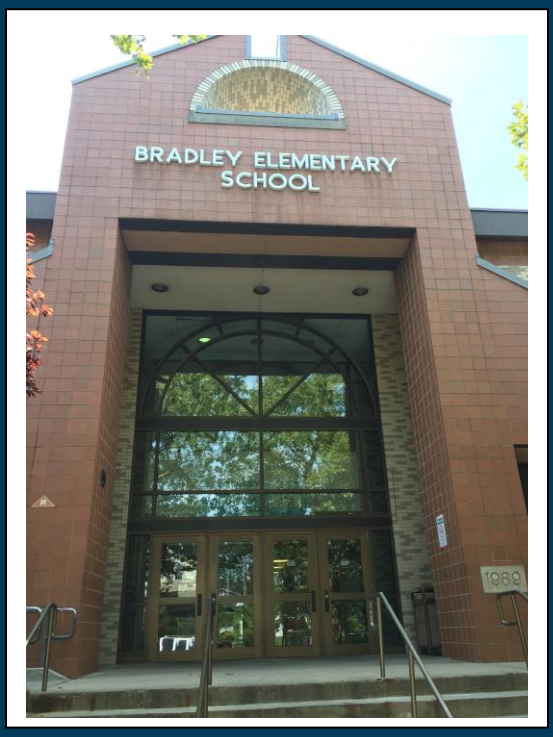
# Local Government Energy Audit:
## Energy Audit Report




***Bradley Elementary School***

Asbury Park Board of Education

1100 Third Ave

Asbury Park, New Jersey 07712

October 11, 2018

Final Report by:

**TRC Energy Services**

# Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate saving are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services (TRC) and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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# 1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Bradley Elementary School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC) as part of a comprehensive effort to assist New Jersey public schools and local government agencies in controlling their energy costs and help protect our environment by reducing energy consumption statewide.

## 1.1 Facility Summary

Bradley Elementary School is an 82,305 square foot facility. It is comprised of various space types within a single building. It is a two-story building, which includes classrooms, offices, library, gym, and mechanical spaces. Lighting at Bradley Elementary School consists primarily of fixtures with T8 linear fluorescent bulbs which are considered inefficient by today's lighting standards. The building also has fixtures containing compact fluorescent (CFL) bulbs and high intensity discharge (HID) lamps.

All areas of the building are heated and most areas are cooled. Unit ventilators with hot water coils heat the classrooms and hot water reheat coils serve the remaining areas of the building. Six roof top air conditioning units and seven spilt air conditioning system provide cooling to the building.

A thorough description of the facility and our observations are located in Section 2.

## 1.2 Your Cost Reduction Opportunities

### Energy Conservation Measures

TRC evaluated seven measures which together represent an opportunity for Bradley Elementary School to reduce its annual energy costs by roughly $26,822 and its annual greenhouse gas emissions by 224,033 lbs $CO_2e$. We estimate that if all measures are implemented as recommended, then the project would pay for itself in energy savings alone in about 5.4 years. The breakdown of current utility costs in shown in Figure 1. Projected future utility costs, following project implementation is shown in Figure 2. Together these measures represent an opportunity to reduce Bradley Elementary School's annual energy usage by about 14% overall.

*Figure 1 – Previous 12 Month Utility Costs*

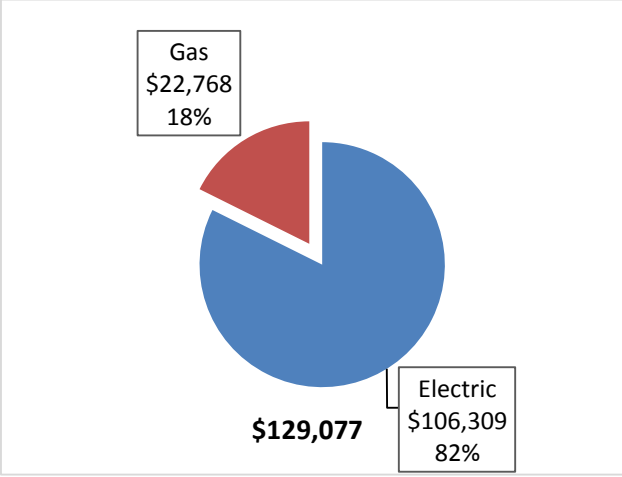
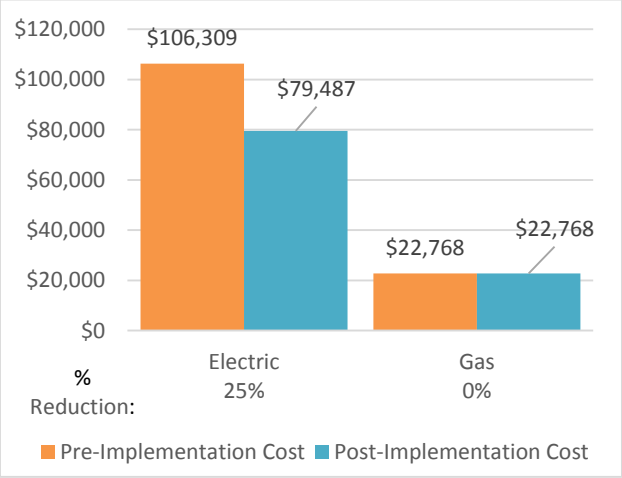



*Figure 2 – Potential Post-Implementation Costs*




A detailed description of Bradley Elementary School's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

*Figure 3 – Summary of Energy Reduction Opportunities*

| Energy Conservation Measure | | Recommend? | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($)* | Estimated Net Cost ($) | Simple Payback Period (yrs)** | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lighting Upgrades** | | | **130,633** | **33.5** | **0.0** | **$15,749.40** | **$83,398.06** | **$19,425.00** | **$63,973.06** | **4.1** | **131,547** |
| ECM 1 | Install LED Fixtures | Yes | 55,196 | 10.5 | 0.0 | $6,654.56 | $25,526.24 | $8,960.00 | $16,566.24 | 2.5 | 55,582 |
| ECM 2 | Retrofit Fixtures with LED Lamps | Yes | 75,437 | 23.1 | 0.0 | $9,094.84 | $57,871.82 | $10,465.00 | $47,406.82 | 5.2 | 75,965 |
| **Lighting Control Measures** | | | **12,158** | **3.4** | **0.0** | **$1,465.77** | **$16,126.00** | **$2,065.00** | **$14,061.00** | **9.6** | **12,243** |
| ECM 3 | Install Occupancy Sensor Lighting Controls | Yes | 12,158 | 3.4 | 0.0 | $1,465.77 | $16,126.00 | $2,065.00 | $14,061.00 | 9.6 | 12,243 |
| **Variable Frequency Drive (VFD) Measures** | | | **35,497** | **3.6** | **0.0** | **$4,279.61** | **$10,388.90** | **$0.00** | **$10,388.90** | **2.4** | **35,745** |
| ECM 4 | Install VFDs on Hot Water Pumps | Yes | 35,497 | 3.6 | 0.0 | $4,279.61 | $10,388.90 | $0.00 | $10,388.90 | 2.4 | 35,745 |
| **Electric Unitary HVAC Measures** | | | **16,277** | **4.9** | **0.0** | **$1,962.44** | **$50,580.46** | **$2,615.00** | **$47,965.46** | **24.4** | **16,391** |
| ECM 5 | Install High Efficiency Electric AC | Yes | 16,277 | 4.9 | 0.0 | $1,962.44 | $50,580.46 | $2,615.00 | $47,965.46 | 24.4 | 16,391 |
| **HVAC System Improvements** | | | **27,912** | **1.4** | **0.0** | **$3,365.09** | **$7,497.40** | **$250.00** | **$7,247.40** | **2.2** | **28,107** |
| ECM 6 | Install Programmable Thermostats | Yes | 21,879 | 0.0 | 0.0 | $2,637.77 | $6,597.40 | $0.00 | $6,597.40 | 2.5 | 22,032 |
| ECM 7 | Install Dual Enthalpy Outside Economizer Control | Yes | 6,033 | 1.4 | 0.0 | $727.32 | $900.00 | $250.00 | $650.00 | 0.9 | 6,075 |
| **TOTALS** | | | **222,477** | **46.8** | **0.0** | **$26,822.31** | **$167,990.82** | **$24,355.00** | **$143,635.82** | **5.4** | **224,033** |

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

**Lighting Upgrades** generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

**Lighting Controls** measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

**Variable Frequency Drives (VFDs)** are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

**Electric Unitary HVAC** measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

**HVAC System Improvements** generally involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperature conditions. These measures save energy by reducing the demand on HVAC systems and the amount of time systems operate.

## Energy Efficient Practices

TRC also identified nine low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Bradley Elementary School include:

- Reduce Air Leakage
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean and/or Replace HVAC Filters
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these energy efficient practices, please refer to Section 5.

## On-Site Generation Measures

TRC evaluated the potential for installing on-site solar photovoltaic (PV) electric generation at Bradley Elementary School. Based on the configuration of the site and its loads there is a high potential for installing a solar PV array.

*Figure 4 – Photovoltaic Potential*

| | | |
|---|---|---|
| **Potential** | High | |
| **System Potential** | 226 | kW DC STC |
| **Electric Generation** | 269,250 | kWh/yr |
| **Displaced Cost** | $23,420 | /yr |
| **Installed Cost** | $646,400 | |

For details on our evaluation and on-site generation potential, please refer to Section 6.

## 1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- Pay for Performance - Existing Building (P4P)
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

Larger facilities with an interest in a more comprehensive whole building approach to energy conservation should consider participating in the Pay for Performance (P4P) program. Projects eligible for this project program must meet minimum savings requirements. Final incentives are calculated based on actual measured performance achieved at the end of the project. The application process is more involved, and it requires working with a qualified P4P contractor, but the process may result in greater energy savings overall and more lucrative incentives, up to 50% of project's total cost.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8 or: www.njcleanenergy.com/ci.

# 2 FACILITY INFORMATION AND EXISTING CONDITIONS

## 2.1 Project Contacts

*Figure 5 – Project Contacts*

| Name | Role | E-Mail | Phone # |
|---|---|---|---|
| **Customer** | | | |
| Walter Sosa | Buildings and Grounds Supervisor | sosaw@asburypark.k12.nj.us | (732) 776 2663 x2851 |
| Geoffrey Hastings | Business Administrator | hastingsg@asburypark.k12.nj.us | (732) 776 2606 x2426 |
| **TRC Energy Services** | | | |
| Tom Page | Auditor | TPage@trcsolutions.com | (732) 855-0033 |

## 2.2 General Site Information

On August 11, 2017, TRC performed an energy audit at Bradley Elementary School located in Asbury Park, New Jersey. TRC's team met with Walter Sosa to review the facility operations and help focus our investigation on specific energy-using systems.

