.0	1.12	2,600	2,902	$ 519.39	NONE PROPOSED	12	1116.0	1.12	1,820	2902	2031	Ceiling Mounted Occupancy Sensor	1	-	870.48	-	870	$ 155.82	0	0	0	63.5	21.5	0	85
188	Mountview School	001	5 Classroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	720.0	0.72	2,600	1,872	$ 335.09	NONE PROPOSED	12	720.0	0.72	1,820	1872	1310	Ceiling Mounted Occupancy Sensor	1	-	561.60	-	562	$ 100.53	0	0	65	63.5	21.5	65	865
189	Mountview School	001	13 Classroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	46	4278.0	4.28	2,600	11,123	$ 1,990.98	NONE PROPOSED	46	4278.0	4.28	1,820	11123	7786	Ceiling Mounted Occupancy Sensor	1	-	3,336.84	-	3,337	$ 597.29	0	0	0	63.5	21.5	0	85
190	Mountview School	001	Girls Bathroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 55.85	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Automatic Wall Switch Occupancy Sensor	1	-	93.60	-	94	$ 16.75	0	0	65	103	73.5	65	306.5
191	Mountview School	001	Closet	Surface Mount Fixture w/ 13W CFL	2	30.0	0.03	500	15	$ 2.69	NONE PROPOSED	2	30.0	0.03	350	15	11	Automatic Wall Switch Occupancy Sensor	1	-	4.50	-	5	$ 0.81	0	0	0	103	73.5	0	176.5
192	Mountview School	001	Closet	Surface Mount Fixture w/ 13W CFL	2	30.0	0.03	500	15	$ 2.69	NONE PROPOSED	2	30.0	0.03	350	15	11	Automatic Wall Switch Occupancy Sensor	1	-	4.50	-	5	$ 0.81	0	0	0	103	73.5	0	176.5
193	Mountview School	001	Boys Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 55.85	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Automatic Wall Switch Occupancy Sensor	1	-	93.60	-	94	$ 16.75	0	0	65	103	73.5	65	306.5
194	Mountview School	001	12 Classroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	12	1116.0	1.12	2,600	2,902	$ 519.39	NONE PROPOSED	12	1116.0	1.12	1,820	2902	2031	Ceiling Mounted Occupancy Sensor	1	-	870.48	-	870	$ 155.82	0	0	0	63.5	21.5	0	85
195	Mountview School	001	6 Classroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	360.0	0.36	2,600	936	$ 167.54	NONE PROPOSED	6	360.0	0.36	1,820	936	655	Ceiling Mounted Occupancy Sensor	1	-	280.80	-	281	$ 50.26	0	0	65	63.5	21.5	65	475
196	Mountview School	001	11 Classroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	12	1116.0	1.12	2,600	2,902	$ 519.39	NONE PROPOSED	12	1116.0	1.12	1,820	2902	2031	Ceiling Mounted Occupancy Sensor	1	-	870.48	-	870	$ 155.82	0	0	0	63.5	21.5	0	85
197	Mountview School	001	7 Classroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	12	1116.0	1.12	2,600	2,902	$ 519.39	NONE PROPOSED	12	1116.0	1.12	1,820	2902	2031	Ceiling Mounted Occupancy Sensor	1	-	870.48	-	870	$ 155.82	0	0	0	63.5	21.5	0	85
198	Mountview School	001	10 Classroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	12	1116.0	1.12	2,600	2,902	$ 519.39	NONE PROPOSED	12	1116.0	1.12	1,820	2902	2031	Ceiling Mounted Occupancy Sensor	1	-	870.48	-	870	$ 155.82	0	0	0	63.5	21.5	0	85

Appendix D-Lighting Spreadsheet

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Fixtures	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Annual Cost of Energy Existing	Proposed Replacement Solution	Prop. Qty of Fixtures	Prop. Watts	Prop. kW Base	Prop. Oper. Hrs. w/ Sensors	Prop. kWh w/o Sensors	Prop. kWh w/ Sensors	Proposed Occupancy Sensor	Sensor Qtys	Total kWh Saved Lighting Only	kWh Saved Sensors Only	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector	Bulb	Labor	OS Cost	OS Labor	Subtotal	Total
199	Mountview School	001	9 Classroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	720.0	0.72	2,600	1,872	$ 335.09	NONE PROPOSED	12	720.0	0.72	1,820	1872	1310	Ceiling Mounted Occupancy Sensor	1	-	561.60	-	562	$ 100.53	0	0	65	63.5	21.5	65	865
200	Mountview School	001	8 Classroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	12	1116.0	1.12	2,600	2,902	$ 519.39	NONE PROPOSED	12	1116.0	1.12	1,820	2902	2031	Ceiling Mounted Occupancy Sensor	1	-	870.48	-	870	$ 155.82	0	0	0	63.5	21.5	0	85
201	Mountview School	001	Faculty Toilet	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	500	30	$ 5.37	NONE PROPOSED	1	60.0	0.06	350	30	21	Automatic Wall Switch Occupancy Sensor	1	-	9.00	-	9	$ 1.61	0	0	0	103	73.5	0	176.5
202	Mountview School	001	Girls Room	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	3	360.0	0.36	500	180	$ 32.22	NONE PROPOSED	3	360.0	0.36	350	180	126	Ceiling Mounted Occupancy Sensor	1	-	54.00	-	54	$ 9.67	0	0	0	63.5	21.5	0	85
203	Mountview School	001	23 Kindergarten	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	17	2040.0	2.04	2,600	5,304	$ 949.42	NONE PROPOSED	17	2040.0	2.04	1,820	5304	3713	Ceiling Mounted Occupancy Sensor	1	-	1,591.20	-	1,591	$ 284.82	0	0	0	63.5	21.5	0	85
204	Mountview School	001	Bathroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	120.0	0.12	500	60	$ 10.74	NONE PROPOSED	1	120.0	0.12	350	60	42	Automatic Wall Switch Occupancy Sensor	1	-	18.00	-	18	$ 3.22	0	0	0	103	73.5	0	176.5
205	Mountview School	001	Girls Bathroom	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	3	180.0	0.18	500	90	$ 16.11	NONE PROPOSED	3	180.0	0.18	350	90	63	Automatic Wall Switch Occupancy Sensor	1	-	27.00	-	27	$ 4.83	0	0	0	103	73.5	0	176.5
206	Mountview School	001	Hall	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	63	3780.0	3.78	8,736	33,022	$ 5,910.95	NONE PROPOSED	63	3780.0	3.78	8,736	33022	33022	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
207	Mountview School	001	Hall	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	28	3360.0	3.36	8,736	29,353	$ 5,254.18	NONE PROPOSED	28	3360.0	3.36	8,736	29353	29353	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
208	Mountview School	001	Hall	13W CFL CAN	3	45.0	0.05	8,736	393	$ 70.37	NONE PROPOSED	3	45.0	0.05	8,736	393	393	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
209	Mountview School	001	Hall	2-13W CFL CAN	8	240.0	0.24	8,736	2,097	$ 375.30	NONE PROPOSED	8	240.0	0.24	8,736	2097	2097	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
210	Mountview School	001	Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	32.0	0.03	8,736	280	$ 50.04	NONE PROPOSED	1	32.0	0.03	8,736	280	280	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	65
211	Mountview School	001	Food Prep	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	6	720.0	0.72	2,600	1,872	$ 335.09	NONE PROPOSED	6	720.0	0.72	2,600	1872	1872	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
212	Mountview School	001	Cafeteria	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	36	4320.0	4.32	2,600	11,232	$ 2,010.53	NONE PROPOSED	36	4320.0	4.32	2,600	11232	11232	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
213	Mountview School	001	Cafeteria	13W CFL CAN	20	300.0	0.30	2,600	780	$ 139.62	NONE PROPOSED	20	300.0	0.30	2,600	780	780	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
214	Mountview School	001	Boys Bathroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	3	360.0	0.36	500	180	$ 32.22	NONE PROPOSED	3	360.0	0.36	350	180	126	Automatic Wall Switch Occupancy Sensor	1	-	54.00	-	54	$ 9.67	0	0	0	103	73.5	0	176.5
215	Mountview School	001	Library	1X4 Suspended Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	7	651.0	0.65	2,600	1,693	$ 302.98	NONE PROPOSED	7	651.0	0.65	2,600	1693	1693	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	455
216	Mountview School	001	Library	1X4 Suspended Fixtures w/ 6-T8 Lamps w/ Electronic Ballasts	12	2160.0	2.16	2,600	5,616	$ 1,005.26	NONE PROPOSED	12	2160.0	2.16	2,600	5616	5616	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
217	Mountview School	001	Library	13W CFL CAN	42	630.0	0.63	2,600	1,638	$ 293.20	NONE PROPOSED	42	630.0	0.63	2,600	1638	1638	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
218	Mountview School	001	Library	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	8	480.0	0.48	2,600	1,248	$ 223.39	NONE PROPOSED	8	480.0	0.48	2,600	1248	1248	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
219	Mountview School	001	Library Office	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	6	720.0	0.72	500	360	$ 64.44	NONE PROPOSED	6	720.0	0.72	350	360	252	Ceiling Mounted Occupancy Sensor	1	-	108.00	-	108	$ 19.33	0	0	0	63.5	21.5	0	85
220	Mountview School	001	24 Classroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	18	2160.0	2.16	2,600	5,616	$ 1,005.26	NONE PROPOSED	18	2160.0	2.16	1,820	5616	3931	Ceiling Mounted Occupancy Sensor	1	-	1,684.80	-	1,685	$ 301.58	0	0	0	63.5	21.5	0	85
221	Mountview School	001	24 Classroom Bath	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	120.0	0.12	500	60	$ 10.74	NONE PROPOSED	1	120.0	0.12	350	60	42	Automatic Wall Switch Occupancy Sensor	1	-	18.00	-	18	$ 3.22	0	0	0	103	73.5	0	176.5
222	Mountview School	001	Display Case	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	64.0	0.06	8,760	561	$ 100.35	NONE PROPOSED	2	64.0	0.06	8,760	561	561	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	130
223	Mountview School	001	22 Classroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	16	1920.0	1.92	2,600	4,992	$ 893.57	NONE PROPOSED	16	1920.0	1.92	1,820	4992	3494	Ceiling Mounted Occupancy Sensor	1	-	1,497.60	-	1,498	$ 268.07	0	0	0	63.5	21.5	0	85
224	Mountview School	001	22 Classroom Bath	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	120.0	0.12	500	60	$ 10.74	NONE PROPOSED	1	120.0	0.12	350	60	42	Automatic Wall Switch Occupancy Sensor	1	-	18.00	-	18	$ 3.22	0	0	0	103	73.5	0	176.5
225	Mountview School	001	Electrical Room	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	240.0	0.24	500	120	$ 21.48	NONE PROPOSED	2	240.0	0.24	350	120	84	Automatic Wall Switch Occupancy Sensor	1	-	36.00	-	36	$ 6.44	0	0	0	103	73.5	0	176.5
226	Mountview School	001	18 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 268.07	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 80.42	0	0	65	63.5	21.5	65	1255
227	Mountview School	001	21 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 268.07	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 80.42	0	0	65	63.5	21.5	65	1255
228	Mountview School	001	20 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 268.07	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 80.42	0	0	65	63.5	21.5	65	1255
229	Mountview School	001	19 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 268.07	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 80.42	0	0	65	63.5	21.5	65	1255
230	Mountview School	001	17 Classroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	15	1800.0	1.80	2,600	4,680	$ 837.72	NONE PROPOSED	15	1800.0	1.80	1,820	4680	3276	Ceiling Mounted Occupancy Sensor	1	-	1,404.00	-	1,404	$ 251.32	0	0	0	63.5	21.5	0	85
231	Mountview School	001	14 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 268.07	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 80.42	0	0	65	63.5	21.5	65	1255

Appendix D-Lighting Spreadsheet

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Fixtures	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Annual Cost of Energy Existing	Proposed Replacement Solution	Prop. Qty of Fixtures	Prop. Watts	Prop. kW Base	Prop. Oper. Hrs. w/ Sensors	Prop. kWh w/o Sensors	Prop. kWh w/ Sensors	Proposed Occupancy Sensor	Sensor Qtys	Total kWh Saved Lighting Only	kWh Saved Sensors Only	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector	Bulb	Labor	OS Cost	OS Labor	Subtotal	Total
232	Mountview School	001	15 Classroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	576.0	0.58	2,600	1,498	$ 268.07	NONE PROPOSED	18	576.0	0.58	1,820	1498	1048	Ceiling Mounted Occupancy Sensor	1	-	449.28	-	449	$ 80.42	0	0	65	63.5	21.5	65	1255
233	Mountview School	001	Main Office	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	360.0	0.36	2,600	936	$ 167.54	NONE PROPOSED	6	360.0	0.36	1,820	936	655	Ceiling Mounted Occupancy Sensor	1	-	280.80	-	281	$ 50.26	0	0	0	63.5	21.5	0	85
234	Mountview School	001	Bathroom Hall	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	8,736	524	$ 93.82	NONE PROPOSED	1	60.0	0.06	8,736	524	524	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
235	Mountview School	001	Bathroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	360.0	0.36	500	180	$ 32.22	NONE PROPOSED	6	360.0	0.36	350	180	126	Automatic Wall Switch Occupancy Sensor	1	-	54.00	-	54	$ 9.67	0	0	0	103	73.5	0	176.5
236	Mountview School	001	Bathroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	500	30	$ 5.37	NONE PROPOSED	1	60.0	0.06	350	30	21	Automatic Wall Switch Occupancy Sensor	1	-	9.00	-	9	$ 1.61	0	0	65	103	73.5	65	241.5
237	Mountview School	001	PTA Closet	60W Incandescent Fixture	1	60.0	0.06	500	30	$ 5.37	Replace 60W Incandescent Fixture with 13W CFL	1	15.0	0.02	500	8	8	NONE PROPOSED	0	23	-	0.05	23	$ 4.03	0	5	20	0	0	25	25
238	Mountview School	001	Sprinkler Room	Surface Mount Fixture w/ 3-13W CFL	6	270.0	0.27	2,600	702	$ 125.66	NONE PROPOSED	6	270.0	0.27	2,600	702	702	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
239	Mountview School	001	Kindergarten	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	14	1302.0	1.30	2,600	3,385	$ 605.95	NONE PROPOSED	14	1302.0	1.30	1,820	3385	2370	Ceiling Mounted Occupancy Sensor	1	-	1,015.56	-	1,016	$ 181.79	0	0	0	63.5	21.5	0	85
240	Mountview School	001	Kindgergarten Bath	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	500	23	$ 4.03	NONE PROPOSED	1	45.0	0.05	350	23	16	Automatic Wall Switch Occupancy Sensor	1	-	6.75	-	7	$ 1.21	0	0	0	103	73.5	0	176.5
241	Mountview School	001	Principal	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	240.0	0.24	2,600	624	$ 111.70	NONE PROPOSED	4	240.0	0.24	1,820	624	437	Ceiling Mounted Occupancy Sensor	1	-	187.20	-	187	$ 33.51	0	0	0	63.5	21.5	0	85
242	Mountview School	001	Principal	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	2,600	156	$ 27.92	NONE PROPOSED	1	60.0	0.06	2,600	156	156	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
243	Mountview School	001	Principal Closet	60W Incandescent Fixture	1	60.0	0.06	500	30	$ 5.37	Replace 60W Incandescent Fixture with 13W CFL	1	15.0	0.02	350	8	5	Automatic Wall Switch Occupancy Sensor	1	23	2.25	0.05	25	$ 4.43	0	5	20	103	73.5	25	201.5
244	Mountview School	001	Health Office	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	180.0	0.18	2,600	468	$ 83.77	NONE PROPOSED	3	180.0	0.18	1,820	468	328	Ceiling Mounted Occupancy Sensor	1	-	140.40	-	140	$ 25.13	0	0	0	63.5	21.5	0	85
245	Mountview School	001	Health Office Closet	60W Incandescent Fixture	1	60.0	0.06	500	30	$ 5.37	Replace 60W Incandescent Fixture with 13W CFL	1	15.0	0.02	350	8	5	Automatic Wall Switch Occupancy Sensor	1	23	2.25	0.05	25	$ 4.43	0	5	20	103	73.5	25	201.5
246	Mountview School	001	Health Office Bath	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	2,600	117	$ 20.94	NONE PROPOSED	1	45.0	0.05	1,820	117	82	Automatic Wall Switch Occupancy Sensor	1	-	35.10	-	35	$ 6.28	0	0	0	103	73.5	0	176.5
247	Mountview School	001	Child Guidance Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	3	279.0	0.28	2,600	725	$ 129.85	NONE PROPOSED	3	279.0	0.28	1,820	725	508	Ceiling Mounted Occupancy Sensor	1	-	217.62	-	218	$ 38.95	0	0	0	63.5	21.5	0	85
248	Mountview School	001	Storage	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	180.0	0.18	500	90	$ 16.11	NONE PROPOSED	3	180.0	0.18	350	90	63	Automatic Wall Switch Occupancy Sensor	1	-	27.00	-	27	$ 4.83	0	0	0	103	73.5	0	176.5
249	Mountview School	001	Storage	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	180.0	0.18	500	90	$ 16.11	NONE PROPOSED	3	180.0	0.18	350	90	63	Automatic Wall Switch Occupancy Sensor	1	-	27.00	-	27	$ 4.83	0	0	0	103	73.5	0	176.5
250	Mountview School	001	Book Room	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	360.0	0.36	2,600	936	$ 167.54	NONE PROPOSED	6	360.0	0.36	1,820	936	655	Ceiling Mounted Occupancy Sensor	1	-	280.80	-	281	$ 50.26	0	0	0	63.5	21.5	0	85
251	Mountview School	001	3 Classroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	12	1116.0	1.12	2,600	2,902	$ 519.39	NONE PROPOSED	12	1116.0	1.12	1,820	2902	2031	Ceiling Mounted Occupancy Sensor	1	-	870.48	-	870	$ 155.82	0	0	0	63.5	21.5	0	85
252	Mountview School	001	Faculty Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	6	558.0	0.56	2,600	1,451	$ 259.69	NONE PROPOSED	6	558.0	0.56	1,820	1451	1016	Ceiling Mounted Occupancy Sensor	1	-	435.24	-	435	$ 77.91	0	0	0	63.5	21.5	0	85
253	Mountview School	001	Gym	2x2 400W Metal Halide Fixtures	15	6870.0	6.87	2,600	17,862	$ 3,197.30	Replace Metal Halide Fixtures with 6-Lamp Fluorescent Highbay Fixtures	15	3390.0	3.39	2,600	8814	8814	NONE PROPOSED	0	9,048	-	3.48	9,048	$ 1,619.59	168	105	15	0	0	288	4320
254	Mountview School	001	Gym Stage	Surface Mount Fixture w/ 3-13W CFL	2	90.0	0.09	2,600	234	$ 41.89	NONE PROPOSED	2	90.0	0.09	2,600	234	234	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
255	Mountview School	001	Gym Stage	75W Incandescent Fixture	1	75.0	0.08	2,600	195	$ 34.91	Replace 75W Incandescent Fixture with 25W CFL	1	27.0	0.03	2,600	70	70	NONE PROPOSED	0	125	-	0.05	125	$ 22.34	0	7	20	0	0	27	27
256	Mountview School	001	Gym Stage	25W CFL	90	2430.0	2.43	2,600	6,318	$ 1,130.92	NONE PROPOSED	90	2430.0	2.43	2,600	6318	6318	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
257	Mountview School	001	Gym Stage	60W Incandescent Fixture	1	60.0	0.06	2,600	156	$ 27.92	Replace 60W Incandescent Fixture with 13W CFL	1	15.0	0.02	2,600	39	39	NONE PROPOSED	0	117	-	0.05	117	$ 20.94	0	5	20	0	0	25	25
258	Mountview School	001	Men's Bathroom	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	500	30	$ 5.37	NONE PROPOSED	1	60.0	0.06	350	30	21	Automatic Wall Switch Occupancy Sensor	1	-	9.00	-	9	$ 1.61	0	0	0	103	73.5	0	176.5
259	Mountview School	001	Men's Bathroom	2' 17W T8 Fluorescent Fixture	1	31.0	0.03	500	16	$ 2.77	NONE PROPOSED	1	31.0	0.03	500	16	16	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
260	Mountview School	001	Custodial Closet	2' 17W T8 Fluorescent Fixture	1	31.0	0.03	500	16	$ 2.77	NONE PROPOSED	1	31.0	0.03	350	16	11	Automatic Wall Switch Occupancy Sensor	1	-	4.65	-	5	$ 0.83	0	0	0	103	73.5	0	176.5
261	Mountview School	001	Custodial Closet	1X4 Fixtures w/ 2-T12 Lamps w/ Magnetic Ballasts	1	92.0	0.09	500	46	$ 8.23	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	48.6	0.05	500	24	24	NONE PROPOSED	0	22	-	0.04	22	$ 3.88	15	10	65	0	0	90	90
262	Mountview School	001	Custodial Closet	40W PAR20	1	40.0	0.04	500	20	$ 3.58	NONE PROPOSED	1	40.0	0.04	500	20	20	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
263	Mountview School	001	Janitor's Closet	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	500	23	$ 4.03	NONE PROPOSED	1	45.0	0.05	350	23	16	Automatic Wall Switch Occupancy Sensor	1	-	6.75	-	7	$ 1.21	0	0	0	103	73.5	0	176.5
264	Mountview School	001	Electrical Closet	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	240.0	0.24	500	120	$ 21.48	NONE PROPOSED	2	240.0	0.24	350	120	84	Automatic Wall Switch Occupancy Sensor	1	-	36.00	-	36	$ 6.44	0	0	0	103	73.5	0	176.5