Bradley Elementary School is an 82,305 square foot facility. It is comprised of various space types within a single building. The building was constructed in 1989. It is a two-story building, which includes classrooms, offices, library, gym, and mechanical spaces. Lighting at Bradley Elementary School consists primarily of fixtures with T8 linear fluorescent bulbs which are considered inefficient by today's lighting standards. The building also has fixtures containing compact fluorescent (CFL) bulbs and high intensity discharge (HID) lamps.

Most of the lighting and heating, ventilation, and air condition systems throughout the building are older models that are considered inefficient compared to current standards for new buildings.

## 2.3 Building Occupancy

The school building is open Monday through Friday. The typical schedule is presented in the table below. The school is used approximately 44 weeks during the school year and closed throughout the summer. During a typical day, the facility is occupied by approximately 477 staff and students.

*Figure 6 - Building Schedule*

| Building Name | Weekday/Weekend | Operating Schedule |
|---|---|---|
| Bradley Elementary School | Weekday | 7:30 AM - 4:00 PM |
| Bradley Elementary School | Weekend | Closed |

## 2.4 Building Envelope

The building is constructed of concrete block with a façade of brick and tile. The building has flat roofs covered with a tan-colored bitumen membrane. The building has double-paned operable windows throughout. The exterior doors are double-paned glass with aluminum frames.

## 2.5 On-Site Generation

Bradley Elementary School has a Kohler 80-kW natural gas-fired emergency generator, located behind the building. Its fuel usage per year is negligible, because it is typically only used in the event of emergency or turned for required regular testing.

## 2.6 Energy-Using Systems

Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

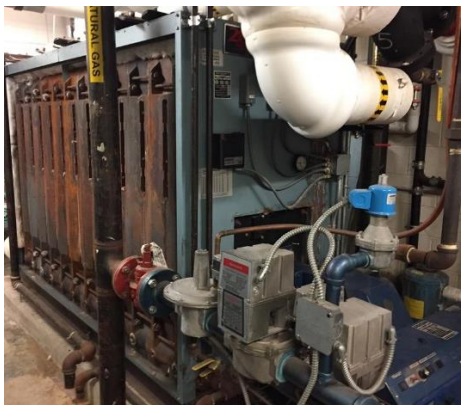
## Lighting System

Lighting is provided almost exclusively by 32-Watt linear fluorescent T8 lamps with electronic ballasts. Most of the fixtures are 2-lamp, 4-foot long troffers with diffusers, though there are also 3-lamp and 4-lamp T8 fixtures. The lighting in multipurpose room was converted to 3-lamp T5 fluorescent fixtures a few years ago. The buildings also has some fixtures with metal halide lamps and also fixtures with incandescent or compact fluorescent bulbs. Lighting control throughout the building is provided by manually operated wall switches.

Exterior lighting is mostly provided by fixtures with metal halide lamp. These fixtures illuminate the building perimeter. The exterior security lighting is controlled by time clocks or photocells.

## Hot Water Heating System

The hot water system consists of two H.B. Smith gas-fired forced draft hot water boilers with an output heating capacity of 3,569 kBtu/hr each. The boiler are 10 years old. The rated combustion efficiency of the boilers is 85%. Each boiler is estimated to have a 2-hp forced draft fan with discharge dampers to control the volume of combustion air. The boilers are configured in a constant flow primary distribution loop with two 15-hp hot water pumps. The boilers provide hot water to the hot water coils throughout the school.



The boilers stage on as needed to server the building load. Based on historic fuel usage, it appears that only a single boiler is needed to serve the building load under most conditions. The boilers operate in a lead/lag configuration.

## Direct Expansion Air Conditioning System (DX)

Six cooling only direct-expansion (DX) packaged air conditioning units are used to condition large portions of the building. The units range in cooling capacity between seven and 30 tons each, with a total combined capacity of over 110 tons. The units appear to have outside air economizers, but we could not determine if they are currently used or functioning properly. All of the units are located on the roof of the school and provide cooling to various zones throughout the building.

Seven split system also serve spaces throughout the school with evaporator coils located above classroom and office ceilings or integrated into unit ventilators. The compressors and condensing coils for the units are located on the roof.



All of the air conditioning units appear to provide constant air volume with a single supply fan.

### Domestic Hot Water Heating System

The school's domestic hot water heating system consists of a single A.O. Smith gas fired water heater with an input heating capacity of 250 kBtu/hr. It is a high a relatively new high efficiency unit with a rated efficiency of 96%. The water heater has a 100 gallon storage tank. Hot water circulation pumps distribute water throughout the building. The recirculation pumps operate continuously.

### Food Service

The school has a small kitchen that is used to reheat pre-prepared lunches for the students and staff. There is no significant amount of cooking or other food preparation on site. The kitchen had a four pan electric steamer, several refrigerators, and an ice maker.

### Building Plug Load

There are roughly 316 computer work stations throughout the facility. The computers are desktop units with LCD monitors. A large server rack was also observed. There is no centralized PC power management software installed.

In addition to the typical classroom and office equipment (e.g. computers, printers, copiers, and servers) there were multiple microwaves and refrigerators used by building staff.

## 2.7 Water-Using Systems

We counted 32 restrooms at this facility. In our sampling of restrooms, we found all of the faucets and the toilets be "low-flow" water-conserving devices.

# 3 SITE ENERGY USE AND COSTS

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

## 3.1 Total Cost of Energy

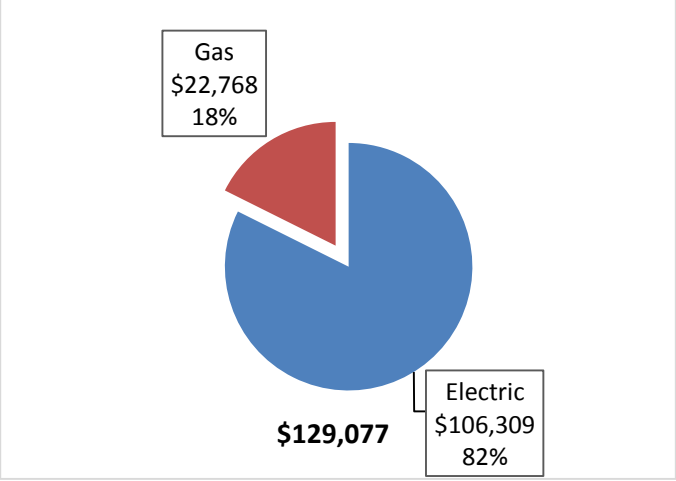
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

*Figure 7 - Utility Summary*

| Utility Summary for Bradley Elementary School | | |
|---|---|---|
| **Fuel** | **Usage** | **Cost** |
| Electricity | 881,779 kWh | $106,309 |
| Natural Gas | 22,309 Therms | $22,768 |
| **Total** | | **$129,077** |

The current annual energy cost for this facility is $129,077 as shown in the chart below.

*Figure 8 - Energy Cost Breakdown*



## 3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over a recent 12 month period was found to be about $0.121/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below.

The electric usage during the summer is much higher than we expected to find, since the school was reported as closed during the summer months. The shape of the electric load curve is indicative of summer cooling. Peak electric usage occurs in July and August, when the school likely has its lowest daily occupancy. To achieve additional savings, the school might consider taking measures to ensure that air conditioning units are shut off when not needed, or perhaps restricted to specific hours or zones when the building is closed.

*Figure 9 - Electric Usage & Demand*

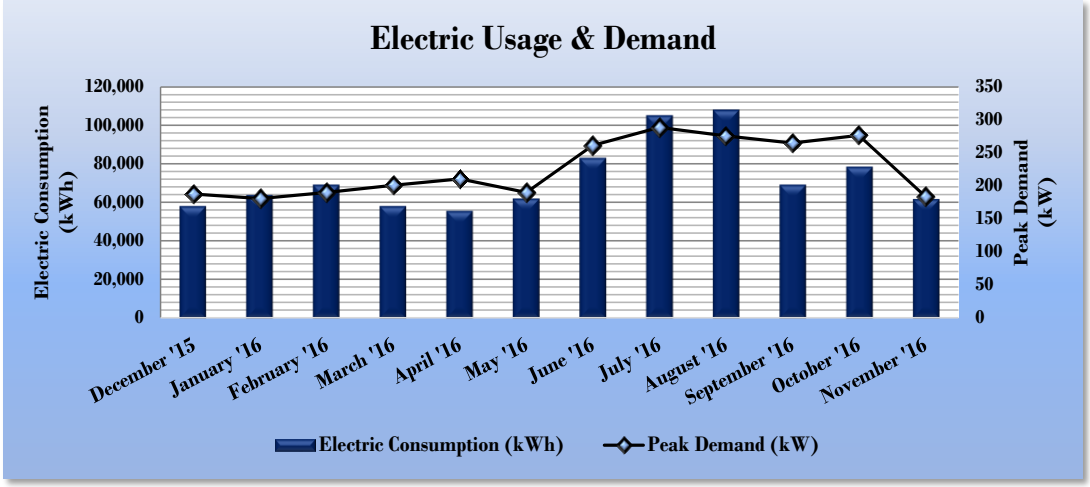



*Figure 10 - Electric Usage & Demand*

| Electric Billing Data for Bradley Elementary School | | | | |
|---|---|---|---|---|
| Period Ending | Days in Period | Electric Usage (kWh) | Demand (kW) | Total Electric Cost |
| 12/29/15 | 31 | 57,900 | 188 | $6,802 |
| 1/27/16 | 29 | 63,600 | 181 | $7,321 |
| 2/25/16 | 29 | 69,000 | 190 | $7,969 |
| 3/25/16 | 29 | 57,900 | 201 | $6,876 |
| 4/25/16 | 31 | 55,500 | 211 | $6,731 |
| 5/24/16 | 29 | 61,800 | 190 | $7,315 |
| 6/23/16 | 30 | 82,800 | 261 | $9,858 |
| 7/25/16 | 32 | 104,700 | 289 | $12,701 |
| 8/23/16 | 29 | 107,700 | 276 | $12,918 |
| 9/23/16 | 31 | 69,000 | 265 | $9,037 |
| 10/25/16 | 32 | 78,300 | 277 | $9,801 |
| 11/22/16 | 28 | 61,500 | 184 | $7,524 |
| **Totals** | **360** | **869,700** | **288.5** | **$104,853** |
| **Annual** | **365** | **881,779** | **288.5** | **$106,309** |

## 3.3 Natural Gas Usage

Natural gas is provided by NJ Natural Gas. The average gas cost over a recent 12 month period was found to be $1.021/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

*Figure 11 - Natural Gas Usage*

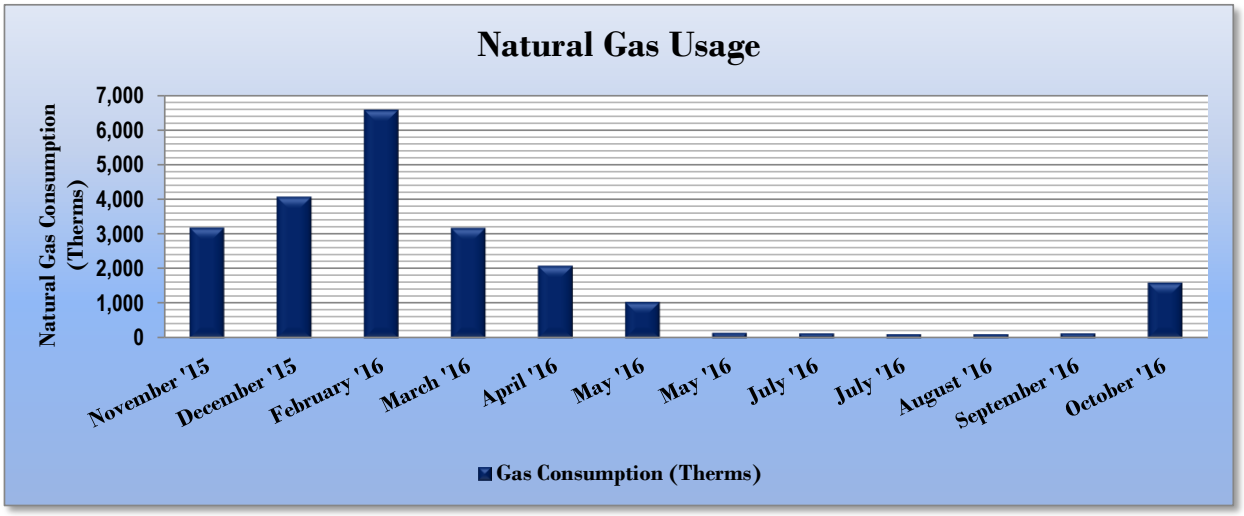



*Figure 12 - Natural Gas Usage*

| Gas Billing Data for Bradley Elementary School | | | |
|---|---|---|---|
| Period Ending | Days in Period | Natural Gas Usage (Therms) | Natural Gas Cost |
| 12/14/15 | 33 | 3,176 | $2,930 |
| 1/14/16 | 31 | 4,061 | $3,637 |
| 2/17/16 | 34 | 6,560 | $5,632 |
| 3/17/16 | 29 | 3,170 | $2,925 |
| 4/18/16 | 32 | 2,079 | $2,054 |
| 5/16/16 | 28 | 1,040 | $1,224 |
| 6/15/16 | 30 | 158 | $521 |
| 7/18/16 | 33 | 143 | $508 |
| 8/15/16 | 28 | 119 | $488 |
| 9/13/16 | 29 | 117 | $487 |
| 10/13/16 | 30 | 145 | $554 |
| 11/11/16 | 29 | 1,601 | $1,870 |
| **Totals** | **366** | **22,370** | **$22,830** |
| **Annual** | **365** | **22,309** | **$22,768** |

## 3.4 Benchmarking

This facility was benchmarked using Portfolio Manager®, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager® analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

The EUI is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy." Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

*Figure 13 - Energy Use Intensity Comparison – Existing Conditions*

| Energy Use Intensity Comparison - Existing Conditions | | |
|---|---|---|
| | Bradley Elementary School | National Median Building Type: School (K-12) |
| Source Energy Use Intensity (kBtu/ft$^2$) | 143.2 | 141.4 |
| Site Energy Use Intensity (kBtu/ft$^2$) | 63.7 | 58.2 |

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the table below:

*Figure 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures*

| Energy Use Intensity Comparison - Following Installation of Recommended Measures | | |
|---|---|---|
| | Bradley Elementary School | National Median Building Type: School (K-12) |
| Source Energy Use Intensity (kBtu/ft$^2$) | 114.3 | 141.4 |
| Site Energy Use Intensity (kBtu/ft$^2$) | 54.4 | 58.2 |

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 40.

A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance.

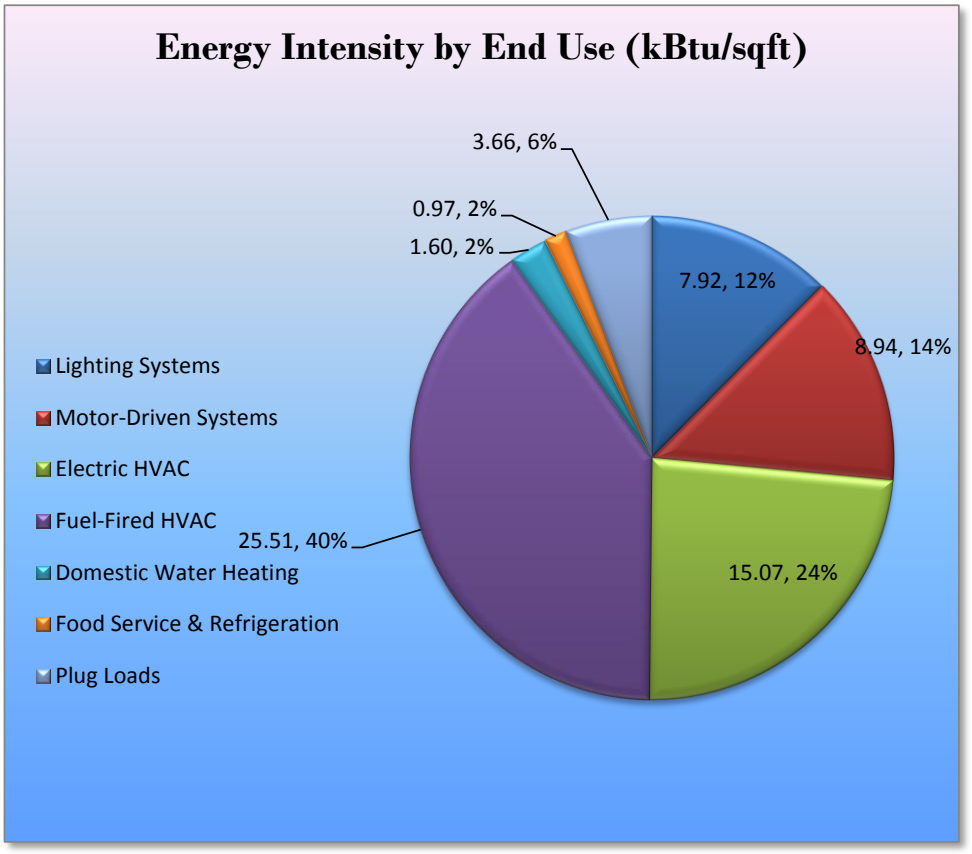
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager® account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager® regularly, so that you can keep track of your building's performance. Free online training is available to help you use ENERGY STAR® Portfolio Manager® to track your building's performance at: https://www.energystar.gov/buildings/training.

## 3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

*Figure 15 - Energy Balance (% and kBtu/SF)*



# 4 ENERGY CONSERVATION MEASURES

*Level of Analysis*

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Bradley Elementary School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

## 4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

*Figure 16 – Summary of Recommended ECMs*

| Energy Conservation Measure | | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($)* | Estimated Net Cost ($) | Simple Payback Period (yrs)** | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Lighting Upgrades** | | **130,633** | **33.5** | **0.0** | **$15,749.40** | **$83,398.06** | **$19,425.00** | **$63,973.06** | **4.1** | **131,547** |
| ECM 1 | Install LED Fixtures | 55,196 | 10.5 | 0.0 | $6,654.56 | $25,526.24 | $8,960.00 | $16,566.24 | 2.5 | 55,582 |
| ECM 2 | Retrofit Fixtures with LED Lamps | 75,437 | 23.1 | 0.0 | $9,094.84 | $57,871.82 | $10,465.00 | $47,406.82 | 5.2 | 75,965 |
| **Lighting Control Measures** | | **12,158** | **3.4** | **0.0** | **$1,465.77** | **$16,126.00** | **$2,065.00** | **$14,061.00** | **9.6** | **12,243** |
| ECM 3 | Install Occupancy Sensor Lighting Controls | 12,158 | 3.4 | 0.0 | $1,465.77 | $16,126.00 | $2,065.00 | $14,061.00 | 9.6 | 12,243 |
| **Variable Frequency Drive (VFD) Measures** | | **35,497** | **3.6** | **0.0** | **$4,279.61** | **$10,388.90** | **$0.00** | **$10,388.90** | **2.4** | **35,745** |
| ECM 4 | Install VFDs on Hot Water Pumps | 35,497 | 3.6 | 0.0 | $4,279.61 | $10,388.90 | $0.00 | $10,388.90 | 2.4 | 35,745 |
| **Electric Unitary HVAC Measures** | | **16,277** | **4.9** | **0.0** | **$1,962.44** | **$50,580.46** | **$2,615.00** | **$47,965.46** | **24.4** | **16,391** |
| ECM 5 | Install High Efficiency Electric AC | 16,277 | 4.9 | 0.0 | $1,962.44 | $50,580.46 | $2,615.00 | $47,965.46 | 24.4 | 16,391 |
| **HVAC System Improvements** | | **27,912** | **1.4** | **0.0** | **$3,365.09** | **$7,497.40** | **$250.00** | **$7,247.40** | **2.2** | **28,107** |
| ECM 6 | Install Programmable Thermostats | 21,879 | 0.0 | 0.0 | $2,637.77 | $6,597.40 | $0.00 | $6,597.40 | 2.5 | 22,032 |
| ECM 7 | Install Dual Enthalpy Outside Economizer Control | 6,033 | 1.4 | 0.0 | $727.32 | $900.00 | $250.00 | $650.00 | 0.9 | 6,075 |
| **TOTALS** | | **222,477** | **46.8** | **0.0** | **$26,822.31** | **$167,990.82** | **$24,355.00** | **$143,635.82** | **5.4** | **224,033** |