Appendix D-Lighting Spreadsheet

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Fixtures	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Annual Cost of Energy Existing	Proposed Replacement Solution	Prop. Qty of Fixtures	Prop. Watts	Prop. kW Base	Prop. Oper. Hrs. w/ Sensors	Prop. kWh w/o Sensors	Prop. kWh w/ Sensors	Proposed Occupancy Sensor	Sensor Qtys	Total kWh Saved Lighting Only	kWh Saved Sensors Only	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector	Bulb	Labor	OS Cost	OS Labor	Subtotal	Total
265	Mountview School	001	Technology Closet	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	240.0	0.24	500	120	$ 21.48	NONE PROPOSED	2	240.0	0.24	350	120	84	Automatic Wall Switch Occupancy Sensor	1	-	36.00	-	36	$ 6.44	0	0	0	103	73.5	0	176.5
266	Mountview School	001	Electrical Room	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	3	360.0	0.36	500	180	$ 32.22	NONE PROPOSED	3	360.0	0.36	350	180	126	Automatic Wall Switch Occupancy Sensor	1	-	54.00	-	54	$ 9.67	0	0	0	103	73.5	0	176.5
267	Mountview School	001	Boys Room	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	3	180.0	0.18	2,600	468	$ 83.77	NONE PROPOSED	3	180.0	0.18	1,820	468	328	Automatic Wall Switch Occupancy Sensor	1	-	140.40	-	140	$ 25.13	0	0	0	103	73.5	0	176.5
268	Mountview School	001	16 - Classroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	15	1800.0	1.80	2,600	4,680	$ 837.72	NONE PROPOSED	15	1800.0	1.80	1,820	4680	3276	Ceiling Mounted Occupancy Sensor	1	-	1,404.00	-	1,404	$ 251.32	0	0	0	63.5	21.5	0	85
269	Mountview School	001	Womens Bathroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	2,600	156	$ 27.92	NONE PROPOSED	1	60.0	0.06	1,820	156	109	Automatic Wall Switch Occupancy Sensor	1	-	46.80	-	47	$ 8.38	0	0	0	103	73.5	0	176.5
270	Mountview School	001	Women's Bathroom	2' 17W T8 Fluorescent Fixture	1	31.0	0.03	2,600	81	$ 14.43	NONE PROPOSED	1	31.0	0.03	2,600	81	81	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
271	Mountview School	001	Display Case	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	32.0	0.03	8,736	280	$ 50.04	NONE PROPOSED	1	32.0	0.03	8,736	280	280	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	65
272	Mountview School	001	Exit Signs	Exit Sign	40	640.0	0.64	8,736	5,591	$ 1,000.80	Replace Exit Sign with Energy Efficient LED Exit Sign	40	200.0	0.20	8,736	1747	1747	NONE PROPOSED	0	3,844	-	-	3,844	$ 688.05	0	61	63	0	0	124	4960
273	Mountview School - Exterior	001	Courtyard	Exterior Wall Packs (Assume 70w)	5	450.0	0.45	4,000	1,800	$ 322.20	Replace Fixture with LED Area Light	5	245.0	0.25	4,000	980	980	NONE PROPOSED	0	820	-	0.21	820	$ 146.78	0	800	134	0	0	934	4670
274	Mountview School - Exterior	001	Courtyard	Exterior Canopy Fixture (Assume 70w)	10	900.0	0.90	4,000	3,600	$ 644.40	Replace Fixture with LED Canopy Light	10	490.0	0.49	4,000	1960	1960	NONE PROPOSED	0	1,640	-	0.41	1,640	$ 293.56	0	800	134	0	0	934	9340
275	Mountview School - Exterior	001	Exterior Canopy	Exterior Canopy Fixture (Assume 70w)	10	900.0	0.90	4,000	3,600	$ 644.40	Replace Fixture with LED Canopy Light	10	490.0	0.49	4,000	1960	1960	NONE PROPOSED	0	1,640	-	0.41	1,640	$ 293.56	0	800	134	0	0	934	9340
276	Mountview School - Exterior	001	Exterior Wall Packs	Exterior Wall Packs (Assume 150W HPS)	14	2660.0	2.66	4,000	10,640	$ 1,904.56	Replace 150W HPS Fixture with LED Area Light	14	770.0	0.77	4,000	3080	3080	NONE PROPOSED	0	7,560	-	1.89	7,560	$ 1,353.24	0	800	134	0	0	934	13076
277	Mountview School - Exterior	001	Exterior Building	25W CFL	2	54.0	0.05	4,000	216	$ 38.66	NONE PROPOSED	2	54.0	0.05	4,000	216	216	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
278	Salem School	001	Main Office	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	6	720.0	0.72	2,600	1,872	$ 329.47	NONE PROPOSED	6	720.0	0.72	1,820	1872	1310	Ceiling Mounted Occupancy Sensor	1	-	561.60	-	562	$ 98.84	0	0	0	63.5	21.5	0	85
279	Salem School	001	Storage	1X4 Suspended Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	500	60	$ 10.56	NONE PROPOSED	2	120.0	0.12	350	60	42	Automatic Wall Switch Occupancy Sensor	1	-	18.00	-	18	$ 3.17	0	0	65	103	73.5	65	306.5
280	Salem School	001	21 Classroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	16	1920.0	1.92	2,600	4,992	$ 878.59	NONE PROPOSED	16	1920.0	1.92	1,820	4992	3494	Ceiling Mounted Occupancy Sensor	1	-	1,497.60	-	1,498	$ 263.58	0	0	0	63.5	21.5	0	85
281	Salem School	001	20 Classroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	16	1920.0	1.92	2,600	4,992	$ 878.59	NONE PROPOSED	16	1920.0	1.92	1,820	4992	3494	Ceiling Mounted Occupancy Sensor	1	-	1,497.60	-	1,498	$ 263.58	0	0	0	63.5	21.5	0	85
282	Salem School	001	Cafeteria	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	36	4320.0	4.32	2,600	11,232	$ 1,976.83	NONE PROPOSED	36	4320.0	4.32	2,600	11232	11232	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
283	Salem School	001	Cafeteria	25W CFL	16	432.0	0.43	2,600	1,123	$ 197.68	NONE PROPOSED	16	432.0	0.43	1,820	1123	786	Ceiling Mounted Occupancy Sensor	0	-	336.96	-	337	$ 59.30	0	0	0	0	0	0	0
284	Salem School	001	Boys Bathroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	4	480.0	0.48	2,600	1,248	$ 219.65	NONE PROPOSED	4	480.0	0.48	1,820	1248	874	Automatic Wall Switch Occupancy Sensor	1	-	374.40	-	374	$ 65.89	0	0	0	103	73.5	0	176.5
285	Salem School	001	Girls Bathroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	4	480.0	0.48	2,600	1,248	$ 219.65	NONE PROPOSED	4	480.0	0.48	1,820	1248	874	Automatic Wall Switch Occupancy Sensor	1	-	374.40	-	374	$ 65.89	0	0	0	103	73.5	0	176.5
286	Salem School	001	Teachers Bathroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	3	360.0	0.36	2,600	936	$ 164.74	NONE PROPOSED	3	360.0	0.36	1,820	936	655	Automatic Wall Switch Occupancy Sensor	1	-	280.80	-	281	$ 49.42	0	0	0	103	73.5	0	176.5
287	Salem School	001	Gym	400W Metal Halide Fixtures	12	5496.0	5.50	2,600	14,290	$ 2,514.97	Replace Metal Halide Fixtures with 6-Lamp Fluorescent Highbay Fixtures	12	2712.0	2.71	2,600	7051	7051	NONE PROPOSED	0	7,238	-	2.78	7,238	$ 1,273.96	168	105	15	0	0	288	3456
288	Salem School	001	Gym Stage	2X2 Fixtures w/ 4-17W T8 Lamps w/ Electronic Ballasts	4	248.0	0.25	2,600	645	$ 113.48	NONE PROPOSED	4	248.0	0.25	2,600	645	645	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
289	Salem School	001	Gym Office	13W CFL CAN	24	360.0	0.36	2,600	936	$ 164.74	NONE PROPOSED	24	360.0	0.36	2,600	936	936	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
290	Salem School	001	Gym Storage	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	500	30	$ 5.28	NONE PROPOSED	1	60.0	0.06	350	30	21	Automatic Wall Switch Occupancy Sensor	1	-	9.00	-	9	$ 1.58	0	0	0	103	73.5	0	176.5
291	Salem School	001	Mens Bathroom	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	2,600	156	$ 27.46	NONE PROPOSED	1	60.0	0.06	1,820	156	109	Automatic Wall Switch Occupancy Sensor	1	-	46.80	-	47	$ 8.24	0	0	0	103	73.5	0	176.5
292	Salem School	001	Womens Bathroom	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 54.91	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Automatic Wall Switch Occupancy Sensor	1	-	93.60	-	94	$ 16.47	0	0	0	103	73.5	0	176.5
293	Salem School	001	Principal's Office	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	4	480.0	0.48	2,600	1,248	$ 219.65	NONE PROPOSED	4	480.0	0.48	1,820	1248	874	Ceiling Mounted Occupancy Sensor	1	-	374.40	-	374	$ 65.89	0	0	0	63.5	21.5	0	85
294	Salem School	001	Nurse's Office	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	4	480.0	0.48	2,600	1,248	$ 219.65	NONE PROPOSED	4	480.0	0.48	1,820	1248	874	Ceiling Mounted Occupancy Sensor	1	-	374.40	-	374	$ 65.89	0	0	0	63.5	21.5	0	85
295	Salem School	001	Nurse's Bathroom	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	2,600	156	$ 27.46	NONE PROPOSED	1	60.0	0.06	1,820	156	109	Automatic Wall Switch Occupancy Sensor	1	-	46.80	-	47	$ 8.24	0	0	0	103	73.5	0	176.5
296	Salem School	001	Teachers Meeting Hall	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	8,736	1,048	$ 184.50	NONE PROPOSED	2	120.0	0.12	6,115	1048	734	Automatic Wall Switch Occupancy Sensor	1	-	314.50	-	314	$ 55.35	0	0	0	103	73.5	0	176.5
297	Salem School	001	Teachers Meeting Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	3	279.0	0.28	2,600	725	$ 127.67	NONE PROPOSED	3	279.0	0.28	1,820	725	508	Ceiling Mounted Occupancy Sensor	1	-	217.62	-	218	$ 38.30	0	0	0	63.5	21.5	0	85

Appendix D-Lighting Spreadsheet

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Fixtures	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Annual Cost of Energy Existing	Proposed Replacement Solution	Prop. Qty of Fixtures	Prop. Watts	Prop. kW Base	Prop. Oper. Hrs. w/ Sensors	Prop. kWh w/o Sensors	Prop. kWh w/ Sensors	Proposed Occupancy Sensor	Sensor Qtys	Total kWh Saved Lighting Only	kWh Saved Sensors Only	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector	Bulb	Labor	OS Cost	OS Labor	Subtotal	Total
298	Salem School	001	Teachers Meeting Room	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	120.0	0.12	2,600	312	$ 54.91	NONE PROPOSED	1	120.0	0.12	2,600	312	312	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
299	Salem School	001	Teachers Bathroom	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	2,600	156	$ 27.46	NONE PROPOSED	1	60.0	0.06	1,820	156	109	Automatic Wall Switch Occupancy Sensor	1	-	46.80	-	47	$ 8.24	0	0	0	103	73.5	0	176.5
300	Salem School	001	Aides Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	186.0	0.19	2,600	484	$ 85.11	NONE PROPOSED	2	186.0	0.19	1,820	484	339	Automatic Wall Switch Occupancy Sensor	1	-	145.08	-	145	$ 25.53	0	0	0	103	73.5	0	176.5
301	Salem School	001	Aides Room	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	240.0	0.24	2,600	624	$ 109.82	NONE PROPOSED	2	240.0	0.24	2,600	624	624	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
302	Salem School	001	Aides Room Closet	Surface Mount Fixture w/ 13W CFL	1	15.0	0.02	500	8	$ 1.32	NONE PROPOSED	1	15.0	0.02	350	8	5	Automatic Wall Switch Occupancy Sensor	1	-	2.25	-	2	$ 0.40	0	0	0	103	73.5	0	176.5
303	Salem School	001	Main Office Closet	Surface Mount Fixture w/ 13W CFL	1	15.0	0.02	500	8	$ 1.32	NONE PROPOSED	1	15.0	0.02	350	8	5	Automatic Wall Switch Occupancy Sensor	1	-	2.25	-	2	$ 0.40	0	0	0	103	73.5	0	176.5
304	Salem School	001	Music Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	14	840.0	0.84	2,600	2,184	$ 384.38	NONE PROPOSED	14	840.0	0.84	1,820	2184	1529	Ceiling Mounted Occupancy Sensor	1	-	655.20	-	655	$ 115.32	0	0	65	63.5	21.5	65	995
305	Salem School	001	Computer Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	240.0	0.24	2,600	624	$ 109.82	NONE PROPOSED	4	240.0	0.24	1,820	624	437	Ceiling Mounted Occupancy Sensor	1	-	187.20	-	187	$ 32.95	0	0	65	63.5	21.5	65	345
306	Salem School	001	Speech/Learning Room	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	9	288.0	0.29	2,600	749	$ 131.79	NONE PROPOSED	9	279.0	0.28	1,820	725	508	Ceiling Mounted Occupancy Sensor	1	23	217.62	0.01	241	$ 42.42	0	0	0	63.5	21.5	0	85
307	Salem School	001	Speech/Learning Closet	Surface Mount Fixture w/ 13W CFL	1	15.0	0.02	500	8	$ 1.32	NONE PROPOSED	1	15.0	0.02	350	8	5	Automatic Wall Switch Occupancy Sensor	1	-	2.25	-	2	$ 0.40	0	0	0	103	73.5	0	176.5
308	Salem School	001	Library	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	15	900.0	0.90	2,600	2,340	$ 411.84	NONE PROPOSED	15	900.0	0.90	2,600	2340	2340	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
309	Salem School	001	Library	2-25W CFL CAN	23	1150.0	1.15	2,600	2,990	$ 526.24	NONE PROPOSED	23	1150.0	1.15	2,600	2990	2990	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
310	Salem School	001	Library	1X4 Suspended Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	32	2976.0	2.98	2,600	7,738	$ 1,361.82	NONE PROPOSED	32	2976.0	2.98	2,600	7738	7738	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	2080
311	Salem School	001	Library Storage	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	6	360.0	0.36	500	180	$ 31.68	NONE PROPOSED	6	360.0	0.36	350	180	126	Ceiling Mounted Occupancy Sensor	1	-	54.00	-	54	$ 9.50	0	0	0	63.5	21.5	0	85
312	Salem School	001	Library Bathroom	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 54.91	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Automatic Wall Switch Occupancy Sensor	1	-	93.60	-	94	$ 16.47	0	0	0	103	73.5	0	176.5
313	Salem School	001	Closet	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	500	23	$ 3.96	NONE PROPOSED	1	45.0	0.05	350	23	16	Automatic Wall Switch Occupancy Sensor	1	-	6.75	-	7	$ 1.19	0	0	0	103	73.5	0	176.5
314	Salem School	001	Teachers Bathroom	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	2,600	117	$ 20.59	NONE PROPOSED	1	45.0	0.05	1,820	117	82	Automatic Wall Switch Occupancy Sensor	1	-	35.10	-	35	$ 6.18	0	0	0	103	73.5	0	176.5
315	Salem School	001	Teachers Bathroom Closet	100W Incandescent Fixture	3	300.0	0.30	500	150	$ 26.40	Replace 100W Incandescent Fixture with 25W CFL	3	75.0	0.08	350	38	26	Ceiling Mounted Occupancy Sensor	1	113	11.25	0.23	124	$ 21.78	0	7	20	63.5	21.5	27	166
316	Salem School	001	Boiler Room	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	60.0	0.06	500	30	$ 5.28	NONE PROPOSED	1	60.0	0.06	500	30	30	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
317	Salem School	001	Boiler Room	Surface Mount Fixture w/ 3-13W CFL	5	225.0	0.23	500	113	$ 19.80	NONE PROPOSED	5	225.0	0.23	500	113	113	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
318	Salem School	001	Boiler Hall	60W Incandescent Fixture	1	60.0	0.06	8,736	524	$ 92.25	Replace 60W Incandescent Fixture with 13W CFL	1	15.0	0.02	8,736	131	131	NONE PROPOSED	0	393	-	0.05	393	$ 69.19	0	5	20	0	0	25	25
319	Salem School	001	Counselor/Resource Room	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	3	360.0	0.36	2,600	936	$ 164.74	NONE PROPOSED	3	360.0	0.36	1,820	936	655	Ceiling Mounted Occupancy Sensor	1	-	280.80	-	281	$ 49.42	0	0	0	63.5	21.5	0	85
320	Salem School	001	7 Classroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	720.0	0.72	2,600	1,872	$ 329.47	NONE PROPOSED	12	720.0	0.72	1,820	1872	1310	Ceiling Mounted Occupancy Sensor	1	-	561.60	-	562	$ 98.84	0	0	65	63.5	21.5	65	865
321	Salem School	001	7 Classroom Bath	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	2,600	117	$ 20.59	NONE PROPOSED	1	45.0	0.05	1,820	117	82	Automatic Wall Switch Occupancy Sensor	1	-	35.10	-	35	$ 6.18	0	0	0	103	73.5	0	176.5
322	Salem School	001	5 Classroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	720.0	0.72	2,600	1,872	$ 329.47	NONE PROPOSED	12	720.0	0.72	1,820	1872	1310	Ceiling Mounted Occupancy Sensor	1	-	561.60	-	562	$ 98.84	0	0	65	63.5	21.5	65	865
323	Salem School	001	5 Classroom Bath	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	2,600	117	$ 20.59	NONE PROPOSED	1	45.0	0.05	1,820	117	82	Automatic Wall Switch Occupancy Sensor	1	-	35.10	-	35	$ 6.18	0	0	0	103	73.5	0	176.5
324	Salem School	001	3 Kindergarten Classroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	20	2400.0	2.40	2,600	6,240	$ 1,098.24	NONE PROPOSED	20	2400.0	2.40	1,820	6240	4368	Ceiling Mounted Occupancy Sensor	1	-	1,872.00	-	1,872	$ 329.47	0	0	0	63.5	21.5	0	85
325	Salem School	001	Kindergarten Bath	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	240.0	0.24	500	120	$ 21.12	NONE PROPOSED	2	240.0	0.24	350	120	84	Automatic Wall Switch Occupancy Sensor	1	-	36.00	-	36	$ 6.34	0	0	0	103	73.5	0	176.5
326	Salem School	001	Kindergarten Storage	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	4	480.0	0.48	500	240	$ 42.24	NONE PROPOSED	4	480.0	0.48	350	240	168	Automatic Wall Switch Occupancy Sensor	1	-	72.00	-	72	$ 12.67	0	0	0	103	73.5	0	176.5
327	Salem School	001	1 Kindergarten Classroom	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	3	180.0	0.18	2,600	468	$ 82.37	NONE PROPOSED	3	180.0	0.18	1,820	468	328	Ceiling Mounted Occupancy Sensor	1	-	140.40	-	140	$ 24.71	0	0	0	63.5	21.5	0	85
328	Salem School	001	1 Kindergarten Classroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	24	1440.0	1.44	2,600	3,744	$ 658.94	NONE PROPOSED	24	1440.0	1.44	2,600	3744	3744	NONE PROPOSED	0	-	-	-	-	$ -	0	0	65	0	0	65	1560
329	Salem School	001	1 Kindergarten Classroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	186.0	0.19	2,600	484	$ 85.11	NONE PROPOSED	2	186.0	0.19	1,820	484	339	Ceiling Mounted Occupancy Sensor	1	-	145.08	-	145	$ 25.53	0	0	0	63.5	21.5	0	85
330	Salem School	001	Hall	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	15	1800.0	1.80	8,736	15,725	$ 2,767.56	NONE PROPOSED	15	1800.0	1.80	8,736	15725	15725	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0

Appendix D-Lighting Spreadsheet

Seq. #	Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Exist. Qty of Fixtures	Exist. Watts	Exist. kW Base	Oper. Hrs.	Exist. kWh	Annual Cost of Energy Existing	Proposed Replacement Solution	Prop. Qty of Fixtures	Prop. Watts	Prop. kW Base	Prop. Oper. Hrs. w/ Sensors	Prop. kWh w/o Sensors	Prop. kWh w/ Sensors	Proposed Occupancy Sensor	Sensor Qtys	Total kWh Saved Lighting Only	kWh Saved Sensors Only	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector	Bulb	Labor	OS Cost	OS Labor	Subtotal	Total
331	Salem School	001	23 Classroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	16	1920.0	1.92	2,600	4,992	$ 878.59	NONE PROPOSED	16	1920.0	1.92	1,820	4992	3494	Ceiling Mounted Occupancy Sensor	1	-	1,497.60	-	1,498	$ 263.58	0	0	0	63.5	21.5	0	85
332	Salem School	001	22 Classroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	16	1920.0	1.92	2,600	4,992	$ 878.59	NONE PROPOSED	16	1920.0	1.92	1,820	4992	3494	Ceiling Mounted Occupancy Sensor	1	-	1,497.60	-	1,498	$ 263.58	0	0	0	63.5	21.5	0	85
333	Salem School	001	19 Classroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	16	1920.0	1.92	2,600	4,992	$ 878.59	NONE PROPOSED	16	1920.0	1.92	1,820	4992	3494	Ceiling Mounted Occupancy Sensor	1	-	1,497.60	-	1,498	$ 263.58	0	0	0	63.5	21.5	0	85
334	Salem School	001	Food Prep	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	4	480.0	0.48	2,600	1,248	$ 219.65	NONE PROPOSED	4	480.0	0.48	1,820	1248	874	Ceiling Mounted Occupancy Sensor	1	-	374.40	-	374	$ 65.89	0	0	0	63.5	21.5	0	85
335	Salem School	001	Hall	13W CFL CAN	24	360.0	0.36	8,736	3,145	$ 553.51	NONE PROPOSED	24	360.0	0.36	8,736	3145	3145	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
336	Salem School	001	Hall	2X2 Fixtures w/ 4-17W T8 Lamps w/ Electronic Ballasts	41	2542.0	2.54	8,736	22,207	$ 3,908.42	NONE PROPOSED	41	2542.0	2.54	8,736	22207	22207	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
337	Salem School	001	Electrical Closet	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	3	360.0	0.36	500	180	$ 31.68	NONE PROPOSED	3	360.0	0.36	350	180	126	Automatic Wall Switch Occupancy Sensor	1	-	54.00	-	54	$ 9.50	0	0	0	103	73.5	0	176.5
338	Salem School	001	Hall	2X2 Fixtures w/ 2-32W T8 Lamps w/ Electronic Ballasts	38	2280.0	2.28	8,736	19,918	$ 3,505.58	NONE PROPOSED	38	2280.0	2.28	8,736	19918	19918	NONE PROPOSED	0	-	-	-	-	$ -	0	0	0	0	0	0	0
339	Salem School	001	Faculty Dining	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	240.0	0.24	2,600	624	$ 109.82	NONE PROPOSED	2	240.0	0.24	1,820	624	437	Automatic Wall Switch Occupancy Sensor	1	-	187.20	-	187	$ 32.95	0	0	0	103	73.5	0	176.5
340	Salem School	001	Art	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	16	960.0	0.96	2,600	2,496	$ 439.30	NONE PROPOSED	16	960.0	0.96	1,820	2496	1747	Ceiling Mounted Occupancy Sensor	1	-	748.80	-	749	$ 131.79	0	0	65	63.5	21.5	65	1125
341	Salem School	001	Kindergarten	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	15	1800.0	1.80	2,600	4,680	$ 823.68	NONE PROPOSED	15	1800.0	1.80	1,820	4680	3276	Ceiling Mounted Occupancy Sensor	1	-	1,404.00	-	1,404	$ 247.10	0	0	0	63.5	21.5	0	85
342	Salem School	001	14 Classroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	14	840.0	0.84	2,600	2,184	$ 384.38	NONE PROPOSED	14	840.0	0.84	1,820	2184	1529	Ceiling Mounted Occupancy Sensor	1	-	655.20	-	655	$ 115.32	0	0	65	63.5	21.5	65	995
343	Salem School	001	15 Classroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	14	840.0	0.84	2,600	2,184	$ 384.38	NONE PROPOSED	14	840.0	0.84	1,820	2184	1529	Ceiling Mounted Occupancy Sensor	1	-	655.20	-	655	$ 115.32	0	0	65	63.5	21.5	65	995
344	Salem School	001	16 Classroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	21	1260.0	1.26	2,600	3,276	$ 576.58	NONE PROPOSED	21	1260.0	1.26	1,820	3276	2293	Ceiling Mounted Occupancy Sensor	1	-	982.80	-	983	$ 172.97	0	0	65	63.5	21.5	65	1450
345	Salem School	001	18 Classroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	14	840.0	0.84	2,600	2,184	$ 384.38	NONE PROPOSED	14	840.0	0.84	1,820	2184	1529	Ceiling Mounted Occupancy Sensor	1	-	655.20	-	655	$ 115.32	0	0	65	63.5	21.5	65	995
346	Salem School	001	17 Classroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	14	840.0	0.84	2,600	2,184	$ 384.38	NONE PROPOSED	14	840.0	0.84	1,820	2184	1529	Ceiling Mounted Occupancy Sensor	1	-	655.20	-	655	$ 115.32	0	0	65	63.5	21.5	65	995
347	Salem School	001	Classroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	15	1800.0	1.80	2,600	4,680	$ 823.68	NONE PROPOSED	15	1800.0	1.80	1,820	4680	3276	Ceiling Mounted Occupancy Sensor	1	-	1,404.00	-	1,404	$ 247.10	0	0	0	63.5	21.5	0	85
348	Salem School	001	Janitor's Closet	Surface Mount Fixture w/ 3-13W CFL	1	45.0	0.05	500	23	$ 3.96	NONE PROPOSED	1	45.0	0.05	350	23	16	Automatic Wall Switch Occupancy Sensor	1	-	6.75	-	7	$ 1.19	0	0	0	103	73.5	0	176.5
349	Salem School	001	Boys Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	120.0	0.12	2,600	312	$ 54.91	NONE PROPOSED	2	120.0	0.12	1,820	312	218	Automatic Wall Switch Occupancy Sensor	1	-	93.60	-	94	$ 16.47	0	0	65	103	73.5	65	306.5

APPENDIX E

SOLAR ENERGY FINANCING WORKSHEET

Memorial Junior School
Design Goal: Provide
99% of average annual electricity

Existing Conditons

Average Annual Electrical Usage (kWh)	831,252
Current Utility Price ($/kWh)	$0.1720

Calculations

Solar Rating (Zip Code: 07728)	4.6 kWh/sq-m/day
Solar Capacity Required (kW)	670
Roof Space Needed (sq-ft)	67,000
Annual Solar kWh (PV Watts)	821,152
Net System installation Cost ($9/kWh)	$6,030,000
Electrical Service Modification Cost	$100,000
Total System Installation Cost	**$6,130,000**
Materials	$4,291,000
Labor	$1,839,000
Inflated System Installation Cost	$7,662,500

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.78%
Annual Maintenance Costs	2%

Year	Utility Price	Solar kWh	Utility Savings	SRECS	Maintenance Costs	Annual Cash Flow	Cummulative Cash Flow
Install							
1	0.1720	821,152.0	$141,238.1	$517,685	($16,423)	$642,499.7	$642,499.7
2	0.1785	817,046.2	$145,844.1	$502,219	($16,341)	$631,721.9	$1,274,221.6
3	0.1852	812,961.0	$150,600.2	$487,065	($16,259)	$621,406.0	$1,895,627.7
4	0.1923	808,896.2	$155,511.4	$470,091	($16,178)	$609,424.3	$2,505,052.0
5	0.1995	804,851.7	$160,582.8	$453,708	($16,097)	$598,193.9	$3,103,245.9
6	0.2071	800,827.5	$165,819.6	$437,896	($16,017)	$587,699.5	$3,690,945.4
7	0.2149	796,823.3	$171,227.1	$422,636	($15,936)	$577,926.4	$4,268,871.8
8	0.2230	792,839.2	$176,811.0	$407,907	($15,857)	$568,861.1	$4,837,732.9
9	0.2314	788,875.0	$182,577.0	$393,691	($15,778)	$560,490.8	$5,398,223.7
10	0.2402	784,930.6	$188,531.0	$379,971	($15,699)	$552,803.6	$5,951,027.3
11	0.2493	781,006.0	$194,679.2	$366,729	($15,620)	$545,788.3	$6,496,815.6
12	0.2587	777,101.0	$201,027.8	$353,949	($15,542)	$539,434.5	$7,036,250.1
13	0.2685	773,215.5	$207,583.6	$341,614	($15,464)	$533,732.8	$7,569,982.9
14	0.2786	769,349.4	$214,353.1	$329,708	($15,387)	$528,674.4	$8,098,657.4
15	0.2891	765,502.6	$221,343.3	$318,218	($15,310)	$524,251.3	$8,622,908.7
16	0.3001	761,675.1	$228,561.6	$19,042	($15,234)	$232,369.9	$8,855,278.6
17	0.3114	757,866.7	$236,015.2	$18,947	($15,157)	$239,804.5	$9,095,083.2
18	0.3232	754,077.4	$243,711.9	$18,852	($15,082)	$247,482.3	$9,342,565.4
19	0.3354	750,307.0	$251,659.6	$18,758	($15,006)	$255,411.1	$9,597,976.5
20	0.3481	746,555.5	$259,866.4	$18,664	($14,931)	$263,599.2	$9,861,575.8
21	0.3612	742,822.7	$268,340.9	$18,571	($14,856)	$272,055.1	$10,133,630.8
22	0.3749	739,108.6	$277,091.8	$18,478	($14,782)	$280,787.4	$10,414,418.2
23	0.3891	735,413.0	$286,128.1	$18,385	($14,708)	$289,805.1	$10,704,223.3
24	0.4038	731,736.0	$295,459.0	$18,293	($14,635)	$299,117.7	$11,003,340.9
25	0.4190	728,077.3	$305,094.2	$18,202	($14,562)	$308,734.6	$11,312,075.5