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

## 4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 17 below.

*Figure 17 – Summary of Lighting Upgrade ECMs*

| Energy Conservation Measure | | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Lighting Upgrades** | | **130,633** | **33.5** | **0.0** | **$15,749.40** | **$83,398.06** | **$19,425.00** | **$63,973.06** | **4.1** | **131,547** |
| ECM 1 | Install LED Fixtures | 55,196 | 10.5 | 0.0 | $6,654.56 | $25,526.24 | $8,960.00 | $16,566.24 | 2.5 | 55,582 |
| ECM 2 | Retrofit Fixtures with LED Lamps | 75,437 | 23.1 | 0.0 | $9,094.84 | $57,871.82 | $10,465.00 | $47,406.82 | 5.2 | 75,965 |

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

### ECM 1: Install LED Fixtures

*Summary of Measure Economics*

| Interior/ Exterior | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| Interior | 22,950 | 6.3 | 0.0 | $2,766.87 | $13,383.25 | $6,045.00 | $7,338.25 | 2.7 | 23,110 |
| Exterior | 32,246 | 4.2 | 0.0 | $3,887.68 | $12,142.98 | $2,915.00 | $9,227.98 | 2.4 | 32,472 |

*Measure Description*

We recommend replacing existing fixtures containing HID lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

## ECM 2: Retrofit Fixtures with LED Lamps

*Summary of Measure Economics*

| Interior/ Exterior | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| Interior | 75,437 | 23.1 | 0.0 | $9,094.84 | $57,871.82 | $10,465.00 | $47,406.82 | 5.2 | 75,965 |
| Exterior | 0 | 0.0 | 0.0 | $0.00 | $0.00 | $0.00 | $0.00 | 0.0 | 0 |

*Measure Description*

We recommend retrofitting existing incandescent, halogen, HID and fluorescent lighting technologies with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

## 4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 18 below.

*Figure 18 – Summary of Lighting Control ECMs*

| Energy Conservation Measure | | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Lighting Control Measures** | | **12,158** | **3.4** | **0.0** | **$1,465.77** | **$16,126.00** | **$2,065.00** | **$14,061.00** | **9.6** | **12,243** |
| ECM 3 | Install Occupancy Sensor Lighting Controls | 12,158 | 3.4 | 0.0 | $1,465.77 | $16,126.00 | $2,065.00 | $14,061.00 | 9.6 | 12,243 |

## ECM 3: Install Occupancy Sensor Lighting Controls

*Summary of Measure Economics*

| Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|
| 12,158 | 3.4 | 0.0 | $1,465.77 | $16,126.00 | $2,065.00 | $14,061.00 | 9.6 | 12,243 |

*Measure Description*

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, storage rooms, corridors, classrooms, offices areas, and the gym. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

## 4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 19 below.

*Figure 19 – Summary of Variable Frequency Drive ECMs*

| Energy Conservation Measure | | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Variable Frequency Drive (VFD) Measures** | | **35,497** | **3.6** | **0.0** | **$4,279.61** | **$10,388.90** | **$0.00** | **$10,388.90** | **2.4** | **35,745** |
| ECM 4 | Install VFDs on Hot Water Pumps | 35,497 | 3.6 | 0.0 | $4,279.61 | $10,388.90 | $0.00 | $10,388.90 | 2.4 | 35,745 |

### ECM 4: Install VFDs on Hot Water Pumps

*Summary of Measure Economics*

| Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|
| 35,497 | 3.6 | 0.0 | $4,279.61 | $10,388.90 | $0.00 | $10,388.90 | 2.4 | 35,745 |

*Measure Description*

We recommend installing a variable frequency drives (VFD) to control heating hot water pumps. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint.

Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

If the system contains 3-way valves, they will need to be replaced with 2-way valves to achieve the estimated savings. The cost associated with replacing 3-way valves is not currently included in the project economics.

## 4.1.4 Electric Unitary HVAC Measures

Our recommendations for unitary HVAC measures are summarized in Figure 20 below.

*Figure 20 - Summary of Unitary HVAC ECMs*

| Energy Conservation Measure | | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Electric Unitary HVAC Measures** | | **16,277** | **4.9** | **0.0** | **$1,962.44** | **$50,580.46** | **$2,615.00** | **$47,965.46** | **24.4** | **16,391** |
| ECM 5 | Install High Efficiency Electric AC | 16,277 | 4.9 | 0.0 | $1,962.44 | $50,580.46 | $2,615.00 | $47,965.46 | 24.4 | 16,391 |

### ECM 5: Install High Efficiency Air Conditioning Units

*Summary of Measure Economics*

| Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|
| 16,277 | 4.9 | 0.0 | $1,962.44 | $50,580.46 | $2,615.00 | $47,965.46 | 24.4 | 16,391 |

*Measure Description*

We recommend replacing standard efficiency packaged split system air conditioning units with similarly-sized high efficiency packaged air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units.

We found multiple rooftop units that were at the end of their rated useful lifetime and could be cost-effectively upgrades with new high efficiency units. There was one 20-ton McQuay packaged AC unit, one 4-ton Trane split AC unit, and five mini-split system AC units (three York AC units, 1.5 tons each, and two Airedale AC units). To maximize energy savings, we recommend replacing each of the AC units with the highest efficiency units of similar size and type. The estimated sizes and efficiency ratings for each of the proposed upgrades is shown in Appendix A.

A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

## 4.1.5 HVAC System Upgrades

Our recommendation for HVAC system improvement are summarized in Figure 21 below.

*Figure 21 - Summary of HVAC System Improvement ECMs*

| Energy Conservation Measure | | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|
| **HVAC System Improvements** | | **27,912** | **1.4** | **0.0** | **$3,365.09** | **$7,497.40** | **$250.00** | **$7,247.40** | **2.2** | **28,107** |
| ECM 6 | Install Programmable Thermostats | 21,879 | 0.0 | 0.0 | $2,637.77 | $6,597.40 | $0.00 | $6,597.40 | 2.5 | 22,032 |
| ECM 7 | Install Dual Enthalpy Outside Economizer Control | 6,033 | 1.4 | 0.0 | $727.32 | $900.00 | $250.00 | $650.00 | 0.9 | 6,075 |

### ECM 6: Install Programmable Thermostats

*Summary of Measure Economics*

| Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|
| 21,879 | 0.0 | 0.0 | $2,637.77 | $6,597.40 | $0.00 | $6,597.40 | 2.5 | 22,032 |

*Measure Description*

We recommend replacing manual thermostats with programmable thermostats and ensuring the air conditioning systems are turn off when the school is unoccupied. Manual thermostats are generally adjusted to a single heating and cooling setpoint and left at that setting regardless of occupancy in the area served by the HVAC equipment. As a result, the same level of heating and cooling is provided regardless of the occupancy in the space.

Programmable thermostats can be set to maintain different temperature settings for different times of day and for different days of the week. By reducing heating temperature setpoints and raising cooling temperature setpoints when space are unoccupied, the operation of the HVAC equipment is reduced while still maintaining reasonable space temperatures for building usage at all times.

Programmable thermostats provide energy savings by reducing heating and cooling energy usage when a room is unoccupied.

When the school is closed for prolonged periods the HVAC systems should be turned off.

Some of the newer models of programmable thermostats on the market today allow multiple HVAC operation schedules to be programmed for each zone. Many new models also offer the ability monitor system usage and zone temperatures remotely via the internet and easily reset or manually override programming whenever there is a need to do so.

## ECM 7: Install Dual-Enthalpy Economizers

*Summary of Measure Economics*

| Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|
| 6,033 | 1.4 | 0.0 | $727.32 | $900.00 | $250.00 | $650.00 | 0.9 | 6,075 |

*Measure Description*

Dual-enthalpy economizers are used to control a ventilation system's outside air intake in order to reduce a facility's total cooling load. A dual-enthalpy economizer monitors the air temperature and humidity of both the outside and return air. The control supplies the lowest energy (temperature and humidity) air to the air handling system. When outside air conditions allow, outside air can be used for cooling instead of running the air handling system's compressor. This reduces the demand on the cooling system, lowering its usage hours and saving energy.

Savings result from using outside air instead of mechanical cooling when outside air conditions permit.

When installing new high efficiency air conditioning Units ensure they contain dual enthalpy economizers. We recommend that the new rooftop unit proposed to replace the 20-ton McQuay package AC system, include a dual enthalpy economizer that is programmed to provide cool air from outside when weather conditions permit.

# 5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

## Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

## Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

## Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

## Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

## Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

## Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

## Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

## Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

## Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products ) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gallons per minute (gpm) for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

# 6 On-Site Generation Measures

On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

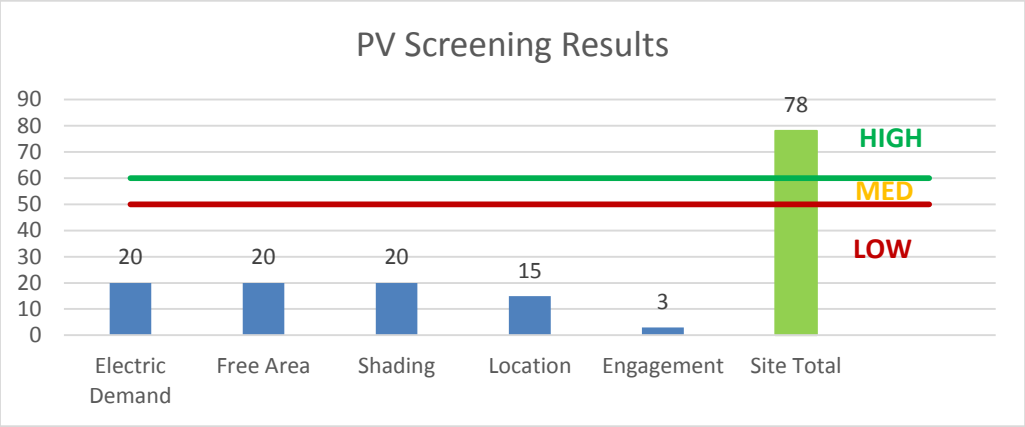
## 6.1 Photovoltaic

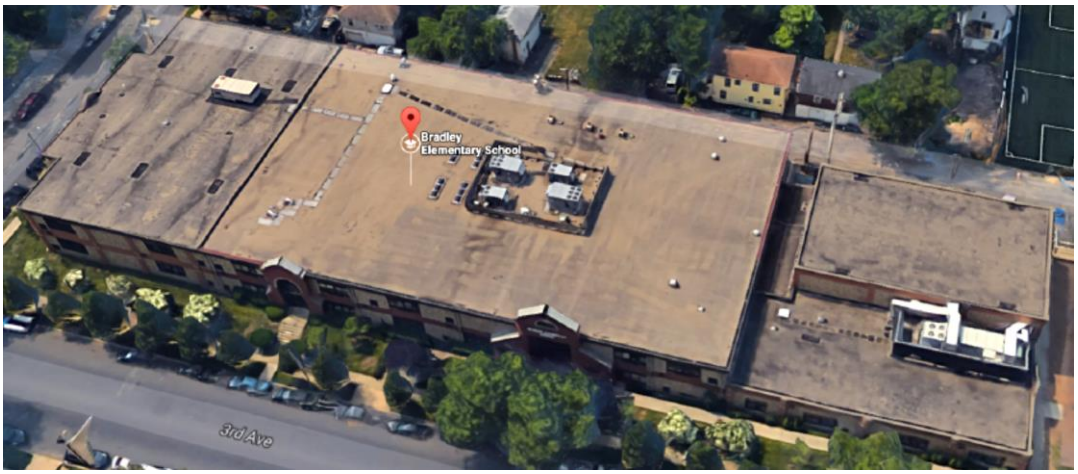
Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a **High Potential** for cost-effective installation of a solar PV array.