Bee Meadow Elementary School
Design Goal: Provide
98% of average annual electricity

Existing Conditons

Average Annual Electrical Usage (kWh)	550,800
Current Utility Price ($/kWh)	$0.1750

Calculations

Solar Rating (Zip Code: 07728)	4.6 kWh/sq-m/day
Solar Capacity Required (kW)	440
Roof Space Needed (sq-ft)	44,000
Annual Solar kWh (PV Watts)	539,264
Net System installation Cost ($9/kWh)	$3,960,000
Electrical Service Modification Cost	$100,000
Total System Installation Cost	**$4,060,000**
Materials	$2,842,000
Labor	$1,218,000
Inflated System Installation Cost	$5,075,000

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.78%
Annual Maintenance Costs	2%

Year	Utility Price	Solar kWh	Utility Savings	SRECS	Maintenance Costs	Annual Cash Flow	Cummulative Cash Flow
Install							
1	0.1750	539,264.0	$94,371.2	$339,972	($10,785)	$423,557.9	$423,557.9
2	0.1816	536,567.7	$97,448.7	$329,815	($10,731)	$416,532.7	$840,090.6
3	0.1885	533,884.8	$100,626.6	$319,864	($10,678)	$409,812.6	$1,249,903.2
4	0.1956	531,215.4	$103,908.2	$308,716	($10,624)	$402,000.3	$1,651,903.4
5	0.2030	528,559.3	$107,296.7	$297,958	($10,571)	$394,683.2	$2,046,586.6
6	0.2107	525,916.5	$110,795.8	$287,574	($10,518)	$387,851.2	$2,434,437.8
7	0.2186	523,287.0	$114,408.9	$277,552	($10,466)	$381,495.0	$2,815,932.9
8	0.2269	520,670.5	$118,139.9	$267,879	($10,413)	$375,605.7	$3,191,538.6
9	0.2355	518,067.2	$121,992.6	$258,544	($10,361)	$370,174.8	$3,561,713.4
10	0.2444	515,476.8	$125,970.9	$249,533	($10,310)	$365,194.7	$3,926,908.1
11	0.2536	512,899.5	$130,078.9	$240,837	($10,258)	$360,658.0	$4,287,566.1
12	0.2632	510,335.0	$134,320.9	$232,444	($10,207)	$356,558.2	$4,644,124.3
13	0.2732	507,783.3	$138,701.3	$224,343	($10,156)	$352,888.9	$4,997,013.1
14	0.2835	505,244.4	$143,224.5	$216,525	($10,105)	$349,644.5	$5,346,657.6
15	0.2942	502,718.1	$147,895.2	$208,979	($10,054)	$346,819.8	$5,693,477.4
16	0.3053	500,204.6	$152,718.2	$12,505	($10,004)	$155,219.2	$5,848,696.6
17	0.3169	497,703.5	$157,698.5	$12,443	($9,954)	$160,187.0	$6,008,883.5
18	0.3288	495,215.0	$162,841.2	$12,380	($9,904)	$165,317.2	$6,174,200.8
19	0.3413	492,738.9	$168,151.6	$12,318	($9,855)	$170,615.3	$6,344,816.0
20	0.3542	490,275.2	$173,635.2	$12,257	($9,806)	$176,086.5	$6,520,902.6
21	0.3675	487,823.9	$179,297.6	$12,196	($9,756)	$181,736.7	$6,702,639.3
22	0.3814	485,384.7	$185,144.6	$12,135	($9,708)	$187,571.6	$6,890,210.8
23	0.3959	482,957.8	$191,182.4	$12,074	($9,659)	$193,597.2	$7,083,808.0
24	0.4108	480,543.0	$197,417.1	$12,014	($9,611)	$199,819.8	$7,283,627.8
25	0.4263	478,140.3	$203,855.0	$11,954	($9,563)	$206,245.7	$7,489,873.5

Salem Drive Elementary School
Design Goal: Provide
100% of average annual electricity

Existing Conditons

Average Annual Electrical Usage (kWh)	245,920
Current Utility Price ($/kWh)	$0.1760

Calculations

Solar Rating (Zip Code: 07728)	4.6 kWh/sq-m/day
Solar Capacity Required (kW)	200
Roof Space Needed (sq-ft)	20,000
Annual Solar kWh (PV Watts)	245,120
Net System installation Cost ($9/kWh)	$1,800,000
Electrical Service Modification Cost	$100,000
Total System Installation Cost	**$1,900,000**
Materials	$1,330,000
Labor	$570,000
Inflated System Installation Cost	$2,375,000

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.78%
Annual Maintenance Costs	2%

Year	Utility Price	Solar kWh	Utility Savings	SRECS	Maintenance Costs	Annual Cash Flow	Cummulative Cash Flow
Install							
1	0.1760	245,120.0	$43,141.1	$154,533	($4,902)	$192,771.4	$192,771.4
2	0.1827	243,894.4	$44,548.0	$149,916	($4,878)	$189,586.2	$382,357.6
3	0.1896	242,674.9	$46,000.7	$145,393	($4,853)	$186,539.8	$568,897.4
4	0.1967	241,461.6	$47,500.9	$140,326	($4,829)	$182,997.3	$751,894.7
5	0.2042	240,254.2	$49,049.9	$135,435	($4,805)	$179,680.1	$931,574.8
6	0.2119	239,053.0	$50,649.5	$130,715	($4,781)	$176,583.8	$1,108,158.6
7	0.2199	237,857.7	$52,301.2	$126,160	($4,757)	$173,704.0	$1,281,862.6
8	0.2282	236,668.4	$54,006.8	$121,763	($4,733)	$171,036.7	$1,452,899.3
9	0.2368	235,485.1	$55,768.0	$117,520	($4,710)	$168,578.1	$1,621,477.5
10	0.2458	234,307.7	$57,586.7	$113,424	($4,686)	$166,324.8	$1,787,802.3
11	0.2551	233,136.1	$59,464.7	$109,471	($4,663)	$164,273.3	$1,952,075.6
12	0.2647	231,970.4	$61,403.9	$105,656	($4,639)	$162,420.8	$2,114,496.4
13	0.2747	230,810.6	$63,406.3	$101,974	($4,616)	$160,764.3	$2,275,260.7
14	0.2851	229,656.5	$65,474.0	$98,420	($4,593)	$159,301.3	$2,434,562.0
15	0.2959	228,508.2	$67,609.2	$94,990	($4,570)	$158,029.5	$2,592,591.5
16	0.3071	227,365.7	$69,814.0	$5,684	($4,547)	$70,950.8	$2,663,542.3
17	0.3187	226,228.9	$72,090.7	$5,656	($4,525)	$73,221.9	$2,736,764.2
18	0.3307	225,097.7	$74,441.7	$5,627	($4,502)	$75,567.2	$2,812,331.4
19	0.3432	223,972.2	$76,869.3	$5,599	($4,479)	$77,989.2	$2,890,320.5
20	0.3562	222,852.4	$79,376.1	$5,571	($4,457)	$80,490.3	$2,970,810.8
21	0.3696	221,738.1	$81,964.6	$5,543	($4,435)	$83,073.3	$3,053,884.1
22	0.3836	220,629.4	$84,637.6	$5,516	($4,413)	$85,740.7	$3,139,624.8
23	0.3981	219,526.3	$87,397.7	$5,488	($4,391)	$88,495.3	$3,228,120.1
24	0.4132	218,428.7	$90,247.8	$5,461	($4,369)	$91,339.9	$3,319,460.1
25	0.4288	217,336.5	$93,190.9	$5,433	($4,347)	$94,277.5	$3,413,737.6

Mountview Road Elementary School
Design Goal: Provide
99% of average annual electricity

Existing Conditons

Average Annual Electrical Usage (kWh)	223,787
Current Utility Price ($/kWh)	$0.1787

Calculations

Solar Rating (Zip Code: 07728)	4.6 kWh/sq-m/day
Solar Capacity Required (kW)	180
Roof Space Needed (sq-ft)	18,000
Annual Solar kWh (PV Watts)	220,608
Net System installation Cost ($9/kWh)	$1,620,000
Electrical Service Modification Cost	$100,000
Total System Installation Cost	**$1,720,000**
Materials	$1,204,000
Labor	$516,000
Inflated System Installation Cost	$2,150,000

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.78%
Annual Maintenance Costs	2%

Year	Utility Price	Solar kWh	Utility Savings	SRECS	Maintenance Costs	Annual Cash Flow	Cummulative Cash Flow
Install							
1	0.1787	220,608.0	$39,422.6	$139,079	($4,412)	$174,089.9	$174,089.9
2	0.1855	219,505.0	$40,708.3	$134,924	($4,390)	$171,242.6	$345,332.5
3	0.1925	218,407.4	$42,035.8	$130,853	($4,368)	$168,521.0	$513,853.5
4	0.1997	217,315.4	$43,406.6	$126,293	($4,346)	$165,353.4	$679,206.9
5	0.2073	216,228.8	$44,822.2	$121,892	($4,325)	$162,389.3	$841,596.2
6	0.2151	215,147.7	$46,283.9	$117,644	($4,303)	$159,624.7	$1,001,221.0
7	0.2233	214,071.9	$47,793.2	$113,544	($4,281)	$157,055.7	$1,158,276.7
8	0.2317	213,001.6	$49,351.8	$109,587	($4,260)	$154,678.7	$1,312,955.4
9	0.2405	211,936.6	$50,961.2	$105,768	($4,239)	$152,490.3	$1,465,445.7
10	0.2495	210,876.9	$52,623.1	$102,082	($4,218)	$150,487.4	$1,615,933.1
11	0.2590	209,822.5	$54,339.2	$98,524	($4,196)	$148,667.0	$1,764,600.1
12	0.2688	208,773.4	$56,111.3	$95,091	($4,175)	$147,026.5	$1,911,626.6
13	0.2789	207,729.5	$57,941.1	$91,777	($4,155)	$145,563.3	$2,057,189.9
14	0.2895	206,690.9	$59,830.6	$88,578	($4,134)	$144,275.2	$2,201,465.1
15	0.3004	205,657.4	$61,781.8	$85,491	($4,113)	$143,160.0	$2,344,625.1
16	0.3118	204,629.1	$63,796.5	$5,116	($4,093)	$64,819.7	$2,409,444.8
17	0.3236	203,606.0	$65,877.0	$5,090	($4,072)	$66,895.0	$2,476,339.8
18	0.3358	202,588.0	$68,025.3	$5,065	($4,052)	$69,038.2	$2,545,378.0
19	0.3485	201,575.0	$70,243.7	$5,039	($4,032)	$71,251.6	$2,616,629.6
20	0.3616	200,567.1	$72,534.4	$5,014	($4,011)	$73,537.2	$2,690,166.8
21	0.3753	199,564.3	$74,899.8	$4,989	($3,991)	$75,897.6	$2,766,064.4
22	0.3895	198,566.5	$77,342.4	$4,964	($3,971)	$78,335.2	$2,844,399.7
23	0.4042	197,573.7	$79,864.6	$4,939	($3,951)	$80,852.5	$2,925,252.1
24	0.4195	196,585.8	$82,469.1	$4,915	($3,932)	$83,452.0	$3,008,704.1
25	0.4354	195,602.9	$85,158.4	$4,890	($3,912)	$86,136.5	$3,094,840.6

APPENDIX F

GLACIAL ENERGY – ALTERNATIVE ELECTRIC SUPPLIER QUOTE

Savings Analysis Proposal - JCP&L

Glacial Energy

This analysis illustrates what your recent energy costs savings might have been had Glacial Energy been your preferred electricity supplier.
This proposal is based on your organization's estimated usage (kwh) and demand (kw) over the coming year.

Secure your savings today!

Contract Summary - Forecasted Price Comparison

Company Name: Hanover Board of Education
Billing Address: Mountview Road School, 30 Mountview Road, Whippany, NJ 07981

Start Month:	Mar-10
Number of LDC Accounts:	4
Retail Margin Adder:	N/A

Estimated Rate Comparison over the next 12 months

Avg Rate ($/kwh)*:	$	0.12283
Annual Utility Charges:	$	225,071
Glacial Energy Index:	$	0.11029
Glacial Charges:	$	202,093

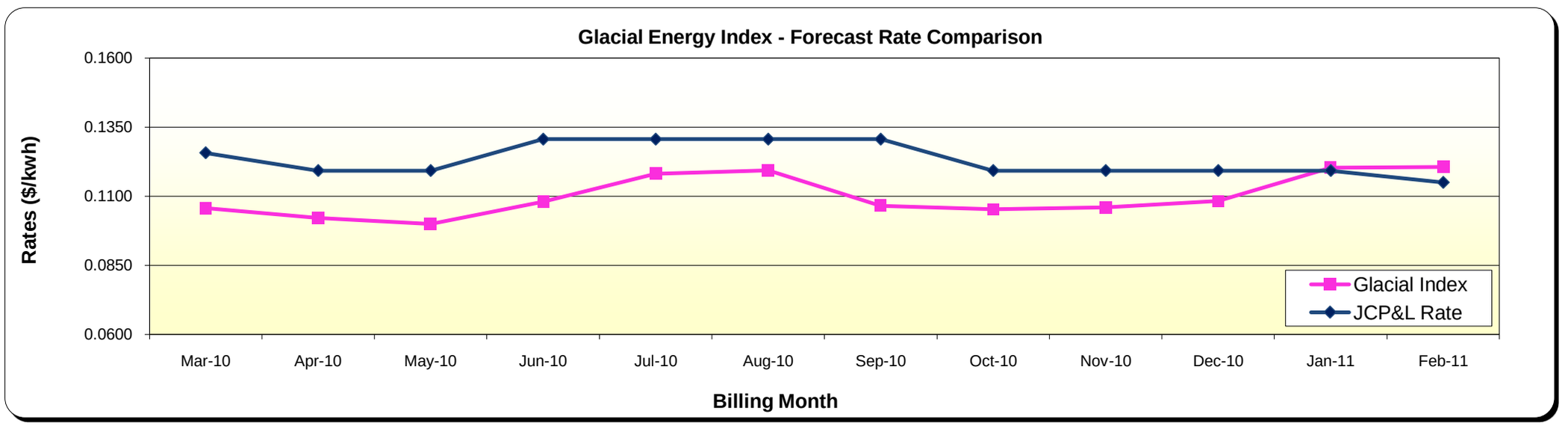
Forecasted Customer Usage Data Summary

Usage (kwh):	1,832,432
Avg Monthly Usage (kwh):	152,703
Peak Monthly kw:	637
Peak Load Factor:	33%
Capacity PLC:	364
Transmission PLC:	394

Savings Summary

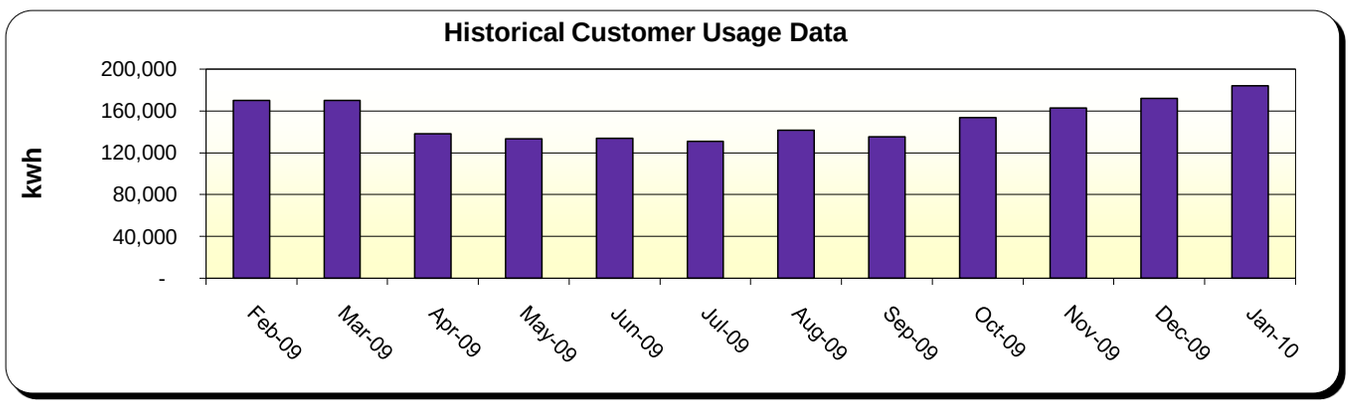
Estimated Savings vs. Utility	**$**	**22,978**
Savings (Glacial vs. Utility)		**10%**

The savings in this proposal are estimated, not guaranteed. Actual savings will vary.



Glacial Index Includes:
a. Wholesale Delivery Price of Energy
b. Energy Losses and Unaccounted for Energy (UFE)
c. Ancillary Services & other ISO Charges
d. Zonal Congestion
e. Retail Adder
f. Transmission Losses & Charges
g. Capacity Charges
h. NJ SUT (Tariff Rate also includes NJ SUT)

Glacial Index Excludes:
a. Distribution or other (wires) charges from the utility
b. Non NJ SUT Taxes.



	LDC Account No:	Physical Address:
1	08004375850000095059	Mountview Road School, 30 Mountview Road, Whippany, NJ 07
2	08004375850000243369	Salem Drive School, 29 Salem Drive, Whippany, NJ 07981
3	08004375850000333997	Memorial Junior School, 61 Highland Avenue, Whippany, NJ 07
4	08004375850000334044	Bee Meadow School, 120 reynolds Avenue, Whippany, NJ 0798

1. The Glacial Index price is a monthly variable rate, it is not a fixed rate.
2. The index is based in part on forecasted ISO charges, estimated future zonal energy prices and the cost to provide service.
3. The forward tariff rates are based on the latest, pending or estimated utility rates (inclusive of NJ SUT), as published by the utility forecasted for this rate schedule.

Savings Analysis Proposal - JCP&L

Glacial Energy

This analysis illustrates what your recent energy costs savings might have been had Glacial Energy been your preferred electricity supplier.

Contract Summary - Historical Utility Charges

Company Name: Hanover Board of Education
Billing Address: Mountview Road School, 30 Mountview Road, Whippany, NJ 07981

Historical Timeframe (mo.):	6
Start Month:	Aug-09
Number of LDC Accounts:	4

Estimated Historical Utility Charges

Avg Rate ($/kwh):	$	0.11534
Annual Utility Charges:	$	109,525

Glacial Energy Index:	$	0.10431
Glacial Charges:	$	99,046

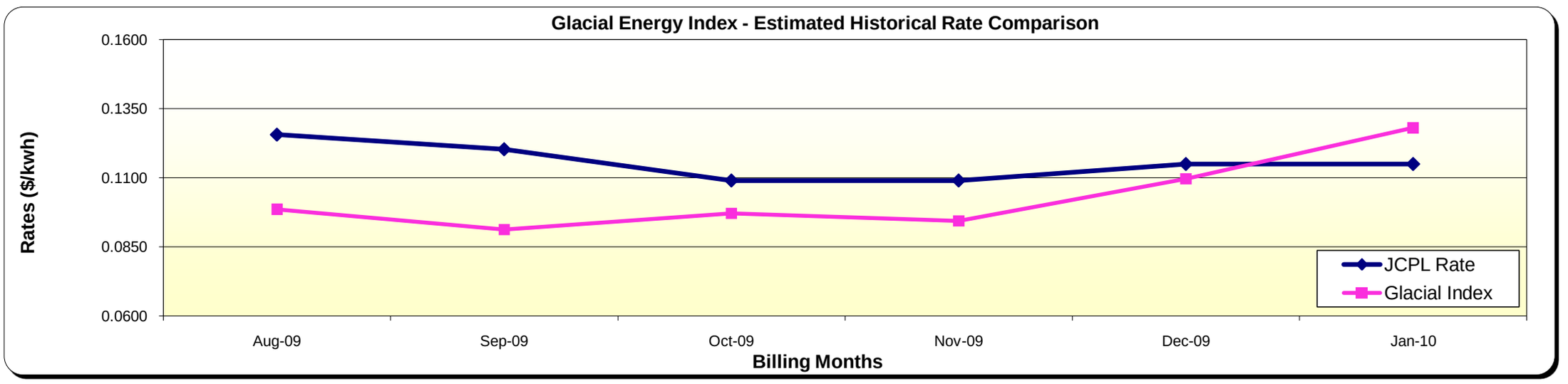
6 month Period Summary

Usage (kwh):	949,566
Avg Monthly Usage (kwh):	158,261
Peak Monthly kw:	637
Peak Load Factor:	34%
Capacity PLC:	364
Transmission PLC:	394

Savings Summary

Estimated Savings vs. Utility	**$**	**10,479**
Savings (Glacial vs. Utility)		**10%**

The savings in this proposal are estimated, not guaranteed. Actual savings will vary.



Glacial Index Includes:
a. Wholesale Delivery Price of Energy
b. Energy Losses and Unaccounted for Energy (UFE)
c. Ancillary Services & other ISO Charges
d. Zonal Congestion
e. Retail Adder
f. Transmission Losses & Charges
g. Capacity Charges
h. NJ SUT (Tariff Rate also includes NJ SUT)

Glacial Index Excludes:
a. Distribution or other (wires) charges from the utility
b. Non NJ SUT Taxes.

1. The historic tariff rate comparison is based on the customer's historical usage as provided or estimated and provided or estimated demand over the previous term.
2. Savings are based on the corresponding utility rates for the appropriate rate schedule over the analysis term.

APPENDIX G

NJ SMARTSTART INCENTIVES INFORMATION AND WORKSHEETS

New Jersey's Clean Energy PROGRAM™
Your Power to Save
njcleanenergy.com

New Jersey SmartStart BUILDINGS®

BPU

2010 Prescriptive Lighting Application

Customer Information

Company	Electric Utility Serving Applicant	Electric Account No.	Installation Date
Facility Address	City	State	Zip
Type of Project ❑ New Construction ❑ Renovation ❑ Equipment Replacement		Size of Building	
Company Mailing Address	City	State	Zip
Contact Person (Name/Title)	Telephone No. ( )	Fax No. ( )	
Incorporated? ❑ Yes ❑ No ❑ Exempt	Federal Tax ID# or SSN	Email Address	
Incentive Payment to ❑ Customer ❑ Contractor ❑ Other	Please assign payment to contractor/vendor/other indicated below Customer Signature		

Payee Information (must submit W-9 form with application)

Company	Contact Name		Incorporated? Yes No	Email Address Federal Tax ID#	
Street Address	City	State	Zip	Telephone No. ( )	Fax No. ( )

Contractor/Vendor Information (if different from Payee)

Company	Contact Name		Incorporated? ❑ Yes ❑ No	Email Address Federal Tax ID#	
Street Address	City	State	Zip	Telephone No. ( )	Fax No. ( )

Building Type (circle one)

Education-Primary School; Education-Community College; Education-University; Grocery; Medical-Hospital; Medical-Clinic; Lodging Hotel(Guest Rooms); Lodging Motel; Manufacturing-Light Industrial; Office-Large; Office-Small; Restaurant-Sit Down; Restaurant-Fast Food; Retail-3 Story Large; Retail- Single Story Large; Retail-Small; Storage Conditioned; Storage Unconditioned; Warehouse; Other

Prescriptive Lighting Incentive

$_____ Total Incentive (per attached worksheet calculations)

Note: Prescriptive Lighting Worksheet must accompany this application.

Specific Program Requirements* (These requirements are in addition to the Program Terms and Conditions.)

1. Please refer to the Program Guide for additional applicable technical requirements.
2. Include the manufacturer's specification sheet with the application package and mail or fax directly to the Commercial/Industrial Market Manager.
3. Incentives for T-5 and T-8 lamps with electronic ballasts are available only for fixtures with a Total Harmonic Distortion of ≤20%.
4. All eligible lighting devices must be UL listed.
5. Requirements for CFL fixtures (must meet all requirements):
   - Fixtures must be new and ENERGY STAR qualified
   - Fixtures must have replaceable electronic ballasts
   - Total Harmonic Distortion (THD) must not exceed 33%
   - Power factor of the ballast must be no less than 90%
   - The manufacturer must warrant all fixtures for a minimum of 3 years. Warranty does not pertain to lamps or photocells not physically part of the fixture.
   - The installer must warrant fixture installation – minimum of 1 yr.