The amount of free roof area, ease of installation, and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof may be feasible. If Bradley Elementary School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

***Figure 22 - Photovoltaic Screening***




| | | |
|---|---|---|
| **Potential** | High | |
| **System Potential** | 226 | kW DC STC |
| **Electric Generation** | 269,250 | kWh/yr |
| **Displaced Cost** | $23,420 | /yr |
| **Installed Cost** | $646,400 | |

From the aerial photo of Bradley Elementary School shown above, we estimate that the school's rooftop has ample unshaded space available that could likely support a solar PV array. We estimate that there is enough available space to install up to 226 kW of PV generating capacity. Such an array on this site could likely generate enough power to offset over 30% of the school's annual electric purchases from the grid. With financial support from the state's SREC (Solar Renewable Energy Certificate) Registration Program (SRP) such projects often pay for themselves in energy savings and sale of renewable energy credits in approximately 8 years, or less.

Solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.3 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

## 6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a **Low Potential** for installing a cost-effective CHP system.

The low and infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the low potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.

# 7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

Bradley Elementary school does **not** appear to meet the necessary requirements to be eligible to participate in a demand response program.

# 8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 23 for a list of the eligible programs identified for each recommended ECM.

*Figure 23 - ECM Incentive Program Eligibility*

| Energy Conservation Measure | | SmartStart Prescriptive | SmartStart Custom | Direct Install | Pay For Performance Existing Buildings |
|---|---|---|---|---|---|
| ECM 1 | Install LED Fixtures | x | | | x |
| ECM 2 | Retrofit Fixtures with LED Lamps | x | | | x |
| ECM 3 | Install Occupancy Sensor Lighting Controls | x | | | x |
| ECM 4 | Install VFDs on Hot Water Pumps | x | | | x |
| ECM 5 | Install High Efficiency Electric AC | x | | | x |
| ECM 6 | Install Programmable Thermostats | | | | x |
| ECM 7 | Install Dual Enthalpy Outside Economizer Control | x | | | x |

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci.

## 8.1 SmartStart

**Overview**

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

**Equipment with Prescriptive Incentives Currently Available:**

*Electric Chillers*
*Electric Unitary HVAC*
*Gas Cooling*
*Gas Heating*
*Gas Water Heating*
*Ground Source Heat Pumps*
*Lighting*
*Lighting Controls*
*Refrigeration Doors*
*Refrigeration Controls*
*Refrigerator/Freezer Motors*
*Food Service Equipment*
*Variable Frequency Drives*

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

**Incentives**

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the retrofit incentives have been applied in this report. Custom measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

**How to Participate**

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB.

## 8.2 Pay for Performance - Existing Buildings

**Overview**

The Pay for Performance – Existing Buildings (P4P EB) program is designed for larger customers with a peak demand over 200 kW in any of the preceding 12 months. Under this program the minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings. P4P is a generally a good option for medium to large sized facilities looking to implement as many measures as possible under a single project in order to achieve deep energy savings. This program has an added benefit of evaluating a broad spectrum of measures that may not otherwise qualify under other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also utilize the P4P program.

**Incentives**

Incentives are calculated based on estimated and achieved energy savings ranging from $0.18-$0.22/kWh and $1.80-$2.50/therm, capped at the lesser of 50% total project cost, or $1 million per electric account and $1 million per natural gas account, per fiscal year, not to exceed $2 million per project. An incentive of $0.15/square foot is also available to offset the cost of developing the Energy Reduction Plan (see below) contingent on the project moving forward with measure installation.

**How to Participate**

To participate in the P4B EB program you will need to contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, the Partner will help further evaluate the measures identified in this report through development of the Energy Reduction Plan (ERP), assist you in implementing selected measures, and verify actual savings one year after the installation. At each of these three milestones your Partner will also facilitate securing program incentives.

Approval of the final scope of work is required by the program prior to installation completion. Although installation can be accomplished by a contractor of your choice (some P4P Partners are also contractors) or by internal personnel, the Partner must remain involved to ensure compliance with the program guidelines and requirements.

Detailed program descriptions, instructions for applying, applications and list of Partners can be found at: www.njcleanenergy.com/P4P.

## 8.3 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec.

## 8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO."
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP.

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

# 9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

## 9.1 Retail Electric Supply Options

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 deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third-party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third-party electric suppliers. If your facility is purchasing electricity from a third-party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third-party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

## 9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third-party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third-party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third-party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third-party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

# Appendix A: Equipment Inventory & Recommendations

## Lighting Inventory & Recommendations

| | Existing Conditions | | | | | Proposed Conditions | | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Fixture Recommendation | Add Controls? | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Boiler Rm | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 2,090 | 0.26 | 952 | 0.0 | $114.75 | $702.00 | $120.00 | 5.07 |
| Exit Sign | 45 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 45 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| All Purpose Rm | 24 | Linear Fluorescent - T5: 4' T5 (28W) - 3L | Wall Switch | 90 | 2,090 | Relamp | Yes | 24 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 0.94 | 3,435 | 0.0 | $414.14 | $2,884.80 | $500.00 | 5.76 |
| All Purpose Rm | 20 | High-Pressure Sodium: (1) 250W Lamp | Wall Switch | 295 | 2,090 | Fixture Replacement | Yes | 20 | LED - Fixtures: Low-Bay | Occupancy Sensor | 75 | 1,463 | 3.18 | 11,657 | 0.0 | $1,405.39 | $5,471.60 | $3,035.00 | 1.73 |
| Kitchen Back Hall | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | No | 3 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 2,090 | 0.06 | 238 | 0.0 | $28.69 | $175.50 | $30.00 | 5.07 |
| Kitchen | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | No | 9 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 2,090 | 0.19 | 714 | 0.0 | $86.06 | $526.50 | $90.00 | 5.07 |
| Kitchen Restroom | 2 | Compact Fluorescent: 13W CFL - 2L Pin | Occupancy Sensor | 26 | 1,200 | Relamp | No | 2 | LED Screw-In Lamps: 5W LED Lamp | Occupancy Sensor | 9 | 1,200 | 0.02 | 47 | 0.0 | $5.66 | $215.01 | $0.00 | 38.01 |
| Dry Storage | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 500 | 0.04 | 38 | 0.0 | $4.58 | $117.00 | $20.00 | 21.20 |
| Kitchen Office | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,890 | Relamp | Yes | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,323 | 0.05 | 181 | 0.0 | $21.85 | $233.00 | $40.00 | 8.83 |
| Elect / Storage Rm | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 400 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 400 | 0.04 | 30 | 0.0 | $3.66 | $117.00 | $20.00 | 26.50 |
| Stage | 12 | Halogen Incandescent: 120W - 1L | Wall Switch | 120 | 2,090 | Relamp | No | 12 | LED Screw-In Lamps: 36W Lamp | Wall Switch | 36 | 2,090 | 0.66 | 2,423 | 0.0 | $292.09 | $645.04 | $60.00 | 2.00 |
| Gym | 20 | Metal Halide: (1) 250W Lamp | Wall Switch | 295 | 2,090 | Fixture Replacement | Yes | 20 | LED - Fixtures: Low-Bay | Occupancy Sensor | 89 | 1,463 | 3.06 | 11,203 | 0.0 | $1,350.62 | $6,551.60 | $3,140.00 | 2.53 |
| Gym Storage 1 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 600 | Relamp | Yes | 6 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 420 | 0.16 | 173 | 0.0 | $20.81 | $621.00 | $95.00 | 25.27 |
| Gym Office | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 1,890 | Relamp | Yes | 4 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,323 | 0.16 | 544 | 0.0 | $65.56 | $416.80 | $80.00 | 5.14 |
| Girls Locker Office | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 2,090 | Relamp | Yes | 4 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 0.16 | 601 | 0.0 | $72.50 | $840.80 | $130.00 | 9.80 |
| Gym Storage 2 | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 600 | Relamp | No | 4 | LED - Linear Tubes: (3) 4' Lamps | Wall Switch | 44 | 600 | 0.13 | 137 | 0.0 | $16.47 | $300.80 | $60.00 | 14.62 |
| 1st Fl Corridor | 20 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 2,090 | Relamp | Yes | 20 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 0.82 | 3,007 | 0.0 | $362.50 | $2,584.00 | $440.00 | 5.91 |
| Music Rm | 20 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 20 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.55 | 2,005 | 0.0 | $241.67 | $1,710.00 | $270.00 | 5.96 |
| Music Rm Storage | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,000 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,000 | 0.04 | 76 | 0.0 | $9.15 | $117.00 | $20.00 | 10.60 |
| Boys Rm | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 2,090 | Relamp | Yes | 2 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 0.08 | 301 | 0.0 | $36.25 | $420.40 | $65.00 | 9.80 |
| Girls Rm | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 2,090 | Relamp | Yes | 2 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 0.08 | 301 | 0.0 | $36.25 | $420.40 | $65.00 | 9.80 |
| Art Rm | 18 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 2,090 | Relamp | Yes | 18 | LED - Linear Tubes: (4) 4' Lamps | Occupancy Sensor | 58 | 1,463 | 0.87 | 3,176 | 0.0 | $382.84 | $2,252.40 | $430.00 | 4.76 |
| Art Rm Storage | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 600 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 600 | 0.04 | 46 | 0.0 | $5.49 | $117.00 | $20.00 | 17.67 |
| Custodial Closet | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 500 | 0.04 | 38 | 0.0 | $4.58 | $117.00 | $20.00 | 21.20 |
| Class Rm 100 | 14 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 14 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.38 | 1,403 | 0.0 | $169.17 | $1,359.00 | $210.00 | 6.79 |