5.1 Screw-in PAR 38 or 30 Compact Fluorescent Lamps (CFL) with Aluminum Reflectors replacing existing incandescent fixtures.
   - The lamp must be warranted by the manufacturer for 8,000 hours
   - Total Harmonic Distortion must not exceed 33%
   - Power factor of the ballast must be ≥90%

6. Pulse Start Metal Halide (including pole-mounted parking lot lighting) must have a 12% minimum wattage reduction.
7. T-5 or T-8 Fixtures replacing incandescent or T-12 fluorescent fixtures greater than 250 watt or High Intensity Discharge shall comply as follows:

7.1 T-5 fixtures replacing T-12 fluorescent or incandescent fixtures 250 watts or greater, or HID fixtures shall have a ballast factor greater than or equal to 1.0; have reflectivity greater than or equal to 91%; have a minimum 2 lamps; and be designated as F54T5 HO.

7.2 T-8 fixtures replacing T-12 fluorescent or incandescent fixtures 250 watts or greater, or HID fixtures shall have a ballast factor greater than or equal to 1.14; have reflectivity greater than or equal to 91%; have a minimum of 4 lamps; and be designated as F32T8, minimum 32 watts.

7.3 Incentives for delamped T-8 lamps with new reflectors are available only for fixtures with a Total Harmonic Distortion of ≤20%. Electronic ballast replacement required for all eligible delamped fixtures. Eligible delamping can include reduction in linear lamp feet from existing conditions. For example, 1-8' linear fluorescent lamp can be considered as 2-4' linear lamps. U-bend lamps 4' in total length can be considered as 2-F17/T8 lamps.

7.4 Electronic ballast replacement is necessary for all eligible delamped fixtures.

7.5 Reduced wattage T8 (28W/25W 4') (1-4 lamps) retrofit requires lamp and ballast replacement.

8. LED Refridgerated/Freezer Case Lighting must meet NEEP Design Lights Consortium Standards or be on an ENERGY STAR or a SSL Qualified Product list. For new door installations on existing open cases, indicate the number of LED fixtures to be installed. Also indicate "New Door" in the Fixture Type column on the Prescriptive Lighting Worksheet (ie. New Door 5' LED).

Application Checklist (Before submitting your application, please make sure you have signed in the space below and completed the following items.)

- ❑ Payee Information is filled out and a W-9 form of the payee is included
- ❑ Manufacturer's specification sheets for proposed technology are included
- ❑ A copy (all pages) of a recent month's utility bill is included

ACKNOWLEDGEMENT

CUSTOMER'S SIGNATURE

By signing, I certify that I have read, understand and agree to the Specific Program Requirements/Terms and Conditions listed on this application form, I will also submit for approval a properly completed application package, which includes this signed application, worksheet (if applicable), manufacturer's specification sheets and complete utility bill (name and address on utility bill must match name and address on application).

Prescriptive Lighting Measures and Incentives*

Type of Fixture	Incentive
Recessed and Surface-Mounted Compact Fluorescents (New Fixtures Replacing Incandescent Fixtures Only): Only available for hard-wired, electronically ballasted new fixtures with rare earth phosphor lamps and 4-pin based tubes (including: twin tube, quad tube, triple tube, 2D or circline lamps), THD<33% and BF>0.9	$25 per 1-lamp fixture $30 per 2-lamp or more fixture
Screw-in PAR 38 or PAR 30 (CFL) as per 5.1 above	$7 per lamp replaced
High-Efficiency Fluorescent Fixtures: For retrofit of T-12 fixtures to T-5 or T-8 with electronic ballasts	$15 per fixture (1-4 lamps retrofits)

For replacement of fixtures with new T-5 or T-8 fixtures

Type of Old Fixture	Wattage of Old Fixture	Type of New Fixture	Incentive Per Fixture Removed
HID, T-12, Incandescent	≥ 1000 Watts	T-5, T-8	$284
HID, T-12, Incandescent	400-999 Watt	T-5, T-8	$100
HID, T-12, Incandescent	250-399 Watt	T-5, T-8	$50
HID only	175-249 Watt	T-5, T-8	$43
HID only	100-174 Watt	T-5, T-8	$30
HID only	75-99 Watt	T-5, T-8	$16
T-12 only	<250 Watt	T-5, T-8 (1 & 2 lamp)	$25
T-12 only	<250 Watt	T-5, T-8 (3 & 4 lamp)	$30

For retrofit of T-8 fixtures by permanent delamping & new reflectors are available only for fixtures with a total Harmonic Distortion of ≤20%. Electronic ballast replacement required for all eligible delamped fixtures.	**$20 per fixture**
New Construction & Complete Renovation	**Performance based only**
LED Exit Signs (new fixtures only):	
For existing facilities with connected load <75 kW	**$20 per fixture**
For existing facilities with connected load ≥ 75 kW	**$10 per fixture**
Pulse Start Metal Halide (for fixtures ≥ 150 watts)	**$25 per fixture (includes parking lot lighting)**
Parking lot low bay - LED	**$43 per fixture**
T-12 to T-8 fixtures by permanent delamping & new reflectors. Electronic ballast replacement is necessary for all eligible delamped fixtures.	**$30 per fixture**
Retrofit of existing 32 watt T-8 system to Reduced Wattage (28W/25W 4')	**$10 per fixture (1-4 lamps)**
LED Refrigerated/Freezer Case Lighting: Incentive for replacement of fluorescent lighting systems in medium or low temperature display cases	**$42 per 5' LED fixture $65 per 6' LED fixture**
Induction Lighting Fixtures	
Retrofit of HID	**$50 per HID (≥100W) fixture retrofitted with induction lamp, power coupler and generator. Replacement unit must use 30% less wattage per fixture than existing HID system**
Replacement of HID	**$70 per HID (≥100W) fixture with a new induction fixture**

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New Jersey's Clean Energy Program
c/o TRC Energy Services
900 Route 9 North, Suite 104 • Woodbridge, NJ 07095
Phone: 866-657-6278 • Fax: 732-855-0422

Visit our web site: NJCleanEnergy.com/ssb

*Incentives/Requirements subject to change.

NJ SmartStart Buildings®

Program Terms and Conditions

Definitions:

Design Incentives – Incentives that may be offered to design professionals by the Program.

Design Services – Services that may be offered to design professionals under the Program.

Energy-Efficient Measures – Any device eligible to receive a Program Incentive payment through the NJ Clean Energy Commercial and Industrial Program (New Jersey SmartStart Buildings).

New Jersey Utilities – The regulated electric and/or gas utilities in the State of New Jersey. They are: Atlantic City Electric, Jersey Central Power & Light, Rockland Electric Company, New Jersey Natural Gas, Elizabethtown Gas, PSE&G, and South Jersey Gas.

Administrator – New Jersey Board of Public Utilities, Office of Clean Energy

Participating Customers – Those non-residential electric and/or gas service customers of the New Jersey Utilities who participate in this Program.

Product Installation or Equipment Installation – Installation of the Energy-Efficient Measures.

Market Manager – TRC Energy Services.

Program – The Commercial and Industrial Energy-Efficient Construction Program (New Jersey SmartStart Buildings) offered herein by the New Jersey Board of Public Utilities, Office of Clean Energy pursuant to state regulatory approval under the New Jersey Electric Discount and Energy Competition Act, NJSA 48:3-49, et seq.

Program Incentives – Refers to the amount or level of incentive that the Program provides to Participating Customers pursuant to the Program offered herein (see description under "Incentive Amount" heading).

Program Offer – Program Incentives are available to non-residential retail electric and/or gas service customers of the New Jersey Utilities identified above. Program Incentives for new construction are available only for projects in areas designated for growth in the State Plan. Public school (K-12) new construction projects are exempted from this restriction and are eligible for new Program incentives throughout the State. Customers, or their trade allies, can determine if a location is in a designated growth area by referring to the Smart Growth Locator available from the HMFA website or contact the Market Manager if you are uncertain about project eligibility.

Application and Eligibility Process – The Program pays incentives after the installation of qualified energy efficient measures that were pre-approved (for exceptions to this condition, please refer to "Exceptions for Approval".) In order to be eligible for Program Incentives, a Customer, or an agent (contractor/vendor) authorized by a Customer, must submit a properly completed application package. The package must include an application signed by the customer; a complete (current) utility bill; and technology worksheet and manufacturer's cut sheets (where appropriate). This information must be submitted to the Market Manager before equipment is installed. Applications for measures that are self installed by customers must be submitted by the customer and not the sales vendor of the measure, however, the customer may elect to assign payment of the incentive to the sales vendor. This application package must be received by the Market Manager on or before December 31, 2010 in order to be eligible for 2010 incentives. The Market Manager will review the application package to determine if the project is eligible for a Program Incentive. If eligible, the Customer will receive an approval letter with the estimated authorized incentive amount and the date by which the equipment must be installed in order for the approval to remain in effect. Upon receipt of an approval letter, the Customer may then proceed to install the equipment listed on the approved application. Equipment installed prior to the date of the Market Manager's approval letter is not eligible for an incentive. The Market Manager reserves the right to conduct a pre-inspection of the facility prior to the installation of equipment. This will be done prior to the issuance of the approval letter. All equipment must be purchased within 12 months of date of application. **Any Customer and/or agent who purchases equipment prior to the receipt of an incentive approval letter does so at his/her own risk.**

Exceptions for Approval – The Application and Eligibility Process pertains to all projects except for those involving either Unitary HVAC or Motors having an incentive amount less than $5,000. These measures, at this incentive level, may be installed without prior approval. In addition, but at the sole discretion of the Market Manager, emergency replacement of equipment may not require a prior approval determination and letter. **In such cases, please notify the Market Manager of such emergencies as early as possible, that an application will soon be sent in that was not pre-approved.**

Post Installation Approval – After installation is completed, the Customer, or an agent authorized by the Customer, must finalize and submit an invoice for the purchase of the equipment (material cost must be broken out from labor costs), and any other required documentation as specified on the equipment application or in the Market Manager's initial approval letter.

Please refer to the Program Guide on the NJCleanEnergy.com/ssb website for the complete Application and Eligibility Process.

The Market Manager reserves the right to verify sales transactions and to have reasonable access to Participating Customer's facility to inspect both pre-existing product or equipment (if applicable) and the Energy-Efficient Measures installed under this Program, either prior to issuing incentives or at a later time.

Energy-Efficient Measures must be installed in buildings located within a New Jersey Utilities' service territory and designated on the Participating Customer's incentive application. Program Incentives are available for qualified Energy-Efficient Measures as listed and described in the Program materials and incentive applications. The Participating Customer must ultimately own the equipment, either through an up-front purchase or at the end of a short-term lease. Design Incentives are available to design professionals as described in the Program materials and applications. A different and separate agreement must be executed by participating design professionals to be eligible for this type of incentive. The design professional does not need to be based in New Jersey.

Equipment procured by Participating Customers through another program offered by New Jersey's Clean Energy Program or the New Jersey Utilities, as applicable, is not eligible for incentives through this program. Customers who have not contributed to the Societal Benefits Charge of the applicable New Jersey Utility are not be eligible for incentives offered through this program.

Incentive Amount – Program Incentives will equal either: a) the approved Program Incentive amount, or b) the actual equipment cost of the Energy-Efficient Measure, whichever is less, as determined by the Market Manager. Products offered at no direct cost to the customer are ineligible. Incomplete application submissions, applications requiring inspections and unanticipated high volume of activities may cause processing delays. Program Incentives are limited to $500,000 per utility account in a calendar year. Contact the Market Manager regarding any questions.

Tax Liability – The Market Manager will not be responsible for any tax liability that may be imposed on any Participating Customer as a result of the payment of Program Incentives. All Participating Customers must supply their Federal Tax Identification number or social security number to the Market Manager on the application form in order to receive a Program Incentive. In addition, Participating Customers must also provide a Tax Clearance Form (Business Assistance or Incentive Clearance Certificate) that is dated within 90 days of equipment installation.

Endorsement – The Market Manager and Administrator do not endorse, support or recommend any particular manufacturer, product or system design in promoting this Program.

Warranties – THE MARKET MANAGER AND ADMINISTRATOR DO NOT WARRANT THE PERFORMANCE OF INSTALLED EQUIPMENT, AND/OR SERVICES RENDERED AS PART OF THIS PROGRAM, EITHER EXPRESSLY OR IMPLICITLY. NO WARRANTIES OR REPRESENTATIONS OF ANY KIND, WHETHER STATUTORY, EXPRESSED, OR IMPLIED, INCLUDING, WITHOUT LIMITATIONS, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING EQUIPMENT OR SERVICES PROVIDED BY A MANUFACTURER OR VENDOR. CONTACT YOUR VENDOR/SERVICES PROVIDER FOR DETAILS REGARDING PERFORMANCE AND WARRANTIES.

Limitation of Liability – By virtue of participating in this Program, Participating Customers agree to waive any and all claims or damages against the Market Manager or the Administrator, except the receipt of the Program Incentive. Participating Customers agree that the Market Manager's and Administrator's liability, in connection with this Program, is limited to paying the Program Incentive specified. Under no circumstances shall the Market Manager, its representatives, or subcontractors, or the Administrator, be liable for any lost profits, special, punitive, consequential or incidental damages or for any other damages or claims connected with or resulting from participation in this Program. Further, any liability attributed to the Market Manager under this Program shall be individual, and not joint and/or several.

Assignment – The Participating Customer may assign Program Incentive payments to a specified vendor.

Participating Customer's Certification – Participating Customer certifies that he/she purchased and installed the equipment listed in their application at their defined New Jersey location. Participating Customer agrees that all information is true and that he/she has conformed to all of the Program and equipment requirements listed in the application.

Termination – The New Jersey Board of Public Utilities reserves the right to extend, modify (this includes modification of Program Incentive levels) or terminate this Program without prior or further notice.

Acknowledgement – I have read, understood and am in compliance with all rules and regulations concerning this incentive program. I certify that all information provided is correct to the best of my knowledge, and I give the Market Manager permission to share my records with the New Jersey Board of Public Utilities, and contractors it selects to manage, coordinate or evaluate the NJ SmartStart Buildings Program. Additionally, I allow reasonable access to my property to inspect the installation and performance of the technologies and installations that are eligible for incentives under the guidelines of New Jersey's Clean Energy Program.

New Jersey's Clean Energy Program™
Your Power to Save
njcleanenergy.com

New Jersey SmartStart Buildings®

New Jersey BPU Board of Public Utilities

2010 Prescriptive Lighting Incentive Worksheet

Customer Information

Company	Facility Address
☐ Check here if multiple worksheets are being submitted for one project/building.	Date Submitted

Prescriptive Lighting Information

For additional fixtures, attach additional sheets and check here ☐

Reason N–New R–Replaced	**Fixture Type Installed**	**Fixture Type Removed**	**Permanent Delamp w/ New Reflector** (Y/N)	**Location** (Bldg/Rm)	**Size of Replaced Lamps in Watts**	**A Incentive Per Fixture** (Table)	**B # of Units**	**Total Incentives (AxB)**
(Examples) R	2x4 3L T-5	2x4 3L T-12	N	Office	40	$15	8	$15 x 8 = $120
R	2x2 2L T-8	2x2 2L T-12	N	Office	34	$15	10	$15 x 10 = $150
R	28w CFL	100w Incan	N	Supply Room	100	$25	3	$25 x 3 = $75
R	250w Pulse Start Metal Halide	400w Mercury Vapor	N	Warehouse	450	$25	3	$25 x 3 = $75
N	New Doors 5' LED	1L T-8 5'	N	Dairy Case #5	38	$42	25	$42 x 25=$1,050
							Total (including additional sheets)	

Specific Program Requirements* (These requirements are in addition to the Program Terms and Conditions.)

1. Please refer to the Program Guide for additional applicable technical requirements.
2. Include the manufacturer's specification sheet with the application package and mail or fax directly to the Commercial/Industrial Market Manager.
3. Incentives for T-5 and T-8 lamps with electronic ballasts are available only for fixtures with a Total Harmonic Distortion of ≤20%.
4. All eligible lighting devices must be UL listed.
5. Requirements for CFL fixtures (must meet all requirements):
   - Fixtures must be new and Energy Star qualified
   - Fixtures must have replaceable electronic ballasts
   - Total Harmonic Distortion (THD) must not exceed 33%
   - Power factor of the ballast must be no less than 90%
   - The manufacturer must warrant all fixtures for a minimum of 3 years. Warranty does not pertain to lamps or photocells not physically part of the fixture.
   - The installer must warrant fixture installation – minimum of 1 yr.

5.1 Screw-in PAR 38 or 30 Compact Fluorescent Lamps (CFL) with Aluminum Reflectors replacing existing incandescent fixtures.
   - The lamp must be warranted by the manufacturer for 8,000 hours
   - Total Harmonic Distortion must not exceed 33%
   - Power factor of the ballast must be ≥90%

6. Pulse Start Metal Halide (including pole-mounted parking lot lighting) must have a 12% minimum wattage reduction.
7. T-5 or T-8 Fixtures replacing incandescent or T-12 fluorescent fixtures greater than 250 watt or High Intensity Discharge shall comply as follows:

7.1 T-5 fixtures replacing T-12 fluorescent or incandescent fixtures 250 watts or greater, or HID fixtures shall have a ballast factor greater than or equal to 1.0; have reflectivity greater than or equal to 91%; have a minimum 2 lamps; and be designated as F54T5 HO.

7.2 T-8 fixtures replacing T-12 fluorescent or incandescent fixtures 250 watts or greater, or HID fixtures shall have a ballast factor greater than or equal to 1.14; have reflectivity greater than or equal to 91%; have a minimum of 4 lamps; and be designated as F32T8, minimum 32 watts.

7.3 Incentives for delamped T-8 lamps with new reflectors are available only for fixtures with a total Harmonic Distortion of ≤20%. Electronic ballast replacement required for all eligible delamped fixtures. Eligible delamping can include reduction in linear lamp feet from existing conditions. For example, 1-8' linear fluorescent lamp can be considered as 2-4' linear lamps. U-bend lamps 4' in total length can be considered as 2-F17/T8 lamps.

7.4 Electronic ballast replacement is necessary for all eligible delamped fixtures.

7.5 Reduced wattage T8 (28W/25W 4') (1-4 lamps) retrofit requires lamp and ballast replacement.

8. LED Refridgerated/Freezer Case Lighting must meet NEEP Design Lights Consortium Standards or be on an ENERGY STAR or a SSL Qualified Product list. For new door installations on existing open cases, indicate the number of LED fixtures to be installed. Also indicate "New Door" in the Fixture Type column on the Prescriptive Lighting Worksheet (ie. New Door 5' LED).

ACKNOWLEDGEMENT

_____

CUSTOMER'S SIGNATURE

By signing, I certify that I have read, understand and agree to the Specific Program Requirements/Terms and Conditions listed on this application form, I will also submit for approval a properly completed application package, which includes this signed application, worksheet (if applicable), manufacturer's specification sheets and complete utility bill (name and address on utility bill must match name and address on application).

Prescriptive Lighting Measures and Incentives*

Type of Fixture	Incentive
Recessed and Surface-Mounted Compact Fluorescents (New Fixtures Replacing Incandescent Fixtures Only): Only available for hard-wired, electronically ballasted new fixtures with rare earth phosphor lamps and 4-pin based tubes (including: twin tube, quad tube, triple tube, 2D or circline lamps), THD<33% and BF>0.9	$25 per 1-lamp fixture $30 per 2-lamp or more fixture
Screw-in PAR 38 or PAR 30 (CFL) as per 5.1 above	$7 per lamp replaced
High-Efficiency Fluorescent Fixtures: For retrofit of T-12 fixtures to T-5 or T-8 with electronic ballasts	$15 per fixture (1-4 lamps retrofits)
For replacement of fixtures with new T-5 or T-8 fixtures	

Type of Old Fixture	Wattage of Old Fixture	Type of New Fixture	Incentive Per Fixture Removed
HID, T-12, Incandescent	≥ 1000 Watts	T-5, T-8	$284
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New Construction & Complete Renovation	**Performance based only**
LED Exit Signs (new fixtures only):	
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Retrofit of HID	**$50 per HID (≥100W) fixture retrofitted with induction lamp, power coupler and generator. Replacement unit must use 30% less wattage per fixture than existing HID system**
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Post Installation Approval – After installation is completed, the Customer, or an agent authorized by the Customer, must finalize and submit an invoice for the purchase of the equipment (material cost must be broken out from labor costs), and any other required documentation as specified on the equipment application or in the Market Manager's initial approval letter.

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Energy-Efficient Measures must be installed in buildings located within a New Jersey Utilities' service territory and designated on the Participating Customer's incentive application. Program Incentives are available for qualified Energy-Efficient Measures as listed and described in the Program materials and incentive applications. The Participating Customer must ultimately own the equipment, either through an up-front purchase or at the end of a short-term lease. Design Incentives are available to design professionals as described in the Program materials and applications. A different and separate agreement must be executed by participating design professionals to be eligible for this type of incentive. The design professional does not need to be based in New Jersey.

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Incentive Amount – Program Incentives will equal either: a) the approved Program Incentive amount, or b) the actual equipment cost of the Energy-Efficient Measure, whichever is less, as determined by the Market Manager. Products offered at no direct cost to the customer are ineligible. Incomplete application submissions, applications requiring inspections and unanticipated high volume of activities may cause processing delays. Program Incentives are limited to $500,000 per utility account in a calendar year. Contact the Market Manager regarding any questions.

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Endorsement – The Market Manager and Administrator do not endorse, support or recommend any particular manufacturer, product or system design in promoting this Program.

Warranties – THE MARKET MANAGER AND ADMINISTRATOR DO NOT WARRANT THE PERFORMANCE OF INSTALLED EQUIPMENT, AND/OR SERVICES RENDERED AS PART OF THIS PROGRAM, EITHER EXPRESSLY OR IMPLICITLY. NO WARRANTIES OR REPRESENTATIONS OF ANY KIND, WHETHER STATUTORY, EXPRESSED, OR IMPLIED, INCLUDING, WITHOUT LIMITATIONS, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING EQUIPMENT OR SERVICES PROVIDED BY A MANUFACTURER OR VENDOR. CONTACT YOUR VENDOR/SERVICES PROVIDER FOR DETAILS REGARDING PERFORMANCE AND WARRANTIES.

Limitation of Liability – By virtue of participating in this Program, Participating Customers agree to waive any and all claims or damages against the Market Manager or the Administrator, except the receipt of the Program Incentive. Participating Customers agree that the Market Manager's and Administrator's liability, in connection with this Program, is limited to paying the Program Incentive specified. Under no circumstances shall the Market Manager, its representatives, or subcontractors, or the Administrator, be liable for any lost profits, special, punitive, consequential or incidental damages or for any other damages or claims connected with or resulting from participation in this Program. Further, any liability attributed to the Market Manager under this Program shall be individual, and not joint and/or several.

Assignment – The Participating Customer may assign Program Incentive payments to a specified vendor.

Participating Customer's Certification – Participating Customer certifies that he/she purchased and installed the equipment listed in their application at their defined New Jersey location. Participating Customer agrees that all information is true and that he/she has conformed to all of the Program and equipment requirements listed in the application.

Termination – The New Jersey Board of Public Utilities reserves the right to extend, modify (this includes modification of Program Incentive levels) or terminate this Program without prior or further notice.

Acknowledgement – I have read, understood and am in compliance with all rules and regulations concerning this incentive program. I certify that all information provided is correct to the best of my knowledge, and I give the Market Manager permission to share my records with the New Jersey Board of Public Utilities, and contractors it selects to manage, coordinate or evaluate the NJ SmartStart Buildings Program. Additionally, I allow reasonable access to my property to inspect the installation and performance of the technologies and installations that are eligible for incentives under the guidelines of New Jersey's Clean Energy Program.

New Jersey's Clean Energy PROGRAM™
Your Power to Save
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New Jersey SmartStart BUILDINGS®

BPU

2010 Lighting Controls Application

Customer Information

Company	Electric Utility Serving Applicant	Electric Account No.	Installation Date

Facility Address	City	State	Zip

Type of Project ❑ New Construction ❑ Renovation ❑ Equipment Replacement	Size of Building

Company Mailing Address	City	State	Zip

Contact Person (Name/Title)	Telephone No. ( )	Fax No. ( )

Incorporated? ❑ Yes ❑ No ❑ Exempt	Federal Tax ID# or SSN	Email Address

Incentive Payment to ❑ Customer ❑ Contractor ❑ Other	Please assign payment to contractor/vendor/other indicated below Customer Signature

Payee Information (must submit W-9 form with application)

Company	Contact Name	Incorporated? Yes No	Federal Tax ID#	Email Address

Street Address	City	State	Zip	Telephone No. ( )	Fax No. ( )

Contractor/Vendor Information (if different from Payee)

Company	Contact Name	Incorporated? ❑ Yes ❑ No	Federal Tax ID#	Email Address

Street Address	City	State	Zip	Telephone No. ( )	Fax No. ( )

Building Type (circle one)

Education-Primary School; Education-Community College; Education-University; Grocery; Medical-Hospital; Medical-Clinic; Lodging Hotel(Guest Rooms); Lodging Motel; Manufacturing-Light Industrial; Office-Large; Office-Small; Restaurant-Sit Down; Restaurant-Fast Food; Retail-3 Story Large; Retail- Single Story Large; Retail-Small; Storage Conditioned; Storage Unconditioned; Warehouse; Other

Lighting Control Incentive

$_____ Total Incentive (per attached worksheet calculations)

Note: Lighting Controls Incentive Worksheet must accompany this application.

Specific Program Requirements* (These requirements are in addition to the Program Terms and Conditions.)

1. Please refer to the Program Guide for additional applicable technical requirements, including special requirements for lighting controls.
2. Include the manufacturer's specification sheet with the application package and mail or fax directly to the Commercial/Industrial Market Manager.
3. All lighting controls eligible for incentives must be UL listed.
4. Lighting control incentives are only available for control of eligible energy efficient lighting fixtures.
5. If more than one eligible lighting control device is associated with the same eligible fixture, the incentive paid will be for the lighting control device that yields the largest incentive only.
6. Occupancy Sensor Controls (existing facilities only):
   - There is no incentive available for occupancy sensors installed in a space where they are prohibited by state or local building or safety code. Additionally, no incentive is eligible for occupancy sensors in the following specific spaces in all cases: stairways, restrooms (remote mounted only allowed), elevators, corridors/hallways, lobbies, and closets/storage areas.
   - Incentives will only be paid for eligible occupancy sensors (OSW & OSR) controlling at least 2 eligible lighting fixtures and, for OSR installations, a minimum total connected load of 180 watts.
   - Incentives will only be paid for eligible OSRH occupancy sensors controlling eligible fixtures when the controlled wattage is greater than 180 watts.
   - Occupancy sensors with manual override to the "ON" position are ineligible for incentive.
7. High-Low Controls (OHLF and OHLH):
   - Incentives will not be paid for high-low controls on eligible fluorescent fixtures where daylight dimming controls can be effectively employed.
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   - OHLF will control fixtures that have a ballast factor less than 1.0 for T-5s and 1.14 for T-8s.
   - OHLH will control fixtures that have a ballast factor greater than or equal to 1.0 for T-5s and 1.14 for T-8s.
8. Daylight Dimming Controls for eligible fixtures:
   - Incentives will only be paid for eligible daylight dimming controls operating at least 4 eligible ballasts with a minimum total connected load of 240 watts.
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   - DLD will control fixtures that have a ballast factor less than 1.0 for T-5s and 1.14 for T-8s.
   - DDH will control fixtures that have a ballast factor greater than or equal to 1.0 for T-5s and 1.14 for T-8s.

Application Checklist (Before submitting your application, please make sure you have signed in the space below and completed the following items.)

- ❑ Payee Information is filled out and a W-9 form of the payee is included
- ❑ Manufacturer's specification sheets for proposed technology are included
- ❑ A copy (all pages) of a recent month's utility bill is included

ACKNOWLEDGEMENT

_____

CUSTOMER'S SIGNATURE

By signing, I certify that I have read, understand and agree to the Specific Program Requirements/Terms and Conditions listed on this application form, I will also submit for approval a properly completed application package, which includes this signed application, worksheet (if applicable), manufacturer's specification sheets and complete utility bill (name and address on utility bill must match name and address on application).

Lighting Control Prescriptive Incentives*

Control Device Type	Incentive per Unit
OSW – Occupancy Sensor Wall Mounted (Existing facilities only)	$20 per control
OSR – Occupancy Sensor Remote Mounted (Existing facilities only)	$35 per control
DLD – Fluorescent Daylight Dimming	$25 per fixture controlled
DLD – Fluorescent Daylight Dimming (Office Applications)	$50 per fixture controlled
OHLF – Occupancy Controlled High-Low with Step Ballast	$25 per fixture controlled
OSRH – Occupancy Sensor Remote Mounted	$35 per control
OHLH – Occupancy Controlled High-Low with Step Ballast	$75 per fixture controlled
DDH – Daylight Dimming	$75 per fixture controlled

Mail or fax your application package DIRECTLY to the Commercial/Industrial Market Manager.

New Jersey's Clean Energy Program
c/o TRC Energy Services
900 Route 9 North, Suite 104 • Woodbridge, NJ 07095
Phone: 866-657-6278 • Fax: 732-855-0422

Visit our web site: www.NJCleanEnergy.com

*Incentives/Requirements subject to change.

NJ SmartStart Buildings®

Program Terms and Conditions

Definitions:

Design Incentives – Incentives that may be offered to design professionals by the Program.

Design Services – Services that may be offered to design professionals under the Program.

Energy-Efficient Measures – Any device eligible to receive a Program Incentive payment through the NJ Clean Energy Commercial and Industrial Program (New Jersey SmartStart Buildings).

New Jersey Utilities – The regulated electric and/or gas utilities in the State of New Jersey. They are: Atlantic City Electric, Jersey Central Power & Light, Rockland Electric Company, New Jersey Natural Gas, Elizabethtown Gas, PSE&G, and South Jersey Gas.

Administrator – New Jersey Board of Public Utilities, Office of Clean Energy

Participating Customers – Those non-residential electric and/or gas service customers of the New Jersey Utilities who participate in this Program.

Product Installation or Equipment Installation – Installation of the Energy-Efficient Measures.

Market Manager – TRC Energy Services.

Program – The Commercial and Industrial Energy-Efficient Construction Program (New Jersey SmartStart Buildings) offered herein by the New Jersey Board of Public Utilities, Office of Clean Energy pursuant to state regulatory approval under the New Jersey Electric Discount and Energy Competition Act, NJSA 48:3-49, et seq.

Program Incentives – Refers to the amount or level of incentive that the Program provides to Participating Customers pursuant to the Program offered herein (see description under "Incentive Amount" heading).

Program Offer – Program Incentives are available to non-residential retail electric and/or gas service customers of the New Jersey Utilities identified above. Program Incentives for new construction are available only for projects in areas designated for growth in the State Plan. Public school (K-12) new construction projects are exempted from this restriction and are eligible for new Program incentives throughout the State. Customers, or their trade allies, can determine if a location is in a designated growth area by referring to the Smart Growth Locator available from the HMFA website or contact the Market Manager if you are uncertain about project eligibility.

Application and Eligibility Process – The Program pays incentives after the installation of qualified energy efficient measures that were pre-approved (for exceptions to this condition, please refer to "Exceptions for Approval".) In order to be eligible for Program Incentives, a Customer, or an agent (contractor/vendor) authorized by a Customer, must submit a properly completed application package. The package must include an application signed by the customer; a complete (current) utility bill; and technology worksheet and manufacturer's cut sheets (where appropriate). This information must be submitted to the Market Manager before equipment is installed. Applications for measures that are self installed by customers must be submitted by the customer and not the sales vendor of the measure, however, the customer may elect to assign payment of the incentive to the sales vendor. This application package must be received by the Market Manager on or before December 31, 2010 in order to be eligible for 2010 incentives. The Market Manager will review the application package to determine if the project is eligible for a Program Incentive. If eligible, the Customer will receive an approval letter with the estimated authorized incentive amount and the date by which the equipment must be installed in order for the approval to remain in effect. Upon receipt of an approval letter, the Customer may then proceed to install the equipment listed on the approved application. Equipment installed prior to the date of the Market Manager's approval letter is not eligible for an incentive. The Market Manager reserves the right to conduct a pre-inspection of the facility prior to the installation of equipment. This will be done prior to the issuance of the approval letter. All equipment must be purchased within 12 months of date of application. **Any Customer and/or agent who purchases equipment prior to the receipt of an incentive approval letter does so at his/her own risk.**

Exceptions for Approval – The Application and Eligibility Process pertains to all projects except for those involving either Unitary HVAC or Motors having an incentive amount less than $5,000. These measures, at this incentive level, may be installed without prior approval. In addition, but at the sole discretion of the Market Manager, emergency replacement of equipment may not require a prior approval determination and letter. **In such cases, please notify the Market Manager of such emergencies as early as possible, that an application will soon be sent in that was not pre-approved.**

Post Installation Approval – After installation is completed, the Customer, or an agent authorized by the Customer, must finalize and submit an invoice for the purchase of the equipment (material cost must be broken out from labor costs), and any other required documentation as specified on the equipment application or in the Market Manager's initial approval letter.

Please refer to the Program Guide on the NJCleanEnergy.com/ssb website for the complete Application and Eligibility Process.

The Market Manager reserves the right to verify sales transactions and to have reasonable access to Participating Customer's facility to inspect both pre-existing product or equipment (if applicable) and the Energy-Efficient Measures installed under this Program, either prior to issuing incentives or at a later time.

Energy-Efficient Measures must be installed in buildings located within a New Jersey Utilities' service territory and designated on the Participating Customer's incentive application. Program Incentives are available for qualified Energy-Efficient Measures as listed and described in the Program materials and incentive applications. The Participating Customer must ultimately own the equipment, either through an up-front purchase or at the end of a short-term lease. Design Incentives are available to design professionals as described in the Program materials and applications. A different and separate agreement must be executed by participating design professionals to be eligible for this type of incentive. The design professional does not need to be based in New Jersey.

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Limitation of Liability – By virtue of participating in this Program, Participating Customers agree to waive any and all claims or damages against the Market Manager or the Administrator, except the receipt of the Program Incentive. Participating Customers agree that the Market Manager's and Administrator's liability, in connection with this Program, is limited to paying the Program Incentive specified. Under no circumstances shall the Market Manager, its representatives, or subcontractors, or the Administrator, be liable for any lost profits, special, punitive, consequential or incidental damages or for any other damages or claims connected with or resulting from participation in this Program. Further, any liability attributed to the Market Manager under this Program shall be individual, and not joint and/or several.

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New Jersey's Clean Energy PROGRAM™ — Your Power to Save — njcleanenergy.com

New Jersey SmartStart BUILDINGS®

New Jersey BPU Board of Public Utilities

2010 Lighting Controls Incentive Worksheet

Customer Information

Company	Facility Address
☐ Check here if multiple worksheets are being submitted for one project/building.	Date Submitted

Lighting Controls Information

For additional fixtures, attach additional sheets and check here ☐

Location	Reason N–New R–Replaced	Control Device Type	Fixture Type Controlled	Watts Controlled per Device	A # of Fixtures Controlled per Device	B # of Units*	C Incentive per Unit	Total Incentive (B x C)
Office 101	(Examples) N	OSW	4-lamp, T8	220	2	4	$20	4 x $20 = $80
Conference Room A	N	OSR	2-lamp, T8	330	6	2	$35	2 x $35 = $70
Large Office 400	N	DLD	2-lamp, T8	275	N/A	6	$50	6 x $50 = $300
Warehouse A	N	OHLF	4-lamp, T8	140	N/A	12	$25	12 x $25 = $300
Warehouse B	N	OSRH	4-lamp, T5	234	1	5	$35	5 x $35 = $175

*For OSW and OSR, insert number of control devices; for DLD and OHLF, insert total number of ballasts controlled; for OHLH and DDH, insert total number of fixtures controlled.

Total (including additional sheets) ______

Specific Program Requirements* (These requirements are in addition to the Program Terms and Conditions.)

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2. Include the manufacturer's specification sheet with the application package and mail or fax directly to the Commercial/Industrial Market Manager.
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8. Daylight Dimming Controls for Eligible Fixtures:
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   - Incentives will be paid only for eligible daylight dimming control systems designed in accordance with IESNA practice as delineated in "RP-5-99, IESNA Recommended Practice of Daylighting."
   - DLD will control fixtures that have a ballast factor less than 1.0 for T-5s and 1.14 for T-8s.
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Assignment – The Participating Customer may assign Program Incentive payments to a specified vendor.

Participating Customer's Certification – Participating Customer certifies that he/she purchased and installed the equipment listed in their application at their defined New Jersey location. Participating Customer agrees that all information is true and that he/she has conformed to all of the Program and equipment requirements listed in the application.

Termination – The New Jersey Board of Public Utilities reserves the right to extend, modify (this includes modification of Program Incentive levels) or terminate this Program without prior or further notice.

Acknowledgement – I have read, understood and am in compliance with all rules and regulations concerning this incentive program. I certify that all information provided is correct to the best of my knowledge, and I give the Market Manager permission to share my records with the New Jersey Board of Public Utilities, and contractors it selects to manage, coordinate or evaluate the NJ SmartStart Buildings Program. Additionally, I allow reasonable access to my property to inspect the installation and performance of the technologies and installations that are eligible for incentives under the guidelines of New Jersey's Clean Energy Program.

New Jersey Clean Energy Program

Technical Worksheet – Solar Electric Equipment Information

Please carefully read all of the following information. With the help of your Installation Contractor, fully complete Sections A through D, as applicable, of the attached Technical Worksheet for Solar Electric Equipment, as well as the New Jersey Clean Energy Program Rebate Application Form.

GENERAL TERMS AND CONDITIONS

Rebates will be processed based on the date the New Jersey Clean Energy Program (NJCEP) approves the Final Application Form, not on the purchase date of the equipment. Program procedures and rebates are subject to change or cancellation without notice.

To qualify for a rebate, Applicant must comply with all Program Eligibility Requirements, Terms and Conditions, and Installation Requirements, and submit a completed Pre-Installation Application Form. For more information about the New Jersey Clean Energy Program, or for assistance in completing applications or forms, please see www.njcleanenergy.com or call 866-NJSMART

INSTALLATION REQUIREMENTS

Equipment installation must meet the following minimum requirements in order to qualify for payment under the provisions of the New Jersey Clean Energy Program; proposed changes to the requirements will be considered, but they must be documented by the Applicant or Installation Contractor and approved by the NJCEP. These requirements are not all-encompassing and are intended only to address certain minimum safety and efficiency standards.

A: Code Requirements

1. The installation must comply with the provisions of the National Electrical Code and all other applicable local, state and federal codes or practices.
2. All required permits must be properly obtained and posted.
3. The NJCEP Inspection must be performed before the local Building Code Enforcement Office. If not, this may delay the processing of the rebate
4. All required inspections must be performed (i.e., Electrical/NEC, Local Building Codes Enforcement Office, etc.). Note: In order to ensure compliance with provisions of the NEC, an inspection by a state-licensed electrical inspector is mandatory.

B: Solar Electric Module Array

1. Modules must be UL Listed and must be properly installed according to manufacturer's instructions.
2. The maximum amount of sunlight available year-round on a daily basis should not be obstructed. All applications must include documentation of the impact from any obstruction on the annual performance of the solar electric array. This analysis can be performed by using the New Jersey Clean Power Estimator on the program website www.njcep.com.
3. In order to qualify for program incentives, the solar electric system must adhere to a minimum design threshold, relative to the estimated system production using PVWATTS:
    - Solar electric array orientations require that the calculated system output must be at least 80% of the default output calculated by PVWatts. Additionally, all individual series strings of modules output must be at least 70% of the default output calculated by PVWatts.
    - For building integrated solar electric systems (i.e., part of the building envelope materials are comprised of solar electric components), the estimated system output must be 40% of the default output estimated by PVWATTS.
4. System wiring must be installed in accordance with the provisions of the NEC.
5. All modules installed in a series string must be installed in the same plane.

C: Inverter and Controls

1. The inverter and controls must be properly installed according to manufacturer's instructions.
2. The inverter must be certified as compliant with the requirements of IEEE 929 for small photovoltaic systems and with UL 1741.
3. The system should be equipped with the following visual indicators and/or controls:
    - On/off switch • Operating mode setting indicator • AC/DC over current protection • Operating status indicator
4. Warning labels must be posted on the control panels and junction boxes indicating that the circuits are energized by an alternate power source independent of utility-provided power.
5. Operating instructions must be posted on or near the system, or on file with facilities operation and maintenance documents.
6. Systems must have monitoring capability that is readily accessible to the owner. This monitor (meter or display) must at minimum display instantaneous and cumulative production. All projects greater than 10kW must have an output meter that meets ANSI C.12 standards

D: Control Panel to Solar Electric Array Wire Runs

1. Areas where wiring passes through ceilings, walls or other areas of the building must be properly restored, booted and sealed.
2. All interconnecting wires must be copper. (Some provisions may be made for aluminum wiring; approval must be received from utility engineering departments prior to acceptance.)
3. Thermal insulation in areas where wiring is installed must be replaced to "as found or better condition." Access doors to these areas must be properly sealed and gasketed.
4. Wiring connections must be properly made, insulated and weather-protected.
5. All wiring must be attached to the system components by the use of strain relief's or cable clamps, unless enclosed in conduit.
6. All outside wiring must be rated for wet conditions and/or encased in liquid-tight conduit.
7. Insulation on any wiring located in areas with potential high ambient temperature must be rated at 90° C or higher.
8. All wiring splices must be contained in UL-approved workboxes.

E: Batteries (If Applicable)

1. The batteries must be installed according to the manufacturer's instructions.
2. Battery terminals must be adequately protected from accidental contact.
3. DC-rated over current protection must be provided in accordance with the provisions of the NEC.

New Jersey Clean Energy Program

Technical Worksheet – Solar Electric Equipment Information

Original Application Date: _____ Revised Application Date: _____

Customer Name: _____ Application Number: _____

(Corresponding to Rebate Application Form) (Assigned by the NJBPU)

A: EQUIPMENT INFORMATION

1. Solar Electric Module Manufacturer: _____ Module Model Number: _____
2. Power Rating per Module: _____ DC Watts (Refer to STC conditions) Number of Modules: _____
3. Total Array Output: _____ DC Watts (No. of Modules x Power Rating)
4. Inverter Manufacturer: _____ Inverter Model Number: _____
5. Inverter's Continuous AC Rating: _____ AC Watts Number of Inverters: _____
6. Total Inverter Output: _____ AC Watts (Inverter Continuous AC Rating x Number of Inverters)
7. Inverter's Peak Efficiency: _____ (Refer to manufacturer's peak efficiency rating)

B: PROPOSED INSTALLATION/INTERCONNECTION INFORMATION

1. Solar Electric Array Location: _ Rooftop _ Pole Mount or Ground Mount Location:
2. Solar Electric Module Orientation: _____ degrees (e.g., 180 degrees magnetic south)

   Note: in Central New Jersey, magnetic south compass reading is 10 degrees east of true south.
3. Solar Electric Module Tilt: _____ degrees (e.g., flat mount = 0 degrees; vertical mount = 90 degrees)
4. Solar Electric Module Tracking: _Fixed _Single-axis _Double-axis
5. Inverter Location: _ Indoor _ Outdoor Location: _____
6. Utility-Accessible AC Disconnect Switch Location: _____
7. System Type and Mode of Operation:
   - _ Utility interactive (parallel/capable of back feeding the meter) (_ with battery backup)
   - _ Dedicated circuit, utility power as backup (transfer switch) (_ with battery charging)
   - _ Stand-alone (system confined to an independent circuit, no utility backup) (_ with battery charging)

C: INCENTIVE REQUEST CALCULATION

1. System rated output (Section A, line 3 above): _____ DC Watts
2. Incentive Calculation (Calculate appropriate incentive based on System Rated Output):

Residential Applicants that perform Energy Efficiency Audit

a. 0 to 10,000 Watts x $1.75/Watt = $_____+

Residential Applicants that <u>do not</u> perform Energy Efficiency Audit

b. 0 to 10,000 Watts x $1.55/Watt = $_____+

Commercial, Farm, Public and Non-Profit

0 to 50,000 Watts x $1.00/Watt = $_____+

<u>Large PV Project Applications</u>

> 50,000 Watts = $____Not eligible for rebates_____

d. Total Rebate Calculation: $_____

Total Rebate Calculation: $_____

3. School Applicants: Maximum Annual School Rebate: $_____
   (For Public School applicants, enter the lesser value from no. 6 on the School Application form or $50,000)
4. Total Installed System Cost: $_____
   (Eligible installed system cost includes all equipment, installation, and applicable interconnection costs before the New Jersey Clean Energy Program incentive.)
5. **Requested Incentive** (Enter the appropriate value from C2. b or c): $_____

D: WARRANTY INFORMATION

1. Module: _____ Years at _____ Percent of Rated Power Output 2. Inverter: _____ Years 3. Installation: _____ Years

Revised January 2009

APPENDIX H

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COSTS

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Hanover School District
Estimate by: PS
Checked by: JM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Memorial Junior School** Interior Lighting Upgrades	1	ls.		$ 30,725.50	1	ls.	$ 41,943.00	$ 41,943.00	$ 72,668.50
	Subtotal				30,725.50				41,943.00	

SUBTOTAL =	$	72,668.50
MARKUP % =	$	0.15
MARKUP =	$	10,900.28
SUB-TOTAL w/ OH & P =	$	83,568.78
CONTINGENCY % =		0.25
CONTINGENCY =	$	20,892.19
BUDGET COST ESTIMATE =	$	104,460.97

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
2	**Memorial Junior School** Exterior Lighting Upgrades	1	ls.		$ 68,538.00	1	ls.	$ 9,380.00	$ 9,380.00	$ 77,918.00
	Subtotal				68,538.00				9,380.00	

SUBTOTAL =	$	77,918.00
MARKUP % =	$	0.15
MARKUP =	$	11,687.70
SUB-TOTAL w/ OH & P =	$	89,605.70
CONTINGENCY % =		0.25
CONTINGENCY =	$	22,401.43
BUDGET COST ESTIMATE =	$	112,007.13

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
3	**Memorial Junior School** Total Lighting Upgrades	1	ls.		$ 99,263.50	1	ls.	$ 51,323.00	$ 51,323.00	$ 150,586.50
	Subtotal				99,263.50				51,323.00	

SUBTOTAL =	$	150,586.50
MARKUP % =	$	0.15
MARKUP =	$	22,587.98
SUB-TOTAL w/ OH & P =	$	173,174.48
CONTINGENCY % =		0.25
CONTINGENCY =	$	43,293.62
BUDGET COST ESTIMATE =	$	216,468.09

CDM

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Hanover School District
Estimate by: PS
Checked by: JM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Bee Meadow Elementary School** Interior Lighting Upgrades	1	ls.		$ 41,660.00	1	ls.	$ 22,518.50	$ 22,518.50	$ 64,178.50
	Subtotal				41,660.00				22,518.50	

SUBTOTAL =	$	64,178.50
MARKUP % =	$	0.15
MARKUP =	$	9,626.78
SUB-TOTAL w/ OH & P =	$	73,805.28
CONTINGENCY % =		0.25
CONTINGENCY =	$	18,451.32
BUDGET COST ESTIMATE =	$	92,256.59

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
2	**Bee Meadow Elementary School** Exterior Lighting Upgrades	1	ls.		$ 46,800.00	1	ls.	$ 9,519.00	$ 9,519.00	$ 56,319.00
	Subtotal				46,800.00				9,519.00	

SUBTOTAL =	$	56,319.00
MARKUP % =	$	0.15
MARKUP =	$	8,447.85
SUB-TOTAL w/ OH & P =	$	64,766.85
CONTINGENCY % =		0.25
CONTINGENCY =	$	16,191.71
BUDGET COST ESTIMATE =	$	80,958.56

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
3	**Bee Meadow Elementary School** Total Lighting Upgrades	1	ls.		$ 88,460.00	1	ls.	$ 32,037.50	$ 32,037.50	$ 120,497.50
	Subtotal				88,460.00				32,037.50	

SUBTOTAL =	$	120,497.50
MARKUP % =	$	0.15
MARKUP =	$	18,074.63
SUB-TOTAL w/ OH & P =	$	138,572.13
CONTINGENCY % =		0.25
CONTINGENCY =	$	34,643.03
BUDGET COST ESTIMATE =	$	173,215.16

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Hanover School District
Estimate by: PS
Checked by: JM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Salem Drive Elementary School** Interior Lighting Upgrades	1	ls.		$ 10,835.50	1	ls.	$ 21,471.50	$ 21,471.50	$ 32,307.00
	Subtotal				10,835.50				21,471.50	

SUBTOTAL =	$	32,307.00
MARKUP % =	$	0.15
MARKUP =	$	4,846.05
SUB-TOTAL w/ OH & P =	$	37,153.05
CONTINGENCY % =		0.25
CONTINGENCY =	$	9,288.26
BUDGET COST ESTIMATE =	$	46,441.31

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
2	**Salem Drive Elementary School** Exterior Lighting Upgrades	1	ls.		$ 20,800.00	1	ls.	$ 3,484.00	$ 3,484.00	$ 24,284.00
	Subtotal				20,800.00				3,484.00	

SUBTOTAL =	$	24,284.00
MARKUP % =	$	0.15
MARKUP =	$	3,642.60
SUB-TOTAL w/ OH & P =	$	27,926.60
CONTINGENCY % =		0.25
CONTINGENCY =	$	6,981.65
BUDGET COST ESTIMATE =	$	34,908.25

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
3	**Salem Drive Elementary School** Total Lighting Upgrades	1	ls.		$ 31,635.50	1	ls.	$ 24,955.50	$ 24,955.50	$ 56,591.00
	Subtotal				31,635.50				24,955.50	

SUBTOTAL =	$	56,591.00
MARKUP % =	$	0.15
MARKUP =	$	8,488.65
SUB-TOTAL w/ OH & P =	$	65,079.65
CONTINGENCY % =		0.25
CONTINGENCY =	$	16,269.91
BUDGET COST ESTIMATE =	$	81,349.56

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Hanover School District
Estimate by: PS
Checked by: JM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Mountview Road Elementary School** Interior Lighting Upgrades	1	ls.		$ 11,336.50	1	ls.	$ 15,571.00	$ 15,571.00	$ 26,907.50
	Subtotal				11,336.50				15,571.00	

SUBTOTAL =	$	26,907.50
MARKUP % =	$	0.15
MARKUP =	$	4,036.13
SUB-TOTAL w/ OH & P =	$	30,943.63
CONTINGENCY % =		0.25
CONTINGENCY =	$	7,735.91
BUDGET COST ESTIMATE =	$	38,679.53

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
2	**Mountview Road Elementary School** Exterior Lighting Upgrades	1	ls.		$ 31,200.00	1	ls.	$ 5,226.00	$ 5,226.00	$ 36,426.00
	Subtotal				31,200.00				5,226.00	