| | Existing Conditions | | | | | Proposed Conditions | | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Fixture Recommendation | Add Controls? | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Class Rm 100 Storage | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 500 | 0.04 | 38 | 0.0 | $4.58 | $117.00 | $20.00 | 21.20 |
| Front Entrance | 3 | Metal Halide: (1) 250W Lamp | Wall Switch | 295 | 4,380 | Fixture Replacement | No | 3 | LED - Fixtures: Downlight Recessed | Wall Switch | 89 | 4,380 | 0.41 | 3,120 | 0.0 | $376.20 | $813.35 | $15.00 | 2.12 |
| Front Entrance Alcove | 3 | Metal Halide: (1) 250W Lamp | Wall Switch | 295 | 2,090 | Fixture Replacement | No | 3 | LED - Fixtures: Downlight Recessed | Wall Switch | 89 | 2,090 | 0.41 | 1,489 | 0.0 | $179.51 | $813.35 | $15.00 | 4.45 |
| Foyer | 6 | Metal Halide: (1) 70W Lamp | Wall Switch | 95 | 2,090 | Fixture Replacement | No | 6 | LED - Fixtures: Downlight Recessed | Wall Switch | 29 | 2,090 | 0.26 | 959 | 0.0 | $115.62 | $1,626.70 | $30.00 | 13.81 |
| 1st Fl Corridor | 15 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 15 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.41 | 1,503 | 0.0 | $181.25 | $877.50 | $150.00 | 4.01 |
| 1st Fl Corridor | 41 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 2,090 | Relamp | Yes | 41 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 1.68 | 6,164 | 0.0 | $743.13 | $5,243.20 | $895.00 | 5.85 |
| Storage | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 600 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 600 | 0.04 | 46 | 0.0 | $5.49 | $117.00 | $20.00 | 17.67 |
| Class Rm 101 | 17 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 17 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.46 | 1,704 | 0.0 | $205.42 | $1,534.50 | $240.00 | 6.30 |
| Class Rm 101 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.03 | 100 | 0.0 | $12.08 | $174.50 | $10.00 | 13.61 |
| Water Meter Rm | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,463 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.02 | 56 | 0.0 | $6.69 | $58.50 | $10.00 | 7.25 |
| Main Office | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,890 | Relamp | Yes | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,323 | 0.33 | 1,088 | 0.0 | $131.13 | $972.00 | $155.00 | 6.23 |
| Principals Office | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,890 | Relamp | Yes | 6 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,323 | 0.16 | 544 | 0.0 | $65.56 | $621.00 | $95.00 | 8.02 |
| Supply Rm | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,463 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.04 | 111 | 0.0 | $13.39 | $117.00 | $20.00 | 7.25 |
| Main Office Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.03 | 100 | 0.0 | $12.08 | $174.50 | $10.00 | 13.61 |
| VP Office | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,890 | Relamp | Yes | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,323 | 0.05 | 181 | 0.0 | $21.85 | $233.00 | $40.00 | 8.83 |
| Server Closet | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 600 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 600 | 0.04 | 46 | 0.0 | $5.49 | $117.00 | $20.00 | 17.67 |
| Nurse Office | 7 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | No | 7 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 2,090 | 0.15 | 555 | 0.0 | $66.94 | $409.50 | $70.00 | 5.07 |
| Nurse Restroom | 1 | Compact Fluorescent: 13W CFL - 2L Pin | Wall Switch | 26 | 2,090 | Relamp | Yes | 1 | LED Screw-In Lamps: 5W LED Lamp | Occupancy Sensor | 9 | 1,463 | 0.01 | 47 | 0.0 | $5.71 | $223.51 | $0.00 | 39.15 |
| Nurse Inner Office | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.05 | 200 | 0.0 | $24.17 | $233.00 | $40.00 | 7.99 |
| Class Rm 102 | 13 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,500 | Relamp | No | 13 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,500 | 0.28 | 740 | 0.0 | $89.22 | $760.50 | $130.00 | 7.07 |
| Class Rm 102 Storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 500 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 500 | 0.02 | 19 | 0.0 | $2.29 | $58.50 | $10.00 | 21.20 |
| Class Rm 102 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,200 | 0.02 | 46 | 0.0 | $5.49 | $58.50 | $10.00 | 8.83 |
| Class Rm 115 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.33 | 1,203 | 0.0 | $145.00 | $972.00 | $155.00 | 5.63 |
| Class Rm 115 Restroom | 1 | Compact Fluorescent: 13W CFL - 2L Pin | Wall Switch | 26 | 2,090 | Relamp | Yes | 1 | LED Screw-In Lamps: 5W LED Lamp | Occupancy Sensor | 9 | 1,463 | 0.01 | 47 | 0.0 | $5.71 | $223.51 | $0.00 | 39.15 |
| Class Rm 103 | 13 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,500 | Relamp | No | 13 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,500 | 0.28 | 740 | 0.0 | $89.22 | $760.50 | $130.00 | 7.07 |

| | Existing Conditions | | | | | Proposed Conditions | | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Fixture Recommendation | Add Controls? | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Class Rm 103 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,200 | 0.02 | 46 | 0.0 | $5.49 | $58.50 | $10.00 | 8.83 |
| Class Rm 103 Storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 500 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 500 | 0.02 | 19 | 0.0 | $2.29 | $58.50 | $10.00 | 21.20 |
| Class Rm 114 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,500 | 0.26 | 683 | 0.0 | $82.36 | $702.00 | $120.00 | 7.07 |
| Class Rm 114 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,200 | 0.02 | 46 | 0.0 | $5.49 | $58.50 | $10.00 | 8.83 |
| Class Rm 107 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,500 | 0.26 | 683 | 0.0 | $82.36 | $702.00 | $120.00 | 7.07 |
| Class Rm 107 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,200 | 0.02 | 46 | 0.0 | $5.49 | $58.50 | $10.00 | 8.83 |
| Class Rm 110 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,500 | 0.26 | 683 | 0.0 | $82.36 | $702.00 | $120.00 | 7.07 |
| Class Rm 110 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,200 | 0.02 | 46 | 0.0 | $5.49 | $58.50 | $10.00 | 8.83 |
| Class Rm 111 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,500 | 0.26 | 683 | 0.0 | $82.36 | $702.00 | $120.00 | 7.07 |
| Class Rm 111 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,200 | 0.02 | 46 | 0.0 | $5.49 | $58.50 | $10.00 | 8.83 |
| Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,200 | 0.02 | 46 | 0.0 | $5.49 | $58.50 | $10.00 | 8.83 |
| Storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,000 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,000 | 0.02 | 38 | 0.0 | $4.58 | $58.50 | $10.00 | 10.60 |
| Class Rm 104 | 13 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,500 | Relamp | No | 13 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,500 | 0.28 | 740 | 0.0 | $89.22 | $760.50 | $130.00 | 7.07 |
| Class Rm 104 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,200 | 0.02 | 46 | 0.0 | $5.49 | $58.50 | $10.00 | 8.83 |
| Class Rm 104 Storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 500 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 500 | 0.02 | 19 | 0.0 | $2.29 | $58.50 | $10.00 | 21.20 |
| Class Rm 105 | 13 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,500 | Relamp | No | 13 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,500 | 0.42 | 1,110 | 0.0 | $133.83 | $977.60 | $195.00 | 5.85 |
| Class Rm 105 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,200 | 0.03 | 68 | 0.0 | $8.24 | $75.20 | $15.00 | 7.31 |
| Class Rm 105 Storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 500 | Relamp | No | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 500 | 0.03 | 28 | 0.0 | $3.43 | $75.20 | $15.00 | 17.54 |
| Class Rm 106 | 13 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,500 | Relamp | No | 13 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,500 | 0.42 | 1,110 | 0.0 | $133.83 | $977.60 | $195.00 | 5.85 |
| Class Rm 106 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,200 | 0.03 | 68 | 0.0 | $8.24 | $75.20 | $15.00 | 7.31 |
| Class Rm 106 Storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 500 | Relamp | No | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 500 | 0.03 | 28 | 0.0 | $3.43 | $75.20 | $15.00 | 17.54 |
| Class Rm 106 | 13 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,500 | Relamp | No | 13 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,500 | 0.42 | 1,110 | 0.0 | $133.83 | $977.60 | $195.00 | 5.85 |
| Class Rm 106 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,200 | 0.03 | 68 | 0.0 | $8.24 | $75.20 | $15.00 | 7.31 |
| Class Rm 106 Storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 500 | Relamp | No | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 500 | 0.03 | 28 | 0.0 | $3.43 | $75.20 | $15.00 | 17.54 |
| Science Rm 113 | 14 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,463 | Relamp | No | 14 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 0.45 | 1,166 | 0.0 | $140.57 | $1,052.80 | $210.00 | 6.00 |