SUBTOTAL =	$	36,426.00
MARKUP % =	$	0.15
MARKUP =	$	5,463.90
SUB-TOTAL w/ OH & P =	$	41,889.90
CONTINGENCY % =		0.25
CONTINGENCY =	$	10,472.48
BUDGET COST ESTIMATE =	$	52,362.38

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
3	**Mountview Road Elementary School** Total Lighting Upgrades	1	ls.		$ 42,536.50	1	ls.	$ 20,797.00	$ 20,797.00	$ 63,333.50
	Subtotal				42,536.50				20,797.00	

SUBTOTAL =	$	63,333.50
MARKUP % =	$	0.15
MARKUP =	$	9,500.03
SUB-TOTAL w/ OH & P =	$	72,833.53
CONTINGENCY % =		0.25
CONTINGENCY =	$	18,208.38
BUDGET COST ESTIMATE =	$	91,041.91

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Hanover Township School District
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Memorial Junior School									
1	Solar PV System	1	ls.		$ 4,291,000.00	1	ls.	$ 1,839,000.00	###########	$ 6,130,000.00
	Subtotal				4,291,000.00				1,839,000.00	

SUBTOTAL =	$ 6,130,000.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 1,532,500.00
BUDGET COST ESTIMATE =	$ 7,662,500.00

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Bee Meadow Elementary School									
1	Solar PV System	1	ls.		$ 2,842,000.00	1	ls.	$ 1,218,000.00	###########	$ 4,060,000.00
	Subtotal				2,842,000.00				1,218,000.00	

SUBTOTAL =	$ 4,060,000.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 1,015,000.00
BUDGET COST ESTIMATE =	$ 5,075,000.00

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Salem Drive Elementary School									
1	Solar PV System	1	ls.		$ 1,330,000.00	1	ls.	$ 570,000.00	$ 570,000.00	$ 1,900,000.00
	Subtotal				1,330,000.00				570,000.00	

SUBTOTAL =	$ 1,900,000.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 475,000.00
BUDGET COST ESTIMATE =	$ 2,375,000.00

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Mountview Road Elementary School									
1	Solar PV System	1	ls.		$ 1,204,000.00	1	ls.	$ 516,000.00	$ 516,000.00	$ 1,720,000.00
	Subtotal				1,204,000.00				516,000.00	

SUBTOTAL =	$ 1,720,000.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 430,000.00
BUDGET COST ESTIMATE =	$ 2,150,000.00

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Hanover Township School District
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Hanover Township School District** 10KW Wind Turbine	1	ls.		$ 43,645.00	1	ls.	$ 4,000.00	$ 4,000.00	$ 47,645.00
	Subtotal				43,645.00				4,000.00	

SUBTOTAL =	$	47,645.00
MARKUP % =	$	0.15
MARKUP =	$	7,146.75
SUB-TOTAL w/ OH & P =	$	54,791.75
CONTINGENCY % =		0.25
CONTINGENCY =	$	13,697.94
BUDGET COST ESTIMATE =	$	68,489.69

CDM

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

15 British American Blvd
Latham, NY 12110
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Fax (518) 786-3810

Location: Township of Hanover
Estimate by: RKA
Checked by: MG

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Memorial Junior School** Boiler, Gas-Fired, Condensing High Efficiency 2,000 MBH*	4	ea.	$ 34,000.00	$ 136,000.00	4	ea.	$ 5,750.00	$ 23,000.00	$ 159,000.00
	Subtotal				136,000.00				23,000.00	

*Pricing per boiler manufacturer quote, dated 5/19/09

SUBTOTAL =	$	159,000.00
MARKUP % =	$	0.15
MARKUP =	$	23,850.00
SUB-TOTAL w/ OH & P =	$	182,850.00
CONTINGENCY % =		0.25
CONTINGENCY =	$	45,712.50
BUDGET COST ESTIMATE =	$	228,562.50

CDM

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Township of Hanover
Estimate by: RKA
Checked by: MG

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Memorial Junior School									
1	Air Source Heat Pump, single package, 12 tor cooling, 50 MBH heat @ 0<F (Main Office)*	1	ea.	$ 10,100.00	$ 10,100.00	1	ea.	$ 4,125.00	$ 4,125.00	$ 14,225.00
2	Air Source Heat Pump, single package, 10 tor cooling, 45 MBH heat @ 0<F (Faculty Room & Guidance/Nurse Area)*	2	ea.	$ 8,775.00	$ 17,550.00	2	ea.	$ 3,700.00	$ 7,400.00	$ 24,950.00
3	Packaged A/C and HP, 22.5 Tons (Informational Materials Center)**	1	ea.	$ 18,600.00	$ 18,600.00	1	ea.	$ 4,200.00	$ 4,200.00	$ 22,800.00
	Subtotal									

*Pricing per RSMeans, 2010
**Pricing per CDM Cost Data matrix for typical HVAC energy saving measures

SUBTOTAL =	$	61,975.00
MARKUP % =	$	0.15
MARKUP =	$	9,296.25
SUB-TOTAL w/ OH & P =	$	71,271.25
CONTINGENCY % =		0.25
CONTINGENCY =	$	17,817.81
BUDGET COST ESTIMATE =	$	89,089.06

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Township of Hanover
Estimate by: RKA
Checked by: MG

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Bee Meadow Elementary School** Boiler, Gas-Fired, Condensing High Efficiency 2,000 MBH*	3	ea.	$ 34,000.00	$ 102,000.00	3	ea.	$ 5,750.00	$ 17,250.00	$ 119,250.00
	Subtotal				102,000.00				17,250.00	

*Pricing per boiler manufacturer quote, dated 5/19/09

SUBTOTAL =	$	119,250.00
MARKUP % =	$	0.15
MARKUP =	$	17,887.50
SUB-TOTAL w/ OH & P =	$	137,137.50
CONTINGENCY % =		0.25
CONTINGENCY =	$	34,284.38
BUDGET COST ESTIMATE =	$	171,421.88

CDM

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Township of Hanover
Estimate by: RKA
Checked by: MG

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Salem Drive Elementary School** Boiler, Gas-Fired, Condensing High Efficiency 2,000 MBH*	2	ea.	$ 34,000.00	$ 68,000.00	2	ea.	$ 5,750.00	$ 11,500.00	$ 79,500.00
	Subtotal				68,000.00				11,500.00	

*Pricing per boiler manufacturer quote, dated 5/19/09

SUBTOTAL =	$	79,500.00
MARKUP % =	$	0.15
MARKUP =	$	11,925.00
SUB-TOTAL w/ OH & P =	$	91,425.00
CONTINGENCY % =		0.25
CONTINGENCY =	$	22,856.25
BUDGET COST ESTIMATE =	$	114,281.25

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Township of Hanover
Estimate by: RKA
Checked by: MG

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Mountview Road School** Boiler, Gas-Fired, Condensing High Efficiency 2,000 MBH*	2	ea.	$ 34,000.00	$ 68,000.00	2	ea.	$ 5,750.00	$ 11,500.00	$ 79,500.00
	Subtotal				68,000.00				11,500.00	

*Pricing per boiler manufacturer quote, dated 5/19/09

SUBTOTAL =	$	79,500.00
MARKUP % =	$	0.15
MARKUP =	$	11,925.00
SUB-TOTAL w/ OH & P =	$	91,425.00
CONTINGENCY % =		0.25
CONTINGENCY =	$	22,856.25
BUDGET COST ESTIMATE =	$	114,281.25

CDM

15 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Township of Hanover
Estimate by: RKA
Checked by: MG

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Memorial Junior School									
1	Variable Frequency Drive, Enclosed (NEMA 1), 460 Volt, 2 HP motor	2	ea.	$ 950.00	$ 1,900.00	2	ea.	$ 665.00	$ 1,330.00	$ 3,230.00
2	Variable Frequency Drive, Enclosed (NEMA 1), 460 Volt, 7.5 HP motor	2	ea.	$ 1,300.00	$ 2,600.00	2	ea.	$ 795.00	$ 1,590.00	$ 4,190.00
3	Variable Frequency Drive, Enclosed (NEMA 1), 460 Volt, 5 HP motor	2	ea.	$ 1,100.00	$ 2,200.00	2	ea.	$ 665.00	$ 1,330.00	$ 3,530.00
4	Variable Frequency Drive, Enclosed (NEMA 1), 460 Volt, 3 HP motor	2	ea.	$ 950.00	$ 1,900.00	2	ea.	$ 665.00	$ 1,330.00	$ 3,230.00
5	2 Way Zone Valve, Bronze Body, High Head, 125' Pump Head, 1/2" Soldered**	80	ea.	$ 152.00	$ 12,160.00	80	ea.	$ 22.00	$ 1,760.00	$ 13,920.00
	Subtotal				20,760.00				7,340.00	

Pricing per RS Means Costworks 2010

**Assumes one valve per unit ventilator, two unit ventilators per classroom, with 25% contingency

SUBTOTAL =	$	28,100.00
MARKUP % =	$	0.15
MARKUP =	$	4,215.00
SUB-TOTAL w/ OH & P =	$	32,315.00
CONTINGENCY % =		0.25
CONTINGENCY =	$	8,078.75
BUDGET COST ESTIMATE =	$	40,393.75

CDM

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Township of Hanover
Estimate by: RKA
Checked by: MG

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Bee Meadow School									
1	Variable Frequency Drive, Enclosed (NEMA 1), 460 Volt, 2 HP motor	1	ea.	$ 900.00	$ 900.00	2	ea.	$ 665.00	$ 1,330.00	$ 2,230.00
2	Variable Frequency Drive, Enclosed (NEMA 1), 460 Volt, 3 HP motor	2	ea.	$ 900.00	$ 1,800.00	2	ea.	$ 665.00	$ 1,330.00	$ 3,130.00
3	Variable Frequency Drive, Enclosed (NEMA 1), 460 Volt, 7.5HP motor	1	ea.	$ 1,300.00	$ 1,300.00	2	ea.	$ 795.00	$ 1,590.00	$ 2,890.00
4	2 Way Zone Valve, Bronze Body, High Head, 125' Pump Head, 1/2" Soldered**	73	ea.	$ 152.00	$ 11,020.00	73	ea.	$ 22.00	$ 1,595.00	$ 12,615.00
	Subtotal				15,020.00				5,845.00	

Pricing per RS Means Costworks 2010

**Assumes one valve per unit ventilator, two unit ventilators per classroom, with 25% contingency

SUBTOTAL =	$	20,865.00
MARKUP % =	$	0.15
MARKUP =	$	3,129.75
SUB-TOTAL w/ OH & P =	$	23,994.75
CONTINGENCY % =		0.25
CONTINGENCY =	$	5,998.69
BUDGET COST ESTIMATE =	$	29,993.44

CDM

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Township of Hanover
Estimate by: RKA
Checked by: MG

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Salem Drive School									
1	Variable Frequency Drive, Enclosed (NEMA 1), 460 Volt, 10 HP motor	2	ea.	$ 1,550.00	$ 3,100.00	2	ea.	$ 795.00	$ 1,590.00	$ 4,690.00
2	2 Way Zone Valve, Bronze Body, High Head, 125' Pump Head, 1/2" Soldered**	60	ea.	$ 152.00	$ 9,120.00	60	ea.	$ 22.00	$ 1,320.00	$ 10,440.00
	Subtotal				12,220.00				2,910.00	

Pricing per RS Means Costworks 2010

**Assumes one valve per unit ventilator, two unit ventilators per classroom, with 25% contingency

SUBTOTAL =	$	15,130.00
MARKUP % =	$	0.15
MARKUP =	$	2,269.50
SUB-TOTAL w/ OH & P =	$	17,399.50
CONTINGENCY % =		0.25
CONTINGENCY =	$	4,349.88
BUDGET COST ESTIMATE =	$	21,749.38

CDM

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Township of Hanover
Estimate by: RKA
Checked by: MG

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Mountview Road School									
1	Variable Frequency Drive, Enclosed (NEMA 1), 460 Volt, 2 HP motor	2	ea.	$ 950.00	$ 1,900.00	2	ea.	$ 665.00	$ 1,330.00	$ 3,230.00
2	Variable Frequency Drive, Enclosed (NEMA 1), 460 Volt, 3 HP motor	2	ea.	$ 950.00	$ 1,900.00	2	ea.	$ 665.00	$ 1,330.00	$ 3,230.00
3	2 Way Zone Valve, Bronze Body, High Head, 125' Pump Head, 1/2" Soldered**	58	ea.	$ 152.00	$ 8,816.00	58	ea.	$ 22.00	$ 1,276.00	$ 10,092.00
	Subtotal				12,616.00				3,936.00	

Pricing per RS Means Costworks 2010
**Assumes one valve per unit ventilator, two unit ventilators per classroom, with 25% contingency

SUBTOTAL =	$	16,552.00
MARKUP % =	$	0.15
MARKUP =	$	2,482.80
SUB-TOTAL w/ OH & P =	$	19,034.80
CONTINGENCY % =		0.25
CONTINGENCY =	$	4,758.70
BUDGET COST ESTIMATE =	$	23,793.50

APPENDIX I

FACILITY DATA FORMS

New Jersey's Clean Energy Program
njcleanenergy.com

APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name Memorial Junior Middle School			
Street Address 61 Highland Ave		**County**	
City Whippany		**State** NJ	**Zip** 07981
Facility's Description Middle School - Grades 6-8 and Board of Ed. offices.			
Total Sq Ft 113,950	**Year Built** 1953 (2 additions later)	**Hours/Week Occupied** 80-90 hs/wk	**Number of Employees** 500 students 60 teachers.

Building Type (Check only one of the following):

☐	**Emergency Services**	☐	**Garage**
☐	**Center/Meeting Hall/Library**	☐	**Offices**
☐	**Recreation/Entertainment/Parks**	☐	**Religious**
☒	**School**	☐	**School: College**
☐	**Water Treatment/Pumping**	☐	**Other:** _____

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 10/29/2008 to 10/29/2009 gas

12/9/2008 - 12/10/2009 electric

New Jersey's Clean Energy PROGRAM
Your Power to Save
njcleanenergy.com

ELECTRICITY

Electric Utility Name & Account Number(s)	
JCP+L #100005 638844	
Annual kWh Use	**Annual Electricity Cost**
833,600	$ 142,052
Max Summer kW	**Max Winter kW**
263	258

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
PSE+G #66-550-132-08	
Annual Use in Therms	**Annual Natural Gas Cost**
87099.71	$ 25,748

FUEL OIL

Fuel Oil Utility Name & Account Number(s)	
NA	
Annual Use in Gallons	**Annual Fuel Oil Cost**

PROPANE

Propane Utility Name & Account Number(s)	
NA	
Annual Use in Gallons	**Annual Propane Cost**

OTHER

In this section please indicate any other fuel type that the facility uses, such as: solar energy, wind energy, bio-fuel, cogeneration, fuel cells.

Other Fuel Type:	
NA	
Annual Energy Use (indicate units)	**Annual Energy Cost**

STAFF USE ONLY

Date Received: _____ Project No.: _____

New Jersey's Clean Energy PROGRAM
Your Power to Save
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APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name Bee Meadow Elementary School			
Street Address 120 Reynolds Ave		**County**	
City Whippany		**State** NJ	**Zip** 07981
Facility's Description Elementary School, Grades K-5			
Total Sq Ft 65,467	**Year Built** 1974	**Hours/Week Occupied** 80-90	**Number of Employees** ~300 students ~60 teachers

Building Type (Check only one of the following):

☐	**Emergency Services**	☐	**Garage**
☐	**Center/Meeting Hall/Library**	☐	**Offices**
☐	**Recreation/Entertainment/Parks**	☐	**Religious**
☒	**School**	☐	**School: College**
☐	**Water Treatment/Pumping**	☐	**Other:** _____

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 12/1/2008 to 11/30/2009 gas.

12/11/2008 — 12/14/2009 electric

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Your Power to Save
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ELECTRICITY

Electric Utility Name & Account Number(s)	
JCP&L # 100005335300	
Annual kWh Use	**Annual Electricity Cost**
514,000	$ 89,230
Max Summer kW	**Max Winter kW**
196	212

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
PSE&G # 66-575-007-18	
Annual Use in Therms	**Annual Natural Gas Cost**
45,388	$ 13,103

FUEL OIL

Fuel Oil Utility Name & Account Number(s)	
NA	
Annual Use in Gallons	**Annual Fuel Oil Cost**

PROPANE

Propane Utility Name & Account Number(s)	
NA	
Annual Use in Gallons	**Annual Propane Cost**

OTHER

In this section please indicate any other fuel type that the facility uses, such as: solar energy, wind energy, bio-fuel, cogeneration, fuel cells.

Other Fuel Type:	
NA	
Annual Energy Use (indicate units)	**Annual Energy Cost**

STAFF USE ONLY

Date Received: _____ Project No.: _____

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APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name Salem Drive Elementary School			
Street Address 29 Salem Drive		**County**	
City Whippany		**State** NJ	**Zip** 07981
Facility's Description Grades K-5, elementary school			
Total Sq Ft 45,728	**Year Built** 1956	**Hours/Week Occupied** 80-90	**Number of Employees** 314 Students 60 Staff

Building Type (Check only one of the following):

☐	**Emergency Services**	☐	**Garage**
☐	**Center/Meeting Hall/Library**	☐	**Offices**
☐	**Recreation/Entertainment/Parks**	☐	**Religious**
☒	**School**	☐	**School: College**
☐	**Water Treatment/Pumping**	☐	**Other:** _____

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 10/28/2008 to 10/29/2009 gas

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ELECTRICITY

Electric Utility Name & Account Number(s)	
JCP&L # 100005971146	
Annual kWh Use	**Annual Electricity Cost**
250,960	$ 43,469
Max Summer kW	**Max Winter kW**
96	93

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
PSE&G #66-490-703-00	
Annual Use in Therms	**Annual Natural Gas Cost**
32,546	$ 10,511

FUEL OIL

Fuel Oil Utility Name & Account Number(s)	
NA	
Annual Use in Gallons	**Annual Fuel Oil Cost**

PROPANE

Propane Utility Name & Account Number(s)	
NA	
Annual Use in Gallons	**Annual Propane Cost**

OTHER

In this section please indicate any other fuel type that the facility uses, such as: solar energy, wind energy, bio-fuel, cogeneration, fuel cells.

Other Fuel Type:	
NA	
Annual Energy Use (indicate units)	**Annual Energy Cost**

STAFF USE ONLY

Date Received: _____ Project No.: _____

New Jersey's Clean Energy PROGRAM
Take Power To Save
njcleanenergy.com

APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name Mountview Road Elementary School			
Street Address 30 Mountview Road		**County**	
City Maris Plains		**State** NJ	**Zip** 07950
Facility's Description Elementary School, Graded K-5			
Total Sq Ft 47,587	**Year Built** 1958	**Hours/Week Occupied** 80-90	**Number of Employees** ~300 students ~60 teachers

Building Type (Check only one of the following):

☐	**Emergency Services**	☐	**Garage**
☐	**Center/Meeting Hall/Library**	☐	**Offices**
☐	**Recreation/Entertainment/Parks**	☐	**Religious**
☒	**School**	☐	**School: College**
☐	**Water Treatment/Pumping**	☐	**Other:** _____

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 12/1/2008 to 11/30/2009

ELECTRICITY

Electric Utility Name & Account Number(s)	
JCP+L # 100005201561	
Annual kWh Use	**Annual Electricity Cost**
230,080	$ 40,436
Max Summer kW	**Max Winter kW**
97	83

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
PSE+G # 65-588-375-01	
Annual Use in Therms	**Annual Natural Gas Cost**
28,912	$ 9,866

FUEL OIL

Fuel Oil Utility Name & Account Number(s)	
NA	
Annual Use in Gallons	**Annual Fuel Oil Cost**

PROPANE

Propane Utility Name & Account Number(s)	
NA	
Annual Use in Gallons	**Annual Propane Cost**

OTHER

In this section please indicate any other fuel type that the facility uses, such as: solar energy, wind energy, bio-fuel, cogeneration, fuel cells.

Other Fuel Type:	
NA	
Annual Energy Use (indicate units)	**Annual Energy Cost**

STAFF USE ONLY

Date Received: _____	Project No.: _____

APPENDIX J

ECRM FINANCIAL ANALYSES

Lighting Maintenance Cost Savings

T12 to T8 Retrofit	T12 Bulb Cost	T8 Blub Cost	T12 Bulb Average Lifetime (Years)	T8 Bulb Average Lifetime (Years)	Quantity of T12 Replacements vs. T8 Replacements	Cost of T12 Replacement over T8 Life	T8 Bulb Replacements Over Lifetime (15 Yrs)
1 Lamp	$25.0	$23.5	4.6	5.7	1.25	$31.2	3
2 Lamp	$69.9	$67.0	4.6	5.7	1.25	$87.4	3
3 Lamp	$94.9	$90.5	4.6	5.7	1.25	$118.6	3
4 Lamp	$119.8	$114.0	4.6	5.7	1.25	$149.8	3

Incandescent to CFL Retrofit	Incandescent Cost	CFL Cost	Incandescent Average Lifetime (Years)	CFL Average Lifetime (Years)	Quantity of Incandescent Replacements vs. CFL Replacements	Cost of Incandescent Replacement over CFL Life	CFL Replacements Over Lifetime (15 Yrs)
13 Watt	$23.0	$25.0	0.5	2.3	5	$115.0	7
25 Watt	$23.0	$27.0	0.5	2.3	5	$115.0	7
65 Watt	$23.4	$45.0	0.5	2.3	5	$117.0	7

High Pressure Sodium to LED Retrofit	HPS Cost	LED Cost	HPS Average Lifetime (Years)	LED Average Lifetime (years)	Quantity of HPS Replacements vs. LED Replacements	Cost of HPS Replacement over LED Life	LED Replacements Over Lifetime (15 Yrs)
400 Watt	$86.0	$2,671.0	4.6	22.8	5	$430.0	1
150 Watt	$74.0	$2,171.0	4.6	22.8	5	$370.0	1
70 Watt	$25.0	$986.0	4.6	22.8	5	$125.0	1

Metal Halide to Fluorescent	Metal Halide Cost	Fluorescent Cost	Metal Halide Average Lifetime (Years)	Fluorescent Average Lifetime (years)	Quantity of Metal Halide Replacements vs. Fluorescent Replacements	Cost of Metal Halide Replacement over Fluorescent Life	Replacements Over Lifetime (15 Yrs)
6 Lamp	$86.0	$288.0	4.6	5.7	1.25	$107.5	3
4 Lamp	$86.0	$216.0	4.6	5.7	1.25	$107.5	3

Interior Lighting

Building	INC->CFL (13W)	INC->CFL (25W)	T12->T8 (2 Lamp)	MH->FL (6 Lamp)	Total Maintenance Cost Savings	Annual Maintenance Cost Savings
Memorial Junior School	$9,167.3	$0.0	$0.0	$3,390.1	$12,557.5	$837.16
Salem Drive School	$352.6	$1,410.4	$0.0	$678.0	$2,441.0	$162.73
Bee Meadow School	$705.2	$0.0	$91.8	$1,356.0	$2,153.1	$143.54
Mountview Road School	$1,410.4	$352.6	$45.9	$847.5	$2,656.4	$177.09

Exterior Lighting

Building	HPS->LED (70W)	HPS->LED(150W)	HPS->LED(400W)	Total Maintenance Cost Savings	Annual Maintenance Cost Savings
Memorial Junior School	$191.6	$356.5	$94.2	$642.3	$42.82
Salem Drive School	$43.8	$291.7	$0.0	$335.5	$22.37
Bee Meadow School	$32.9	$648.2	$94.2	$775.3	$51.68
Mountview Road School	$136.9	$226.9	$0.0	$363.8	$24.25

ECM	Memorial Junior School - Interior	Bee Meadow Elementary School - Interior	Salem Drive Elementary School - Interior	Mountview Road Elementary School - Interior
Assumed Inflation (Gas)				
Initial Yearly Savings (Gas)				
Assumed Inflation (Electricity)	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$14,156.07	$14,583.34	$6,645.37	$6,788.95
Assumed Average Useful Life (Years)	15	15	15	15
Lifetime Savings	**$263,287.53**	**$271,234.28**	**$123,596.66**	**$126,267.10**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$14,156.07	$14,583.34	$6,645.37	$6,788.95
2	$14,580.75	$15,020.84	$6,844.73	$6,992.62
3	$15,018.17	$15,471.47	$7,050.07	$7,202.40
4	$15,468.72	$15,935.61	$7,261.58	$7,418.47
5	$15,932.78	$16,413.68	$7,479.42	$7,641.02
6	$16,410.76	$16,906.09	$7,703.81	$7,870.25
7	$16,903.09	$17,413.27	$7,934.92	$8,106.36
8	$17,410.18	$17,935.67	$8,172.97	$8,349.55
9	$17,932.49	$18,473.74	$8,418.16	$8,600.04
10	$18,470.46	$19,027.95	$8,670.70	$8,858.04
11	$19,024.57	$19,598.79	$8,930.82	$9,123.78
12	$19,595.31	$20,186.75	$9,198.75	$9,397.49
13	$20,183.17	$20,792.36	$9,474.71	$9,679.42
14	$20,788.67	$21,416.13	$9,758.95	$9,969.80
15	$21,412.33	$22,058.61	$10,051.72	$10,268.90

ECM	Memorial Junior School - Exterior	Bee Meadow Elementary School - Exterior	Salem Drive Elementary School - Exterior	Mountview Road Elementary School - Exterior
Assumed Inflation (Gas)				
Initial Yearly Savings (Gas)				
Assumed Inflation (Electricity)	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$4,312.38	$4,743.20	$1,941.63	$2,087.14
Assumed Average Useful Life (Years)	15	15	15	15
Lifetime Savings	**$80,205.58**	**$88,218.37**	**$36,112.21**	**$38,818.54**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$4,312.38	$4,743.20	$1,941.63	$2,087.14
2	$4,441.75	$4,885.50	$1,999.88	$2,149.75
3	$4,575.00	$5,032.06	$2,059.88	$2,214.25
4	$4,712.25	$5,183.02	$2,121.67	$2,280.67
5	$4,853.62	$5,338.51	$2,185.32	$2,349.09
6	$4,999.23	$5,498.67	$2,250.88	$2,419.57
7	$5,149.21	$5,663.63	$2,318.41	$2,492.15
8	$5,303.68	$5,833.54	$2,387.96	$2,566.92
9	$5,462.79	$6,008.54	$2,459.60	$2,643.93
10	$5,626.68	$6,188.80	$2,533.39	$2,723.24
11	$5,795.48	$6,374.46	$2,609.39	$2,804.94
12	$5,969.34	$6,565.70	$2,687.67	$2,889.09
13	$6,148.42	$6,762.67	$2,768.30	$2,975.76
14	$6,332.88	$6,965.55	$2,851.35	$3,065.04
15	$6,522.86	$7,174.52	$2,936.89	$3,156.99

ECM	Memorial Junior School - Interior & Exterior	Bee Meadow Elementary School - Interior & Exterior	Salem Drive Elementary School - Interior & Exterior	Mountview Road Elementary School - Exterior
Assumed Inflation (Gas)				
Initial Yearly Savings (Gas)				
Assumed Inflation (Electricity)	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$18,468.50	$19,326.50	$8,547.00	$8,876.10
Assumed Average Useful Life (Years)	15	15	15	15
Lifetime Savings	**$343,494.04**	**$359,451.91**	**$158,964.92**	**$165,085.82**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$18,468.50	$19,326.50	$8,547.00	$8,876.10
2	$19,022.56	$19,906.30	$8,803.41	$9,142.38
3	$19,593.23	$20,503.48	$9,067.51	$9,416.65
4	$20,181.03	$21,118.59	$9,339.54	$9,699.15
5	$20,786.46	$21,752.15	$9,619.72	$9,990.13
6	$21,410.05	$22,404.71	$9,908.32	$10,289.83
7	$22,052.35	$23,076.85	$10,205.56	$10,598.53
8	$22,713.93	$23,769.16	$10,511.73	$10,916.48
9	$23,395.34	$24,482.23	$10,827.08	$11,243.98
10	$24,097.20	$25,216.70	$11,151.90	$11,581.30
11	$24,820.12	$25,973.20	$11,486.45	$11,928.74
12	$25,564.72	$26,752.40	$11,831.05	$12,286.60
13	$26,331.66	$27,554.97	$12,185.98	$12,655.20
14	$27,121.61	$28,381.62	$12,551.56	$13,034.85
15	$27,935.26	$29,233.07	$12,928.10	$13,425.90

ECM	Memorial Junior School - Solar	Bee Meadow Elementary School - Solar	Salem Drive Elementary School - Solar	Mountview Road Elementary School - Solar
Assumed Inflation (Gas)				
Initial Yearly Savings (Gas)				
Assumed Inflation (Electricity)	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$141,238.10	$94,371.20	$43,141.10	$39,422.60
Assumed Average Useful Life (Years)	15	15	15	15
Lifetime Savings	**$5,149,437.22**	**$3,440,704.53**	**$1,572,892.77**	**$1,437,318.99**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$141,238.10	$94,371.20	$43,141.10	$39,422.60
2	$145,475.24	$97,202.34	$44,435.33	$40,605.28
3	$149,839.50	$100,118.41	$45,768.39	$41,823.44
4	$154,334.69	$103,121.96	$47,141.44	$43,078.14
5	$158,964.73	$106,215.62	$48,555.69	$44,370.48
6	$163,733.67	$109,402.09	$50,012.36	$45,701.60
7	$168,645.68	$112,684.15	$51,512.73	$47,072.65
8	$173,705.05	$116,064.67	$53,058.11	$48,484.83
9	$178,916.20	$119,546.61	$54,649.85	$49,939.37
10	$184,283.69	$123,133.01	$56,289.35	$51,437.55
11	$189,812.20	$126,827.00	$57,978.03	$52,980.68
12	$195,506.56	$130,631.81	$59,717.37	$54,570.10
13	$201,371.76	$134,550.77	$61,508.89	$56,207.20
14	$207,412.91	$138,587.29	$63,354.16	$57,893.42
15	$213,635.30	$142,744.91	$65,254.78	$59,630.22
16	$220,044.36	$147,027.25	$67,212.43	$61,419.13
17	$226,645.69	$151,438.07	$69,228.80	$63,261.70
18	$233,445.06	$155,981.21	$71,305.66	$65,159.55
19	$240,448.41	$160,660.65	$73,444.83	$67,114.34
20	$247,661.86	$165,480.47	$75,648.18	$69,127.77
21	$255,091.72	$170,444.88	$77,917.63	$71,201.60
22	$262,744.47	$175,558.23	$80,255.15	$73,337.65
23	$270,626.80	$180,824.98	$82,662.81	$75,537.78
24	$278,745.61	$186,249.73	$85,142.69	$77,803.91
25	$287,107.98	$191,837.22	$87,696.97	$80,138.03

ECM	Wind Turbine - Min Wind Speed	Wind Turbine - Max Wind Speed	Wind Turbine - Avg wind Speed
Assumed Inflation (Gas)			
Initial Yearly Savings (Gas)			
Assumed Inflation (Electricity)	3%	3%	3%
Initial Yearly Savings (Electricity)	$841.30	$2,431.70	$1,541.60
Assumed Average Useful Life (Years)	15	15	15
Lifetime Savings	**$29,240.92**	**$84,518.19**	**$53,581.13**
Year	Annual Savings	Annual Savings	Annual Savings
1	$841.30	$2,431.70	$1,541.60
2	$866.54	$2,504.65	$1,587.85
3	$892.54	$2,579.79	$1,635.48
4	$919.31	$2,657.18	$1,684.55
5	$946.89	$2,736.90	$1,735.08
6	$975.30	$2,819.01	$1,787.14
7	$1,004.56	$2,903.58	$1,840.75
8	$1,034.69	$2,990.68	$1,895.97
9	$1,065.73	$3,080.40	$1,952.85
10	$1,097.71	$3,172.82	$2,011.44
11	$1,130.64	$3,268.00	$2,071.78
12	$1,164.56	$3,366.04	$2,133.93
13	$1,199.49	$3,467.02	$2,197.95
14	$1,235.48	$3,571.03	$2,263.89
15	$1,272.54	$3,678.16	$2,331.81
16	$1,310.72	$3,788.51	$2,401.76
17	$1,350.04	$3,902.16	$2,473.82
18	$1,390.54	$4,019.23	$2,548.03
20	$1,475.22	$4,264.00	$2,703.20
21	$1,519.48	$4,391.92	$2,784.30
22	$1,565.07	$4,523.68	$2,867.83
23	$1,612.02	$4,659.39	$2,953.87
24	$1,660.38	$4,799.17	$3,042.48
25	$1,710.19	$4,943.15	$3,133.76

IRR, NPV, AROI - Lighting Upgrades

Based on inflation of: 3%

Interior Lighting Memorial Junior School		Interior Lighting Bee Meadow School		Interior Lighting Salem Drive School		Interior Lighting Mountview Road School	
Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	**($94,100.97)**	0	**($86,661.59)**	0	**($43,096.31)**	0	**($35,104.53)**
1	**$14,993.23**	1	**$14,726.88**	1	**$6,808.10**	1	**$6,966.04**
2	$15,443.03	2	$15,168.69	2	$7,012.34	2	$7,175.02
3	$15,906.32	3	$15,623.75	3	$7,222.71	3	$7,390.27
4	$16,383.51	4	$16,092.46	4	$7,439.39	4	$7,611.98
5	$16,875.01	5	$16,575.23	5	$7,662.58	5	$7,840.34
6	$17,381.26	6	$17,072.49	6	$7,892.45	6	$8,075.55
7	$17,902.70	7	$17,584.66	7	$8,129.23	7	$8,317.82
8	$18,439.78	8	$18,112.20	8	$8,373.10	8	$8,567.35
9	$18,992.98	9	$18,655.57	9	$8,624.30	9	$8,824.37
10	$19,562.76	10	$19,215.24	10	$8,883.03	10	$9,089.10
11	$20,149.65	11	$19,791.70	11	$9,149.52	11	$9,361.78
12	$20,754.14	12	$20,385.45	12	$9,424.00	12	$9,642.63
13	$21,376.76	13	$20,997.01	13	$9,706.72	13	$9,931.91
14	$22,018.06	14	$21,626.92	14	$9,997.92	14	$10,229.86
15	$22,678.61	15	$22,275.73	15	$10,297.86	15	$10,536.76
IRR	16.38%	IRR	17.69%	IRR	16.21%	IRR	21.09%
NPV	$124,247.04	NPV	$127,807.54	NPV	$56,050.78	NPV	$66,342.65
AROI	9.27%	AROI	10.33%	AROI	9.13%	AROI	13.18%

Exterior Lighting Memorial Junior School		Exterior Lighting Bee Meadow School		Exterior Lighting Salem Drive School		Exterior Lighting Mountview Road School	
Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	**($112,007.13)**	0	**($80,958.56)**	0	**($34,908.25)**	0	**($52,362.38)**
1	**$4,355.20**	1	**$4,794.88**	1	**$1,964.00**	1	**$2,111.39**
2	$4,485.86	2	$4,938.73	2	$2,022.92	2	$2,174.73
3	$4,620.43	3	$5,086.89	3	$2,083.61	3	$2,239.97
4	$4,759.04	4	$5,239.49	4	$2,146.12	4	$2,307.17
5	$4,901.82	5	$5,396.68	5	$2,210.50	5	$2,376.39
6	$5,048.87	6	$5,558.58	6	$2,276.81	6	$2,447.68
7	$5,200.34	7	$5,725.34	7	$2,345.12	7	$2,521.11
8	$5,356.35	8	$5,897.10	8	$2,415.47	8	$2,596.74
9	$5,517.04	9	$6,074.01	9	$2,487.94	9	$2,674.65
10	$5,682.55	10	$6,256.23	10	$2,562.57	10	$2,754.89
11	$5,853.02	11	$6,443.92	11	$2,639.45	11	$2,837.53
12	$6,028.62	12	$6,637.24	12	$2,718.64	12	$2,922.66
13	$6,209.47	13	$6,836.35	13	$2,800.19	13	$3,010.34
14	$6,395.76	14	$7,041.44	14	$2,884.20	14	$3,100.65
15	$6,587.63	15	$7,252.69	15	$2,970.73	15	$3,193.67
IRR	-3.58%	IRR	1.15%	IRR	0.54%	IRR	-3.20%
NPV	($48,581.89)	NPV	($11,130.21)	NPV	($6,306.31)	NPV	($21,613.98)
AROI	-2.78%	AROI	-0.74%	AROI	-1.04%	AROI	-2.63%

Interior & Exterior Lighting Memorial Junior School		Interior & Exterior Lighting Bee Meadow School		Interior & Exterior Lighting Salem Drive School		Interior & Exterior Lighting Mountview Road School	
Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	**($206,108.09)**	0	**($167,620.16)**	0	**($78,004.56)**	0	**($87,466.91)**
1	**$19,348.49**	1	**$19,521.72**	1	**$8,772.10**	1	**$9,077.44**
2	$19,928.94	2	$20,107.37	2	$9,035.26	2	$9,349.76
3	$20,526.81	3	$20,710.59	3	$9,306.32	3	$9,630.26
4	$21,142.62	4	$21,331.91	4	$9,585.51	4	$9,919.16
5	$21,776.90	5	$21,971.87	5	$9,873.08	5	$10,216.74
6	$22,430.20	6	$22,631.02	6	$10,169.27	6	$10,523.24
7	$23,103.11	7	$23,309.95	7	$10,474.35	7	$10,838.94
8	$23,796.20	8	$24,009.25	8	$10,788.58	8	$11,164.11
9	$24,510.09	9	$24,729.53	9	$11,112.23	9	$11,499.03
10	$25,245.39	10	$25,471.42	10	$11,445.60	10	$11,844.00
11	$26,002.75	11	$26,235.56	11	$11,788.97	11	$12,199.32
12	$26,782.84	12	$27,022.63	12	$12,142.64	12	$12,565.30
13	$27,586.32	13	$27,833.30	13	$12,506.92	13	$12,942.26
14	$28,413.91	14	$28,668.30	14	$12,882.12	14	$13,330.53
15	$29,266.33	15	$29,528.35	15	$13,268.59	15	$13,730.44
IRR	7.32%	IRR	10.69%	IRR	10.12%	IRR	8.84%
NPV	$75,666.04	NPV	$116,676.73	NPV	$49,744.47	NPV	$44,728.82
AROI	2.72%	AROI	4.98%	AROI	4.58%	AROI	3.71%

IRR, NPV, AROI - PV Solar Energy Systems

Financial Calculations

Based on inflation of: 3%

O&M inflation: 3%

Memorial Junior School				Bee Meadow Elementary School				Salem Drive Elementary School				Mountview Road Elementary School			
Year	Energy Savings	SREC Sales	Cash Flow	Year	Energy Savings	SREC Sales	Cash Flow	Year	Energy Savings	SREC Sales	Cash Flow	Year	Energy Savings	SREC Sales	Cash Flow
0			($7,662,500)	0			($5,075,000)	0			($2,375,000)	0			($2,150,000)
1	$141,238.1	$517,685	$657,650	1	$94,371.2	$339,972	$432,869	1	$43,141.1	$154,533	$195,314	1	$39,422.6	$139,079	$176,142
2	$145,475	$502,219	$646,383	2	$97,202	$329,815	$425,499	2	$44,435	$149,916	$191,921	2	$40,605	$134,924	$173,099
3	$149,840	$487,065	$635,593	3	$100,118	$319,864	$418,464	3	$45,768	$145,393	$188,730	3	$41,823	$130,853	$170,246
4	$154,335	$470,091	$623,114	4	$103,122	$308,716	$410,320	4	$47,141	$140,326	$185,036	4	$43,078	$126,293	$166,940
5	$158,965	$453,708	$611,362	5	$106,216	$297,958	$402,655	5	$48,556	$135,435	$181,560	5	$44,371	$121,892	$163,831
6	$163,734	$437,896	$600,319	6	$109,402	$287,574	$395,458	6	$50,012	$130,715	$178,297	6	$45,702	$117,644	$160,915
7	$168,646	$422,636	$589,970	7	$112,684	$277,552	$388,718	7	$51,513	$126,160	$175,242	7	$47,073	$113,544	$158,186
8	$173,705	$407,907	$580,301	8	$116,065	$267,879	$382,426	8	$53,058	$121,763	$172,391	8	$48,485	$109,587	$155,641
9	$178,916	$393,691	$571,296	9	$119,547	$258,544	$376,572	9	$54,650	$117,520	$169,739	9	$49,939	$105,768	$153,276
10	$184,284	$379,971	$562,944	10	$123,133	$249,533	$371,148	10	$56,289	$113,424	$167,283	10	$51,438	$102,082	$151,089
11	$189,812	$366,729	$555,230	11	$126,827	$240,837	$366,146	11	$57,978	$109,471	$165,019	11	$52,981	$98,524	$149,074
12	$195,507	$353,949	$548,144	12	$130,632	$232,444	$361,558	12	$59,717	$105,656	$162,943	12	$54,570	$95,091	$147,230
13	$201,372	$341,614	$541,674	13	$134,551	$224,343	$357,376	13	$61,509	$101,974	$161,052	13	$56,207	$91,777	$145,553
14	$207,413	$329,708	$535,810	14	$138,587	$216,525	$353,594	14	$63,354	$98,420	$159,344	14	$57,893	$88,578	$144,041
15	$213,635	$318,218	$530,542	15	$142,745	$208,979	$350,206	15	$65,255	$94,990	$157,814	15	$59,630	$85,491	$142,691
16	$220,044	$19,042	$237,775	16	$147,027	$12,505	$158,014	16	$67,212	$5,684	$70,466	16	$61,419	$5,116	$64,104
17	$226,646	$18,947	$244,281	17	$151,438	$12,443	$162,362	17	$69,229	$5,656	$72,454	17	$63,262	$5,090	$65,921
18	$233,445	$18,852	$250,986	18	$155,981	$12,380	$166,843	18	$71,306	$5,627	$74,502	18	$65,160	$5,065	$67,794
19	$240,448	$18,758	$257,895	19	$160,661	$12,318	$171,461	19	$73,445	$5,599	$76,613	19	$67,114	$5,039	$69,723
20	$247,662	$18,664	$265,015	20	$165,480	$12,257	$176,219	20	$75,648	$5,571	$78,789	20	$69,128	$5,014	$71,711
21	$255,092	$18,571	$272,351	21	$170,445	$12,196	$181,122	21	$77,918	$5,543	$81,030	21	$71,202	$4,989	$73,760
22	$262,745	$18,478	$279,911	22	$175,558	$12,135	$186,175	22	$80,255	$5,516	$83,340	22	$73,338	$4,964	$75,871
23	$270,627	$18,385	$287,701	23	$180,825	$12,074	$191,381	23	$82,663	$5,488	$85,720	23	$75,538	$4,939	$78,046
24	$278,746	$18,293	$295,728	24	$186,250	$12,014	$196,745	24	$85,143	$5,461	$88,173	24	$77,804	$4,915	$80,288
25	$287,108	$18,202	$303,999	25	$191,837	$11,954	$202,273	25	$87,697	$5,433	$90,700	25	$80,138	$4,890	$82,597
		IRR	4.2%			IRR	4.2%			IRR	3.7%			IRR	3.7%
		NPV	$860,535			NPV	$550,060			NPV	$157,533			NPV	$139,511
		AROI	4.6%			AROI	4.5%			AROI	4.2%			AROI	4.2%

IRR, NPV, AROI - Wind Energy Systems

Financial Calculations

Based on inflation of: 3%

O&M inflation: 3%

Wind Turbine - Minimum Wind Speed				Wind Turbine - Maximum Wind Speed				Wind Turbine - Average Wind Speed			
REIP Incentive:	$15,341			REIP Incentive:	$44,339			REIP Incentive:	$28,109		
Year	Energy Savings	REC Sales	Cash Flow	Year	Energy Savings	REC Sales	Cash Flow	Year	Energy Savings	REC Sales	Cash Flow
0			($53,148.69)	0			($24,150.69)	0			($40,380.69)
1	$841	$120	$961	1	$2,432	$346	$2,778	1	$1,542	$220	$1,761
2	$867	$119	$986	2	$2,505	$345	$2,849	2	$1,588	$219	$1,806
3	$893	$119	$1,011	3	$2,580	$343	$2,923	3	$1,635	$217	$1,853
4	$919	$118	$1,037	4	$2,657	$341	$2,998	4	$1,685	$216	$1,901
5	$947	$117	$1,064	5	$2,737	$340	$3,076	5	$1,735	$215	$1,950
6	$975	$117	$1,092	6	$2,819	$338	$3,157	6	$1,787	$214	$2,001
7	$1,005	$116	$1,121	7	$2,904	$336	$3,240	7	$1,841	$213	$2,054
8	$1,035	$116	$1,150	8	$2,991	$334	$3,325	8	$1,896	$212	$2,108
9	$1,066	$115	$1,181	9	$3,080	$333	$3,413	9	$1,953	$211	$2,164
10	$1,098	$115	$1,212	10	$3,173	$331	$3,504	10	$2,011	$210	$2,221
11	$1,131	$114	$1,245	11	$3,268	$329	$3,597	11	$2,072	$209	$2,281
12	$1,165	$113	$1,278	12	$3,366	$328	$3,694	12	$2,134	$208	$2,342
13	$1,199	$113	$1,312	13	$3,467	$326	$3,793	13	$2,198	$207	$2,405
14	$1,235	$112	$1,348	14	$3,571	$325	$3,896	14	$2,264	$206	$2,470
15	$1,273	$112	$1,384	15	$3,678	$323	$4,001	15	$2,332	$205	$2,537
16	$1,311	$111	$1,422	16	$3,789	$321	$4,110	16	$2,402	$204	$2,605
17	$1,350	$111	$1,461	17	$3,902	$320	$4,222	17	$2,474	$203	$2,676
18	$1,391	$110	$1,501	18	$4,019	$318	$4,337	18	$2,548	$202	$2,750
19	$1,432	$110	$1,542	19	$4,140	$317	$4,456	19	$2,624	$201	$2,825
20	$1,475	$109	$1,584	20	$4,264	$315	$4,579	20	$2,703	$200	$2,903
21	$1,519	$108	$1,628	21	$4,392	$313	$4,705	21	$2,784	$199	$2,983
22	$1,565	$108	$1,673	22	$4,524	$312	$4,835	22	$2,868	$198	$3,065
23	$1,612	$107	$1,719	23	$4,659	$310	$4,970	23	$2,954	$197	$3,151
24	$1,660	$107	$1,767	24	$4,799	$309	$5,108	24	$3,042	$196	$3,238
25	$1,710	$106	$1,816	25	$4,943	$307	$5,250	25	$3,134	$195	$3,328
		IRR	-3.0%			IRR	13.1%			IRR	3.1%
		NPV	-$30,747			NPV	$40,598			NPV	$667
		AROI	-2.2%			AROI	7.5%			AROI	0.4%

Maintenance Costs - Memorial Junior School - Current Systems (Packaged DX Air Conditioners with Electric Heat)

Multipliers

Unit	Serves	Base Service Hourly Rate	Basic Price	Equipment Multiplier	Application (Commercial)	No. of Inspections per Year (Assume 6)	Age	TOTAL
10 Ton Packaged Unit	Faculty Room	$35.00	$1,203.13	1.00	1.1	1.00	1.25	$1,654.30
10 Ton Packaged Unit	Nurse/Guidance	$35.00	$1,203.13	1.00	1.1	1.00	1.15	$1,521.95
12 Ton Packaged Unit	Main Office	$35.00	$1,203.13	1.00	1.1	1.00	1.25	$1,654.30
22.5 Ton Packaged Unit	IMC	$35.00	$1,925.00	1.00	1.1	1.00	1.25	$2,646.88
							Sum	**$7,477.42**

Multiplier Reference*

Equipment	**Multiplier**
Package, DX	1.00
Split, DX	1.10
Chilled Water	1.10
Dual Comp.	1.10
Air Cooled	1.00
Water Cooled	1.05
Tower or Evap.	1.15
Steam Coil	1.10
Gas Heat	1.20
Oil Heat	1.30
Heat Pump	1.50

Application	
Residential	1.00
Commercial	1.10
Process	1.20

No of Inspections	
2	0.71
4	0.80
6	1.00
9	1.40
12	1.75

Age (Years)	
0-1	0.45
2-5	0.9
6-8	1.08
9-11	1.15
11+	1.25

*Pricing and Multipliers are per "Ottaviano on Mechanical Estimating", by Victor Ottaviano, and adjusted for current wage rates

Maintenance Costs - Memorial Junior School - Proposed Systems (Air Source Heat Pumps)

Unit	Serves	Base Service Hourly Rate	Basic Price	Equipment Multiplier	Application (Commercial)	No. of Inspections per Year (Assume 6)	Age	TOTAL
10 Ton Packaged Unit	Faculty Room	$35.00	$1,203.13	1.50	1.1	1.00	1.25	$2,481.45
10 Ton Packaged Unit	Nurse/Guidance	$35.00	$1,203.13	1.50	1.1	1.00	1.15	$2,282.93
12 Ton Packaged Unit	Main Office	$35.00	$1,203.13	1.50	1.1	1.00	1.25	$2,481.45
22.5 Ton Packaged Unit	IMC	$35.00	$1,925.00	1.50	1.1	1.00	1.25	$3,970.31
							Sum	**$11,216.13**
							Existing Systems:	**$7,477.42**
							Savings:	**-$3,738.71**

Multipliers

Multiplier Reference*

Equipment	**Multiplier**
Package, DX	1.00
Split, DX	1.10
Chilled Water	1.10
Dual Comp.	1.10
Air Cooled	1.00
Water Cooled	1.05
Tower or Evap.	1.15
Steam Coil	1.10
Gas Heat	1.20
Oil Heat	1.30
Heat Pump	1.50
Application	
Residential	1.00
Commercial	1.10
Process	1.20
No of Inspections	
2	0.71
4	0.80
6	1.00
9	1.40
12	1.75
Age (Years)	
0-1	0.45
2-5	0.9
6-8	1.08
9-11	1.15
11+	1.25

*Pricing and Multipliers are per "Ottaviano on Mechanical Estimating", by Victor Ottaviano, and adjusted for current wage rates