| | Existing Conditions | | | | | Proposed Conditions | | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Fixture Recommendation | Add Controls? | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Class Rm 108 | 14 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,500 | Relamp | No | 14 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,500 | 0.45 | 1,195 | 0.0 | $144.12 | $1,052.80 | $210.00 | 5.85 |
| Class Rm 108 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,200 | 0.03 | 68 | 0.0 | $8.24 | $75.20 | $15.00 | 7.31 |
| Class Rm 108 Storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 500 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 500 | 0.02 | 19 | 0.0 | $2.29 | $58.50 | $10.00 | 21.20 |
| Elect Rm | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 400 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 400 | 0.02 | 15 | 0.0 | $1.83 | $58.50 | $10.00 | 26.50 |
| Speech Therpy | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,463 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.04 | 111 | 0.0 | $13.39 | $117.00 | $20.00 | 7.25 |
| Class Rm 12 | 13 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,500 | Relamp | No | 13 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,500 | 0.28 | 740 | 0.0 | $89.22 | $760.50 | $130.00 | 7.07 |
| Class Rm 12 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,200 | 0.02 | 46 | 0.0 | $5.49 | $58.50 | $10.00 | 8.83 |
| Mens / Womens Rm | 4 | Compact Fluorescent: 13W CFL - 2L Pin | Occupancy Sensor | 26 | 1,463 | Relamp | No | 4 | LED Screw-In Lamps: 5W LED Lamp | Occupancy Sensor | 5 | 1,463 | 0.06 | 141 | 0.0 | $17.04 | $430.02 | $0.00 | 25.24 |
| Boys/Girls Rm | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,463 | Relamp | No | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.09 | 222 | 0.0 | $26.77 | $234.00 | $40.00 | 7.25 |
| Custodial Closet | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 500 | Relamp | No | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 500 | 0.09 | 76 | 0.0 | $9.15 | $234.00 | $40.00 | 21.20 |
| Stairway 1 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 8,760 | Relamp | No | 2 | LED - Linear Tubes: (4) 4' Lamps | Wall Switch | 58 | 8,760 | 0.07 | 1,128 | 0.0 | $136.03 | $190.27 | $40.00 | 1.10 |
| Stairway 1 | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 8,760 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 8,760 | 0.02 | 332 | 0.0 | $40.08 | $58.50 | $10.00 | 1.21 |
| Class Rm 200 | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 9 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.25 | 902 | 0.0 | $108.75 | $796.50 | $125.00 | 6.17 |
| 2x Server Closet | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 500 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 500 | 0.02 | 19 | 0.0 | $2.29 | $58.50 | $10.00 | 21.20 |
| Class Rm 201 | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,500 | Relamp | No | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,500 | 0.09 | 228 | 0.0 | $27.45 | $234.00 | $40.00 | 7.07 |
| 2nd Fl Corridor | 26 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 26 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.71 | 2,606 | 0.0 | $314.17 | $1,521.00 | $295.00 | 3.90 |
| 2nd Fl Corridor | 41 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 2,090 | Relamp | Yes | 41 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 1.68 | 6,164 | 0.0 | $743.13 | $5,243.20 | $895.00 | 5.85 |
| Copy Rm | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 2,090 | Relamp | Yes | 2 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 0.08 | 301 | 0.0 | $36.25 | $266.40 | $50.00 | 5.97 |
| Office 224 | 8 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,463 | Relamp | No | 8 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 0.26 | 666 | 0.0 | $80.32 | $601.60 | $120.00 | 6.00 |
| Office 224 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,200 | 0.02 | 46 | 0.0 | $5.49 | $58.50 | $10.00 | 8.83 |
| Office 225 | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 3 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.08 | 301 | 0.0 | $36.25 | $291.50 | $50.00 | 6.66 |
| Commputer Class 217 | 15 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,500 | Relamp | No | 15 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,500 | 0.32 | 854 | 0.0 | $102.94 | $877.50 | $150.00 | 7.07 |
| Class 217 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,200 | 0.02 | 46 | 0.0 | $5.49 | $58.50 | $10.00 | 8.83 |
| Class Rm 214 | 18 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 18 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.49 | 1,804 | 0.0 | $217.50 | $1,593.00 | $250.00 | 6.17 |
| Early Child | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 3 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.08 | 301 | 0.0 | $36.25 | $291.50 | $50.00 | 6.66 |

| | Existing Conditions | | | | | Proposed Conditions | | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Fixture Recommendation | Add Controls? | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,200 | 0.02 | 46 | 0.0 | $5.49 | $58.50 | $10.00 | 8.83 |
| AV Office | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,463 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.04 | 111 | 0.0 | $13.39 | $117.00 | $20.00 | 7.25 |
| Secretary Office | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,890 | Relamp | No | 2 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,890 | 0.06 | 215 | 0.0 | $25.94 | $150.40 | $30.00 | 4.64 |
| Library & Offices | 50 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,890 | Relamp | No | 50 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,890 | 1.08 | 3,586 | 0.0 | $432.37 | $2,925.00 | $500.00 | 5.61 |
| Class Rm 213 | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 9 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.25 | 902 | 0.0 | $108.75 | $796.50 | $125.00 | 6.17 |
| Class Rm 212 | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 9 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.25 | 902 | 0.0 | $108.75 | $796.50 | $125.00 | 6.17 |
| Class Rm 211 | 11 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 11 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.30 | 1,102 | 0.0 | $132.92 | $1,183.50 | $180.00 | 7.55 |
| Class Rm 220 | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 9 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.25 | 902 | 0.0 | $108.75 | $796.50 | $125.00 | 6.17 |
| Supply Closet | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 500 | Relamp | No | 2 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 500 | 0.06 | 57 | 0.0 | $6.86 | $150.40 | $30.00 | 17.54 |
| Office 218 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,463 | Relamp | No | 2 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 0.06 | 167 | 0.0 | $20.08 | $150.40 | $30.00 | 6.00 |
| Class Rm 210 | 14 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,500 | Relamp | No | 14 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,500 | 0.45 | 1,195 | 0.0 | $144.12 | $1,052.80 | $210.00 | 5.85 |
| Class Rm 210 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,200 | 0.03 | 68 | 0.0 | $8.24 | $75.20 | $15.00 | 7.31 |
| Class Rm 210 Storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 200 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 200 | 0.02 | 8 | 0.0 | $0.92 | $58.50 | $10.00 | 53.00 |
| Class Rm 209 | 18 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,500 | Relamp | No | 18 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,500 | 0.58 | 1,537 | 0.0 | $185.30 | $1,353.60 | $270.00 | 5.85 |
| Class Rm 209 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,200 | 0.03 | 68 | 0.0 | $8.24 | $75.20 | $15.00 | 7.31 |
| Class Rm 209 Storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 500 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 500 | 0.02 | 19 | 0.0 | $2.29 | $58.50 | $10.00 | 21.20 |
| 2x Custodial Closet | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 500 | 0.04 | 38 | 0.0 | $4.58 | $117.00 | $20.00 | 21.20 |
| Class Rm 208 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,500 | Relamp | No | 12 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,500 | 0.39 | 1,025 | 0.0 | $123.53 | $902.40 | $180.00 | 5.85 |
| Class Rm 208 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,200 | 0.03 | 68 | 0.0 | $8.24 | $75.20 | $15.00 | 7.31 |
| Boys/Girls Rm | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,463 | Relamp | No | 6 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 0.19 | 500 | 0.0 | $60.24 | $451.20 | $90.00 | 6.00 |
| Stairway 3 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 8,760 | Relamp | No | 5 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 8,760 | 0.16 | 2,493 | 0.0 | $300.60 | $376.00 | $75.00 | 1.00 |
| Class Rm 206 | 14 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,500 | Relamp | No | 14 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,500 | 0.45 | 1,195 | 0.0 | $144.12 | $1,052.80 | $210.00 | 5.85 |
| Class Rm 206 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,200 | 0.03 | 68 | 0.0 | $8.24 | $75.20 | $15.00 | 7.31 |
| Class Rm 206 Storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 500 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 500 | 0.02 | 19 | 0.0 | $2.29 | $58.50 | $10.00 | 21.20 |
| Class Rm 205 | 14 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,500 | Relamp | No | 14 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,500 | 0.45 | 1,195 | 0.0 | $144.12 | $1,052.80 | $210.00 | 5.85 |

| | Existing Conditions | | | | | Proposed Conditions | | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Fixture Recommendation | Add Controls? | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Class Rm 205 Restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,200 | Relamp | No | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,200 | 0.03 | 68 | 0.0 | $8.24 | $75.20 | $15.00 | 7.31 |
| Class Rm 205 Storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 500 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 500 | 0.02 | 19 | 0.0 | $2.29 | $58.50 | $10.00 | 21.20 |
| Office 219 | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,463 | Relamp | No | 9 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,463 | 0.29 | 750 | 0.0 | $90.36 | $676.80 | $135.00 | 6.00 |
| Class Rm 204 | 13 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,500 | Relamp | No | 13 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,500 | 0.28 | 740 | 0.0 | $89.22 | $760.50 | $130.00 | 7.07 |
| Stairway 2 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 8,760 | Relamp | No | 2 | LED - Linear Tubes: (4) 4' Lamps | Wall Switch | 58 | 8,760 | 0.07 | 1,128 | 0.0 | $136.03 | $190.27 | $40.00 | 1.10 |
| Class Rm 203 | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 9 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.25 | 902 | 0.0 | $108.75 | $796.50 | $125.00 | 6.17 |
| Class Rm 202 | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 9 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.25 | 902 | 0.0 | $108.75 | $796.50 | $125.00 | 6.17 |
| Custodial Closet | 1 | Compact Fluorescent: 13W CFL - 2L Pin | Occupancy Sensor | 26 | 500 | Relamp | No | 1 | LED Screw-In Lamps: 5W LED Lamp | Occupancy Sensor | 5 | 500 | 0.01 | 12 | 0.0 | $1.46 | $107.51 | $0.00 | 73.85 |
| Boys/Girls Rm | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,090 | Relamp | Yes | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,463 | 0.11 | 401 | 0.0 | $48.33 | $504.00 | $75.00 | 8.88 |
| Elect Rm | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 500 | 0.04 | 38 | 0.0 | $4.58 | $117.00 | $20.00 | 21.20 |
| Stairway 2 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 8,760 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 8,760 | 0.04 | 665 | 0.0 | $80.16 | $117.00 | $20.00 | 1.21 |
| Building Perimeter | 23 | High-Pressure Sodium: (1) 250W Lamp | None | 295 | 4,380 | Fixture Replacement | No | 23 | LED - Fixtures: Outdoor Wall-Mounted Area Fixture | None | 75 | 4,380 | 3.32 | 25,487 | 0.0 | $3,072.79 | $8,985.57 | $2,300.00 | 2.18 |
| Building Perimeter | 1 | Metal Halide: (1) 400W Lamp | None | 458 | 4,380 | Fixture Replacement | No | 1 | LED - Fixtures: Outdoor Wall-Mounted Area Fixture | None | 137 | 4,380 | 0.21 | 1,615 | 0.0 | $194.69 | $390.68 | $100.00 | 1.49 |
| Building Doorway | 2 | Metal Halide: (1) 70W Lamp | None | 95 | 4,380 | Fixture Replacement | No | 2 | LED - Fixtures: Outdoor Wall-Mounted Area Fixture | None | 29 | 4,380 | 0.09 | 670 | 0.0 | $80.77 | $781.35 | $200.00 | 7.20 |
| Building Perimeter | 3 | Metal Halide: (1) 100W Lamp | None | 128 | 4,380 | Fixture Replacement | No | 3 | LED - Fixtures: Outdoor Wall-Mounted Area Fixture | None | 38 | 4,380 | 0.18 | 1,354 | 0.0 | $163.23 | $1,172.03 | $300.00 | 5.34 |