ECM	Memorial Junior School - Boiler Upgrade	Memorial Junior School - ASHP	Bee Meadow School - Boiler Upgrade	Salem Drive School - Boiler Upgrade	Mountview Road School - Boiler Upgrade	Memorial Junior School - VSD	Bee Meadow School - VSD	Salem Drive School - VSD	Mountview Road School - VSD
Assumed Inflation (Gas)	2%	2%	2%	2%	2%	2%	2%	2%	2%
Initial Yearly Savings (Gas)	$23,480		$19,837	$13,837	$12,370	-$480	-$1,862	-$450	-$238
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)		$8,070.00				$986.00	$2,588.00	$1,111.00	$548.00
Assumed Average Useful Life (Years)	24	15	24	24	24	15	15	15	15
Lifetime Savings	**$714,305.33**	**$150,093.24**	**$603,472.40**	**$420,941.23**	**$376,318.44**	**$10,037.69**	**$15,933.65**	**$12,881.36**	**$6,076.37**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$23,480.00	$8,070.00	$19,836.80	$13,836.80	$12,370.00	$506.00	$726.00	$661.00	$310.00
2	$23,949.60	$8,312.10	$20,233.54	$14,113.54	$12,617.40	$525.98	$766.40	$685.33	$321.68
3	$24,428.59	$8,561.46	$20,638.21	$14,395.81	$12,869.75	$546.66	$808.38	$710.48	$333.76
4	$24,917.16	$8,818.31	$21,050.97	$14,683.72	$13,127.14	$568.05	$852.01	$736.48	$346.25
5	$25,415.51	$9,082.86	$21,471.99	$14,977.40	$13,389.69	$590.18	$897.33	$763.35	$359.16
6	$25,923.82	$9,355.34	$21,901.43	$15,276.95	$13,657.48	$613.09	$944.40	$791.12	$372.51
7	$26,442.29	$9,636.00	$22,339.46	$15,582.48	$13,930.63	$636.78	$993.29	$819.82	$386.31
8	$26,971.14	$9,925.08	$22,786.25	$15,894.13	$14,209.24	$661.29	$1,044.06	$849.48	$400.58
9	$27,510.56	$10,222.83	$23,241.97	$16,212.02	$14,493.43	$686.64	$1,096.77	$880.13	$415.34
10	$28,060.77	$10,529.52	$23,706.81	$16,536.26	$14,783.30	$712.86	$1,151.49	$911.81	$430.58
11	$28,621.99	$10,845.41	$24,180.95	$16,866.98	$15,078.96	$739.98	$1,208.29	$944.54	$446.35
12	$29,194.43	$11,170.77	$24,664.57	$17,204.32	$15,380.54	$768.03	$1,267.23	$978.37	$462.64
13	$29,778.32	$11,505.89	$25,157.86	$17,548.41	$15,688.15	$797.04	$1,328.40	$1,013.31	$479.48
14	$30,373.88	$11,851.07	$25,661.02	$17,899.38	$16,001.91	$827.04	$1,391.87	$1,049.42	$496.88
15	$30,981.36	$12,206.60	$26,174.24	$18,257.36	$16,321.95	$858.06	$1,457.71	$1,086.72	$514.86
16	$31,600.99		$26,697.72	$18,622.51	$16,648.39				
17	$32,233.01		$27,231.68	$18,994.96	$16,981.36				
18	$32,877.67		$27,776.31	$19,374.86	$17,320.99				
19	$33,535.22		$28,331.84	$19,762.36	$17,667.41				
20	$34,205.93		$28,898.47	$20,157.60	$18,020.75				
21	$34,890.04		$29,476.44	$20,560.76	$18,381.17				
22	$35,587.85		$30,065.97	$20,971.97	$18,748.79				
23	$36,299.60		$30,667.29	$21,391.41	$19,123.77				
24	$37,025.59		$31,280.64	$21,819.24	$19,506.24				

IRR, NPV, AROI (HVAC)

Inflation Rate: **3%**

Boiler Upgrade **Memorial Junior School**	
Life of ECRM (Yrs):	**24**
Year	Cash Flow
0	**($220,562.00)**
1	**$25,340.00**
2	$26,100.20
3	$26,883.21
4	$27,689.70
5	$28,520.39
6	$29,376.01
7	$30,257.29
8	$31,165.00
9	$32,099.95
10	$33,062.95
11	$34,054.84
12	$35,076.49
13	$36,128.78
14	$37,212.64
15	$38,329.02
16	$39,478.89
17	$40,663.26
18	$41,883.16
19	$43,139.65
20	$44,433.84
21	$45,766.86
22	$47,139.86
23	$48,554.06
24	$50,010.68
IRR	13.33%
NPV	$369,884.60
AROI	7.32%

Air Source Heat Pumps **Memorial Junior School**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($84,905.00)**
1	**$4,331.00**
2	$4,460.93
3	$4,594.76
4	$4,732.60
5	$4,874.58
6	$5,020.82
7	$5,171.44
8	$5,326.58
9	$5,486.38
10	$5,650.97
11	$5,820.50
12	$5,995.12
13	$6,174.97
14	$6,360.22
15	$6,551.03
IRR	-0.61%
NPV	($21,832.18)
AROI	-1.57%

Boiler Upgrade **Bee Meadow School**	
Life of ECRM (Yrs):	**24**
Year	Cash Flow
0	**($165,422.00)**
1	**$21,336.80**
2	$21,976.90
3	$22,636.21
4	$23,315.30
5	$24,014.76
6	$24,735.20
7	$25,477.26
8	$26,241.57
9	$27,028.82
10	$27,839.68
11	$28,674.88
12	$29,535.12
13	$30,421.17
14	$31,333.81
15	$32,273.82
16	$33,242.04
17	$34,239.30
18	$35,266.48
19	$36,324.47
20	$37,414.21
21	$38,536.63
22	$39,692.73
23	$40,883.52
24	$42,110.02
IRR	12.43%
NPV	$331,746.16
AROI	8.73%

Boiler Upgrade **Salem Drive School**	
Life of ECRM (Yrs):	**24**
Year	Cash Flow
0	**($110,281.00)**
1	**$16,836.80**
2	$17,341.90
3	$17,862.16
4	$18,398.03
5	$18,949.97
6	$19,518.47
7	$20,104.02
8	$20,707.14
9	$21,328.35
10	$21,968.21
11	$22,627.25
12	$23,306.07
13	$24,005.25
14	$24,725.41
15	$25,467.17
16	$26,231.19
17	$27,018.12
18	$27,828.67
19	$28,663.52
20	$29,523.43
21	$30,409.13
22	$31,321.41
23	$32,261.05
24	$33,228.88
IRR	15.54%
NPV	$282,032.79
AROI	11.10%

Boiler Upgrade **Mountview Road School**	
Life of ECRM (Yrs):	**24**
Year	Cash Flow
0	**($110,281.00)**
1	**$15,369.60**
2	$15,830.69
3	$16,305.61
4	$16,794.78
5	$17,298.62
6	$17,817.58
7	$18,352.11
8	$18,902.67
9	$19,469.75
10	$20,053.84
11	$20,655.46
12	$21,275.12
13	$21,913.37
14	$22,570.78
15	$23,247.90
16	$23,945.34
17	$24,663.70
18	$25,403.61
19	$26,165.72
20	$26,950.69
21	$27,759.21
22	$28,591.98
23	$29,449.74
24	$30,333.24
IRR	13.82%
NPV	$247,845.60
AROI	9.77%

Variable Speed Drives **Memorial Junior School**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($40,394.00)**
1	**$506.00**
2	$521.18
3	$536.82
4	$552.92
5	$569.51
6	$586.59
7	$604.19
8	$622.32
9	$640.99
10	$660.22
11	$680.02
12	$700.42
13	$721.44
14	$743.08
15	$765.37
IRR	-13.78%
NPV	($33,025.07)
AROI	-5.41%

Variable Speed Drives **Bee Meadow School**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($29,993.00)**
1	**$726.00**
2	$747.78
3	$770.21
4	$793.32
5	$817.12
6	$841.63
7	$866.88
8	$892.89
9	$919.68
10	$947.27
11	$975.68
12	$1,004.95
13	$1,035.10
14	$1,066.16
15	$1,098.14
IRR	-8.21%
NPV	($19,420.18)
AROI	-4.25%

Variable Speed Drives **Salem Drive School**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($21,749.00)**
1	**$661.00**
2	$680.83
3	$701.25
4	$722.29
5	$743.96
6	$766.28
7	$789.27
8	$812.95
9	$837.34
10	$862.46
11	$888.33
12	$914.98
13	$942.43
14	$970.70
15	$999.82
IRR	-6.07%
NPV	($12,122.79)
AROI	-3.63%

Variable Speed Drives **Mountview Road School**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($23,794.00)**
1	**$310.00**
2	$319.30
3	$328.88
4	$338.75
5	$348.91
6	$359.37
7	$370.16
8	$381.26
9	$392.70
10	$404.48
11	$416.61
12	$429.11
13	$441.99
14	$455.25
15	$468.90
IRR	-13.47%
NPV	($19,279.44)
AROI	-5.36%

APPENDIX K

WIND CAD MODELING

WindCad Turbine Performance Model

BWC EXCEL-S, Grid - Intertie

Tier/neo-SH3055-23-BWC

Prepared For:	**Hanover Township Public Schools**
Site Location:	**Hanover General Area**
Data Source:	**Firstlook 3Tier, AWS Truewind**
Date:	**2/26/2010**

10 kW

Inputs:

Ave. Wind (m/s) =	3.6
Weibull K =	2
Site Altitude (m) =	80
Wind Shear Exp. =	0.180
Anem. Height (m) =	30
Tower Height (m) =	30
Turbulence Factor =	5.0%

Results:

Hub Average Wind Speed (m/s) =	3.60
Air Density Factor =	-1%
Average Output Power (kW) =	0.55
Daily Energy Output (kWh) =	13.1
Annual Energy Output (kWh) =	**4,794**
Monthly Energy Output =	400
Percent Operating Time =	47.2%

Weibull Performance Calculations

Wind Speed Bin (m/s)	Power (kW)	Wind Probability (f)	Net kW @ V
1	0.00	11.50%	0.000
2	0.00	19.15%	0.000
3	0.13	21.16%	0.028
4	0.41	18.39%	0.075
5	0.83	13.26%	0.110
6	1.42	8.12%	0.116
7	2.22	4.28%	0.095
8	3.23	1.96%	0.063
9	4.53	0.78%	0.035
10	6.05	0.27%	0.016
11	7.74	0.08%	0.006
12	9.45	0.02%	0.002
13	10.72	0.01%	0.001
14	11.09	0.00%	0.000
15	11.37	0.00%	0.000
16	11.45	0.00%	0.000
17	11.46	0.00%	0.000
18	11.41	0.00%	0.000
19	11.24	0.00%	0.000
20	10.79	0.00%	0.000
2008, BWC	Totals:	98.98%	0.547

Weibull Calculations:
Wind speed probability is calculated as a Weibull curve defined by the average wind speed and a shape factor, K. To facilitate piece-wise integration, the wind speed range is broken down into "bins" of 1 m/s in width (Column 1). For each wind speed bin, instantaneous wind turbine power (W, Column 2)) is multiplied by the Weibull wind speed probability (f, Column 3). This cross product (Net W, Column 4) is the contribution to average turbine power output contributed by wind speeds in that bin. The sum of these contributions is the average power output of the turbine on a continuous, 24 hour, basis.
Best results are achieved using annual or monthly average wind speeds. Use of daily or hourly average speeds is not recommended.

WindCad Turbine Performance Model

BWC EXCEL-S, Grid - Intertie

Tier/neo-SH3055-23-BWC

Prepared For:	**Hanover Township Public Schools**
Site Location:	**Hanover General Area**
Data Source:	**Firstlook 3Tier, AWS Truewind**
Date:	**2/26/2010**

10 kW

Inputs:

Ave. Wind (m/s) =	5.2
Weibull K =	2
Site Altitude (m) =	80
Wind Shear Exp. =	0.180
Anem. Height (m) =	30
Tower Height (m) =	30
Turbulence Factor =	5.0%

Results:

Hub Average Wind Speed (m/s) =	5.20
Air Density Factor =	-1%
Average Output Power (kW) =	1.58
Daily Energy Output (kWh) =	38.0
Annual Energy Output (kWh) =	**13,856**
Monthly Energy Output =	1,155
Percent Operating Time =	69.9%

Weibull Performance Calculations

Wind Speed Bin (m/s)	Power (kW)	Wind Probability (f)	Net kW @ V
1	0.00	5.69%	0.000
2	0.00	10.42%	0.000
3	0.13	13.50%	0.018
4	0.41	14.67%	0.059
5	0.83	14.08%	0.117
6	1.42	12.25%	0.174
7	2.22	9.76%	0.216
8	3.23	7.19%	0.233
9	4.53	4.92%	0.222
10	6.05	3.13%	0.190
11	7.74	1.86%	0.144
12	9.45	1.04%	0.098
13	10.72	0.54%	0.058
14	11.09	0.26%	0.029
15	11.37	0.12%	0.014
16	11.45	0.05%	0.006
17	11.46	0.02%	0.002
18	11.41	0.01%	0.001
19	11.24	0.00%	0.000
20	10.79	0.00%	0.000
2008, BWC	Totals:	99.51%	1.582

Weibull Calculations:
Wind speed probability is calculated as a Weibull curve defined by the average wind speed and a shape factor, K. To facilitate piece-wise integration, the wind speed range is broken down into "bins" of 1 m/s in width (Column 1). For each wind speed bin, instantaneous wind turbine power (W, Column 2)) is multiplied by the Weibull wind speed probability (f, Column 3). This cross product (Net W, Column 4) is the contribution to average turbine power output contributed by wind speeds in that bin. The sum of these contributions is the average power output of the turbine on a continuous, 24 hour, basis.
Best results are achieved using annual or monthly average wind speeds. Use of daily or hourly average speeds is not recommended.

WindCad Turbine Performance Model

BWC EXCEL-S, Grid - Intertie

Tier/neo-SH3055-23-BWC

Prepared For:	**Hanover Township Public Schools**
Site Location:	**Hanover General Area**
Data Source:	**Firstlook 3Tier, AWS Truewind**
Date:	**2/26/2010**

10 kW

Inputs:

Ave. Wind (m/s) =	4.4
Weibull K =	2
Site Altitude (m) =	3
Wind Shear Exp. =	0.180
Anem. Height (m) =	30
Tower Height (m) =	30
Turbulence Factor =	5.0%

Results:

Hub Average Wind Speed (m/s) =	4.40
Air Density Factor =	0%
Average Output Power (kW) =	1.00
Daily Energy Output (kWh) =	24.1
Annual Energy Output (kWh) =	**8,784**
Monthly Energy Output =	732
Percent Operating Time =	60.6%

Weibull Performance Calculations

Wind Speed Bin (m/s)	Power (kW)	Wind Probability (f)	Net kW @ V
1	0.00	7.85%	0.000
2	0.00	13.90%	0.000
3	0.13	16.99%	0.023
4	0.41	17.01%	0.069
5	0.84	14.71%	0.123
6	1.43	11.26%	0.161
7	2.23	7.71%	0.172
8	3.26	4.77%	0.155
9	4.56	2.68%	0.122
10	6.10	1.37%	0.083
11	7.80	0.64%	0.050
12	9.52	0.27%	0.026
13	10.80	0.11%	0.011
14	11.17	0.04%	0.004
15	11.45	0.01%	0.001
16	11.53	0.00%	0.000
17	11.54	0.00%	0.000
18	11.49	0.00%	0.000
19	11.32	0.00%	0.000
20	10.87	0.00%	0.000
2008, BWC	Totals:	99.32%	1.003

Weibull Calculations:
Wind speed probability is calculated as a Weibull curve defined by the average wind speed and a shape factor, K. To facilitate piece-wise integration, the wind speed range is broken down into "bins" of 1 m/s in width (Column 1). For each wind speed bin, instantaneous wind turbine power (W, Column 2)) is multiplied by the Weibull wind speed probability (f, Column 3). This cross product (Net W, Column 4) is the contribution to average turbine power output contributed by wind speeds in that bin. The sum of these contributions is the average power output of the turbine on a continuous, 24 hour, basis.
Best results are achieved using annual or monthly average wind speeds. Use of daily or hourly average speeds is not recommended.

APPENDIX L

WIND ENERGY FINANCING WORKSHEET

Hanover Township School District
(Minimum Average Site Wind Speed @80m – 8.1 mph)

Annual kWh	4,794
Engineer's Opinion of Probable Cost	$68,489.69

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.00%
Annual Maintenance Costs	$0.02/kWh Production
REC Factor	$25/MWh Production
REIP Incentive	$3.20/kWh First 16,000 kWh
	$0.50/kWh 16,000 kWh - 750,000 kWh

Year	Utility Price	Wind kWh	Utility Savings	RECs	REIP	Maintenance Costs	Annual Cash Flow	Cumulative Cash Flow
1	0.1755	4,794.0	$841.3	$120	$15,341	($96)	$865.3	$865.3
2	0.1808	4,770.0	$862.3	$119	$0	($95)	$886.1	$1,751.4
3	0.1862	4,746.2	$883.7	$119	$0	($95)	$907.4	$2,658.8
4	0.1918	4,722.4	$905.6	$118	$0	($94)	$929.3	$3,588.1
5	0.1975	4,698.8	$928.1	$117	$0	($94)	$951.6	$4,539.7
6	0.2035	4,675.3	$951.2	$117	$0	($94)	$974.6	$5,514.3
7	0.2096	4,652.0	$974.8	$116	$0	($93)	$998.1	$6,512.4
8	0.2158	4,628.7	$999.1	$116	$0	($93)	$1,022.2	$7,534.6
9	0.2223	4,605.6	$1,023.9	$115	$0	($92)	$1,046.9	$8,581.6
10	0.2290	4,582.5	$1,049.3	$115	$0	($92)	$1,072.3	$9,653.8
11	0.2359	4,559.6	$1,075.4	$114	$0	($91)	$1,098.2	$10,752.0
12	0.2429	4,536.8	$1,102.1	$113	$0	($91)	$1,124.8	$11,876.9
13	0.2502	4,514.1	$1,129.5	$113	$0	($90)	$1,152.1	$13,029.0
14	0.2577	4,491.6	$1,157.6	$112	$0	($90)	$1,180.1	$14,209.0
15	0.2655	4,469.1	$1,186.4	$112	$0	($89)	$1,208.7	$15,417.7
16	0.2734	4,446.8	$1,215.8	$111	$0	($89)	$1,238.1	$16,655.8
17	0.2816	4,424.5	$1,246.1	$111	$0	($88)	$1,268.2	$17,924.0
18	0.2901	4,402.4	$1,277.0	$110	$0	($88)	$1,299.0	$19,223.1
19	0.2988	4,380.4	$1,308.8	$110	$0	($88)	$1,330.7	$20,553.7
20	0.3077	4,358.5	$1,341.3	$109	$0	($87)	$1,363.1	$21,916.8
21	0.3170	4,336.7	$1,374.6	$108	$0	($87)	$1,396.3	$23,313.1
22	0.3265	4,315.0	$1,408.8	$108	$0	($86)	$1,430.3	$24,743.4
23	0.3363	4,293.4	$1,443.8	$107	$0	($86)	$1,465.3	$26,208.7
24	0.3464	4,272.0	$1,479.7	$107	$0	($85)	$1,501.0	$27,709.7
25	0.3568	4,250.6	$1,516.4	$106	$0	($85)	$1,537.7	$29,247.4

Hanover Township School District
(Maximum Average Site Wind Speed @80m - 11.6 mph)

Annual kWh	13,856
Engineer's Opinion of Probable Cost	$68,489.69

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.00%
Annual Maintenance Costs	$0.02/kWh Production
REC Factor	$25/MWh Production
REIP Incentive	$3.20/kWh First 16,000 kWh
	$0.50/kWh 16,000 kWh - 750,000 kWh

Year	Utility Price	Wind kWh	Utility Savings	RECs	REIP	Maintenance Costs	Annual Cash Flow	Cumulative Cash Flow
1	0.1755	13,856.0	$2,431.7	$346	$44,339	($277)	$2,501.0	$2,501.0
2	0.1808	13,786.7	$2,492.2	$345	$0	($276)	$2,561.1	$5,062.1
3	0.1862	13,717.8	$2,554.1	$343	$0	($274)	$2,622.7	$7,684.8
4	0.1918	13,649.2	$2,617.6	$341	$0	($273)	$2,685.8	$10,370.6
5	0.1975	13,581.0	$2,682.6	$340	$0	($272)	$2,750.5	$13,121.1
6	0.2035	13,513.0	$2,749.3	$338	$0	($270)	$2,816.8	$15,937.9
7	0.2096	13,445.5	$2,817.6	$336	$0	($269)	$2,884.8	$18,822.7
8	0.2158	13,378.3	$2,887.6	$334	$0	($268)	$2,954.5	$21,777.2
9	0.2223	13,311.4	$2,959.4	$333	$0	($266)	$3,025.9	$24,803.1
10	0.2290	13,244.8	$3,032.9	$331	$0	($265)	$3,099.1	$27,902.3
11	0.2359	13,178.6	$3,108.3	$329	$0	($264)	$3,174.2	$31,076.4
12	0.2429	13,112.7	$3,185.5	$328	$0	($262)	$3,251.1	$34,327.5
13	0.2502	13,047.1	$3,264.7	$326	$0	($261)	$3,329.9	$37,657.4
14	0.2577	12,981.9	$3,345.8	$325	$0	($260)	$3,410.7	$41,068.1
15	0.2655	12,917.0	$3,428.9	$323	$0	($258)	$3,493.5	$44,561.6
16	0.2734	12,852.4	$3,514.1	$321	$0	($257)	$3,578.4	$48,140.0
17	0.2816	12,788.1	$3,601.5	$320	$0	($256)	$3,665.4	$51,805.4
18	0.2901	12,724.2	$3,691.0	$318	$0	($254)	$3,754.6	$55,560.0
19	0.2988	12,660.6	$3,782.7	$317	$0	($253)	$3,846.0	$59,406.0
20	0.3077	12,597.3	$3,876.7	$315	$0	($252)	$3,939.7	$63,345.7
21	0.3170	12,534.3	$3,973.0	$313	$0	($251)	$4,035.7	$67,381.4
22	0.3265	12,471.6	$4,071.8	$312	$0	($249)	$4,134.1	$71,515.5
23	0.3363	12,409.3	$4,172.9	$310	$0	($248)	$4,235.0	$75,750.5
24	0.3464	12,347.2	$4,276.6	$309	$0	($247)	$4,338.4	$80,088.8
25	0.3568	12,285.5	$4,382.9	$307	$0	($246)	$4,444.3	$84,533.2

Hanover Township School District
(Average Site Wind Speed @80m - 9.9 mph)

Annual kWh	8,784
Engineer's Opinion of Probable Cost	$68,489.69

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.00%
Annual Maintenance Costs	$0.02/kWh Production
REC Factor	$25/MWh Production
REIP Incentive	$3.20/kWh First 16,000 kWh
	$0.50/kWh 16,000 kWh - 750,000 kWh

Year	Utility Price	Wind kWh	Utility Savings	RECs	REIP	Maintenance Costs	Annual Cash Flow	Cumulative Cash Flow
1	0.1755	8,784.0	$1,541.6	$220	$28,109	($176)	$1,585.5	$1,585.5
2	0.1808	8,740.1	$1,579.9	$219	$0	($175)	$1,623.6	$3,209.1
3	0.1862	8,696.4	$1,619.2	$217	$0	($174)	$1,662.6	$4,871.8
4	0.1918	8,652.9	$1,659.4	$216	$0	($173)	$1,702.7	$6,574.4
5	0.1975	8,609.6	$1,700.6	$215	$0	($172)	$1,743.7	$8,318.1
6	0.2035	8,566.6	$1,742.9	$214	$0	($171)	$1,785.7	$10,103.8
7	0.2096	8,523.8	$1,786.2	$213	$0	($170)	$1,828.8	$11,932.6
8	0.2158	8,481.1	$1,830.6	$212	$0	($170)	$1,873.0	$13,805.6
9	0.2223	8,438.7	$1,876.1	$211	$0	($169)	$1,918.3	$15,723.9
10	0.2290	8,396.5	$1,922.7	$210	$0	($168)	$1,964.7	$17,688.6
11	0.2359	8,354.6	$1,970.5	$209	$0	($167)	$2,012.3	$19,700.9
12	0.2429	8,312.8	$2,019.4	$208	$0	($166)	$2,061.0	$21,761.9
13	0.2502	8,271.2	$2,069.6	$207	$0	($165)	$2,111.0	$23,872.9
14	0.2577	8,229.9	$2,121.1	$206	$0	($165)	$2,162.2	$26,035.1
15	0.2655	8,188.7	$2,173.8	$205	$0	($164)	$2,214.7	$28,249.8
16	0.2734	8,147.8	$2,227.8	$204	$0	($163)	$2,268.5	$30,518.3
17	0.2816	8,107.0	$2,283.1	$203	$0	($162)	$2,323.7	$32,842.0
18	0.2901	8,066.5	$2,339.9	$202	$0	($161)	$2,380.2	$35,222.2
19	0.2988	8,026.2	$2,398.0	$201	$0	($161)	$2,438.2	$37,660.4
20	0.3077	7,986.0	$2,457.6	$200	$0	($160)	$2,497.6	$40,157.9
21	0.3170	7,946.1	$2,518.7	$199	$0	($159)	$2,558.4	$42,716.4
22	0.3265	7,906.4	$2,581.3	$198	$0	($158)	$2,620.8	$45,337.2
23	0.3363	7,866.8	$2,645.4	$197	$0	($157)	$2,684.8	$48,021.9
24	0.3464	7,827.5	$2,711.2	$196	$0	($157)	$2,750.3	$50,772.2
25	0.3568	7,788.4	$2,778.5	$195	$0	($156)	$2,817.5	$53,589.7