## Motor Inventory & Recommendations

| | | Existing Conditions | | | | | | Proposed Conditions | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Area(s)/System(s) Served | Motor Quantity | Motor Application | HP Per Motor | Full Load Efficiency | VFD Control? | Annual Operating Hours | Install High Efficiency Motors? | Full Load Efficiency | Install VFDs? | Number of VFDs | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Boiler Rm | Boiler Draft Fans | 2 | Combustion Air Fan | 2.0 | 84.0% | No | 2,745 | No | 84.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Boiler Rm | HHW Pumps | 2 | Heating Hot Water Pump | 15.0 | 93.0% | No | 3,391 | No | 93.0% | Yes | 2 | 3.63 | 35,497 | 0.0 | $4,279.61 | $10,388.90 | $0.00 | 2.43 |
| Roof | Various | 15 | Exhaust Fan | 0.5 | 82.5% | No | 8,760 | No | 82.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Mech Space | Split System Evap Fans | 3 | Supply Fan | 0.3 | 82.5% | No | 2,745 | No | 82.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Mech Space | Gym ERU SF | 1 | Supply Fan | 20.0 | 91.0% | No | 3,391 | No | 91.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Mech Space | Gym ERU EX | 1 | Exhaust Fan | 15.0 | 91.0% | No | 3,391 | No | 91.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Classrooms | Classrooms HVAC | 28 | Supply Fan | 0.5 | 82.5% | No | 2,745 | No | 82.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | RTU 1C - Carrier 50PM-C28 | 1 | Supply Fan | 7.5 | 89.5% | No | 3,391 | No | 89.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | RTU 1C - Carrier 50PM-C28 | 2 | Exhaust Fan | 1.0 | 84.0% | No | 2,745 | No | 84.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | RTU 1E - McQuay RPS 020 CSY | 1 | Supply Fan | 7.5 | 89.5% | No | 3,391 | No | 89.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | RTU 1E - McQuay RPS 020 CSY | 1 | Return Fan | 2.0 | 84.0% | No | 2,745 | No | 84.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | RTU 2C - Carrier 50PG-C09 | 1 | Supply Fan | 3.0 | 87.5% | No | 2,745 | No | 87.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | RTU 3C - Carrier 50PM-C24 | 1 | Supply Fan | 5.0 | 87.5% | No | 2,745 | No | 87.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | RTU 3C - Carrier 50PM-C24 | 2 | Exhaust Fan | 1.0 | 84.0% | No | 2,745 | No | 84.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | RTU 4C Carrier 50PG-C08 | 1 | Supply Fan | 3.0 | 87.5% | No | 2,745 | No | 87.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Exhaust Fans | 10 | Exhaust Fan | 0.5 | 83.0% | No | 2,745 | No | 83.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Exhaust Fans | 3 | Exhaust Fan | 0.3 | 82.0% | No | 2,745 | No | 82.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Exhaust Fans | 2 | Exhaust Fan | 0.1 | 80.0% | No | 2,745 | No | 80.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Electrical Rm | Elevator | 1 | Other | 15.0 | 91.0% | No | 100 | No | 91.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Electric HVAC Inventory & Recommendations

| | | Existing Conditions | | | | Proposed Conditions | | | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Area(s)/System(s) Served | System Quantity | System Type | Cooling Capacity per Unit (Tons) | Heating Capacity per Unit (kBtu/hr) | Install High Efficiency System? | System Quantity | System Type | Cooling Capacity per Unit (Tons) | Heating Capacity per Unit (kBtu/hr) | Cooling Mode Efficiency (SEER/EER) | Heating Mode Efficiency (COP) | Install Dual Enthalpy Economizer? | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Roof | York Split Systems | 3 | Split-System AC | 1.50 | | Yes | 3 | Split-System AC | 1.50 | | 16.00 | | No | 0.52 | 1,721 | 0.0 | $207.52 | $6,732.99 | $414.00 | 30.45 |
| Mech Space | Gym ERU | 1 | Packaged AC | 33.08 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Classrooms | Classrooms HVAC Airedale CMX-4 | 1 | Split-System AC | 0.75 | | Yes | 1 | Split-System AC | 0.75 | | 23.00 | | No | 0.29 | 943 | 0.0 | $113.74 | $1,122.17 | $69.00 | 9.26 |
| Classrooms | Classrooms HVAC Airedale CMX-5 | 1 | Split-System AC | 2.00 | | Yes | 1 | Split-System AC | 2.00 | | 21.00 | | No | 0.70 | 2,296 | 0.0 | $276.82 | $2,992.44 | $184.00 | 10.15 |
| Roof | RTU 1C - Carrier 50PM-C28 | 1 | Packaged AC | 25.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | RTU 1E - McQuay RPS 020 CSY | 1 | Packaged AC | 20.00 | | Yes | 1 | Packaged AC | 20.00 | | 11.00 | | Yes | 2.66 | 10,329 | 0.0 | $1,245.33 | $34,647.98 | $1,830.00 | 26.35 |
| Roof | RTU 2C - Carrier 50PG-C09 | 1 | Packaged AC | 8.50 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | RTU 3C - Carrier 50PM-C24 | 1 | Packaged AC | 20.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | RTU 4C Carrier 50PG-C08 | 1 | Packaged AC | 7.33 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Sanyo Mini Split | 1 | Ductless Mini-Split AC | 1.46 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Trane Split | 1 | Split-System AC | 4.00 | | Yes | 1 | Split-System AC | 4.00 | | 17.00 | | No | 2.13 | 7,020 | 0.0 | $846.34 | $5,984.88 | $368.00 | 6.64 |

## Fuel Heating Inventory & Recommendations

| | | Existing Conditions | | | Proposed Conditions | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Area(s)/System(s) Served | System Quantity | System Type | Output Capacity per Unit (MBh) | Install High Efficiency System? | System Quantity | System Type | Output Capacity per Unit (MBh) | Heating Efficiency | Heating Efficiency Units | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Boiler Rm | School | 2 | Non-Condensing Hot Water Boiler | 3,569.00 | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Programmable Thermostat Recommendations

| | | Recommendation Inputs | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Area(s)/System(s) Affected | Thermostat Quantity | Cooling Capacity of Controlled System (Tons) | Electric Heating Capacity of Controlled System (kBtu/hr) | Output Heating Capacity of Controlled System (MBh) | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Roof | School | 20 | 110.00 | | | 0.00 | 21,879 | 0.0 | $2,637.77 | $6,597.40 | $0.00 | 2.50 |

## DHW Inventory & Recommendations

| | | Existing Conditions | | Proposed Conditions | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Area(s)/System(s) Served | System Quantity | System Type | Replace? | System Quantity | System Type | Fuel Type | System Efficiency | Efficiency Units | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Boiler Rm | School | 1 | Storage Tank Water Heater (> 50 Gal) | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Commercial Refrigerator/Freezer Inventory & Recommendations

| | Existing Conditions | | | Proposed Condit | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Quantity | Refrigerator/ Freezer Type | ENERGY STAR Qualified? | Install ENERGY STAR Equipment? | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Kitchen | 1 | Stand-Up Refrigerator, Solid Door (>50 cu. ft.) | No | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Kichen | 1 | Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.) | No | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Kichen | 2 | Stand-Up Refrigerator, Glass Door (≤15 cu. ft.) | No | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Break Rms | 5 | Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.) | Yes | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Office | 1 | Stand-Up Refrigerator, Solid Door (≤15 cu. ft.) | No | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Commercial Ice Maker Inventory & Recommendations

| | Existing Conditions | | | Proposed Condit | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Quantity | Ice Maker Type | ENERGY STAR Qualified? | Install ENERGY STAR Equipment? | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Kitchen | 2 | Ice Making Head (<450 lbs/day), Batch | No | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Cooking Equipment Inventory & Recommendations

| | Existing Conditions | | | Proposed Conditions | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Quantity | Equipment Type | High Efficiency Equipement? | Install High Efficiency Equipment? | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Kitchen | 2 | Electric Steamer | No | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Plug Load Inventory

| | Existing Conditions | | | |
|---|---|---|---|---|
| Location | Quantity | Equipment Description | Energy Rate (W) | ENERGY STAR Qualified? |
| Various | 316 | Desktop Computers | 120.0 | Yes |
| Various | 316 | Computer Monitors | 28.0 | Yes |
| Various | 3 | Sm. Printers | 13.0 | Yes |
| Various | 3 | Lg. Copiers | 380.0 | Yes |
| Various | 4 | Sm. Microwaves | 800.0 | No |
| Various | 12 | Server | 120.0 | Yes |

# *Appendix B: ENERGY STAR® Statement of Energy Performance*

## ENERGY STAR® Statement of Energy Performance

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**40**

**ENERGY STAR® Score**[1]

### Bradley Elementary School

**Primary Property Type:** K-12 School
**Gross Floor Area (ft²):** 82,305
**Built:** 1989

**For Year Ending:** October 31, 2016
**Date Generated:** October 13, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting fo climate and business activity.

### Property & Contact Information

| Property Address | Property Owner | Primary Contact |
|---|---|---|
| Bradley Elementary School<br>1100 Third Avenue<br>Asbury Park, New Jersey 07712 | Asbury Park Board of Education<br>910 4th Avenue<br>Asbury Park, NJ 07712<br>(732) 776-2606 x 2426 | Geoffrey Hastings<br>910 4th Avenue<br>Asbury Park, NJ 07712<br>(732) 776-2606 x 2426<br>hastingsg@asburypark.k12.nj.us |

**Property ID**: 6057954

### Energy Consumption and Energy Use Intensity (EUI)

**Site EUI**
63.3 kBtu/ft²

**Source EUI**
142.2 kBtu/ft²

| Annual Energy by Fuel | |
|---|---|
| Natural Gas (kBtu) | 2,227,637 (43%) |
| Electric - Grid (kBtu) | 2,981,457 (57%) |

| National Median Comparison | |
|---|---|
| National Median Site EUI (kBtu/ft²) | 58.2 |
| National Median Source EUI (kBtu/ft²) | 130.8 |
| % Diff from National Median Source EUI | 9% |
| **Annual Emissions** | |
| Greenhouse Gas Emissions (Metric Tons CO2e/year) | 449 |

### Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____Date: _____

**Licensed Professional**

____ _____
,
(____)____-_____
_____

**Professional Engineer Stamp (if applicable)**