# Local Government Energy Audit:
## Energy Audit Report

**Deptford Township High School**

575 Fox Run Road

Deptford, NJ 08096

Deptford Township Board of Education

July 30, 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 savings 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 the Deptford Township High 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 school districts in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

## 1.1 Facility Summary

Deptford Township High School is a 221,992 square foot facility comprised of offices, classrooms, a media center, gymnasiums, locker rooms, team rooms, restrooms, storage areas, janitor closets, a kitchen, cafeteria and mechanical spaces. This is a two story facility serving ninth grade to senior high school students. The school functions from 7:00 AM to 5:30 PM on the weekdays. During weekends there are sports activities in the school for about four hours a day.

The building was constructed in 1974. Space heating is provided in three different sections. The IMC section is served by two condensing boiler; A, B, C, D, and E wings are served by three non-condensing boilers. Two non-condensing boilers serve the new gym and part of F-wing. Building space cooling is provided by several packaged units, split AC and window AC units. Lighting at the Deptford Township High School consists of aging and inefficient lighting (T8 linear tubes, compact fluorescent lamps (CFL), incandescent lamps) in need of replacement. 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 16 measures and recommends 13 measures which together represent an opportunity for Deptford Township High School to reduce annual energy costs by roughly $69,606 and annual greenhouse gas emissions by 545,183 lbs $CO_2e$. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 5.3 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Deptford Township High School's annual energy use by 17%.

*Figure 1 – Previous 12 Month Utility Costs*

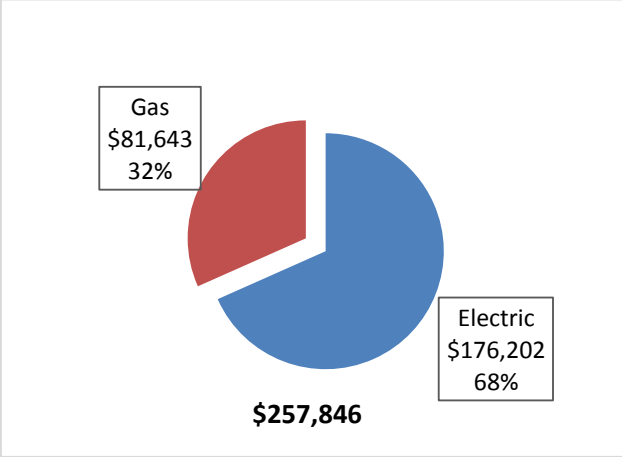
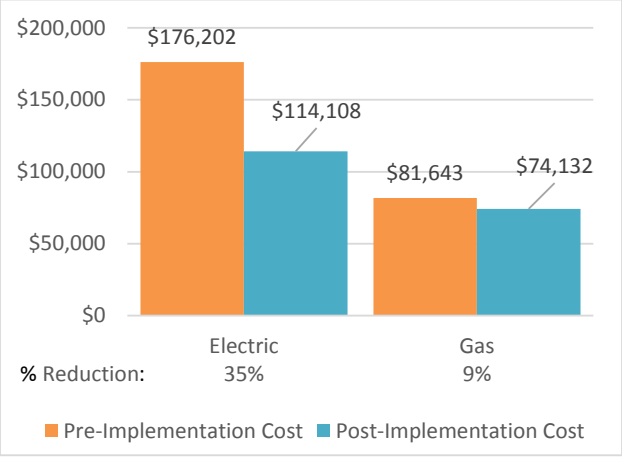



*Figure 2 – Potential Post-Implementation Costs*




A detailed description of Deptford Township High 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 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** | | | **318,163** | **59.1** | **0.0** | **$45,246.52** | **$182,373.49** | **$33,030.00** | **$149,343.49** | **3.3** | **320,388** |
| ECM 1 | Install LED Fixtures | Yes | 14,154 | 1.8 | 0.0 | $2,012.86 | $24,636.47 | $5,000.00 | $19,636.47 | 9.8 | 14,253 |
| ECM 2 | Retrofit Fluorescent Fixtures with LED Lamps and Drivers | Yes | 1,018 | 0.1 | 0.0 | $144.74 | $250.29 | $0.00 | $250.29 | 1.7 | 1,025 |
| ECM 3 | Retrofit Fixtures with LED Lamps | Yes | 302,891 | 57.1 | 0.0 | $43,074.60 | $157,271.63 | $28,030.00 | $129,241.63 | 3.0 | 305,009 |
| ECM 4 | Install LED Exit Signs | Yes | 101 | 0.0 | 0.0 | $14.33 | $215.11 | $0.00 | $215.11 | 15.0 | 101 |
| **Lighting Control Measures** | | | **65,545** | **12.3** | **0.0** | **$9,321.31** | **$35,953.33** | **$9,746.67** | **$26,206.67** | **2.8** | **66,004** |
| ECM 5 | Install Occupancy Sensor Lighting Controls | Yes | 50,282 | 9.7 | 0.0 | $7,150.63 | $22,420.00 | $3,080.00 | $19,340.00 | 2.7 | 50,633 |
| ECM 6 | Install High/Low Lighitng Controls | Yes | 15,264 | 2.7 | 0.0 | $2,170.68 | $13,533.33 | $6,666.67 | $6,866.67 | 3.2 | 15,370 |
| **Motor Upgrades** | | | **0** | **0.0** | **0.0** | **$0.00** | **$6,787.38** | **$0.00** | **$6,787.38** | **0.0** | **0** |
| ECM 7 | Premium Efficiency Motors | Yes | 0 | 0.0 | 0.0 | $0.00 | $6,787.38 | $0.00 | $6,787.38 | 0.0 | 0 |
| **Variable Frequency Drive (VFD) Measures** | | | **33,652** | **7.9** | **0.0** | **$4,785.70** | **$32,079.40** | **$1,200.00** | **$30,879.40** | **6.5** | **33,887** |
| ECM 8 | Install VFDs on Constant Volume (CV) HVAC | Yes | 14,742 | 4.1 | 0.0 | $2,096.42 | $7,213.60 | $1,200.00 | $6,013.60 | 2.9 | 14,845 |
| ECM 9 | Install VFDs on Hot Water Pumps | Yes | 18,910 | 3.8 | 0.0 | $2,689.28 | $24,865.80 | $0.00 | $24,865.80 | 9.2 | 19,043 |
| **Electric Unitary HVAC Measures** | | | **6,496** | **4.7** | **0.0** | **$923.80** | **$78,186.15** | **$2,937.00** | **$75,249.15** | **81.5** | **6,541** |
| | Install High Efficiency Electric AC | No | 2,636 | 1.9 | 0.0 | $374.84 | $30,315.90 | $1,312.00 | $29,003.90 | 77.4 | 2,654 |
| | Install High Efficiency Packaged Terminal AC/HP | No | 3,860 | 2.8 | 0.0 | $548.96 | $47,870.25 | $1,625.00 | $46,245.25 | 84.2 | 3,887 |
| **Gas Heating (HVAC/Process) Replacement** | | | **0** | **0.0** | **861.6** | **$7,182.73** | **$167,480.21** | **$18,000.00** | **$149,480.21** | **20.8** | **100,880** |
| ECM 10 | Install High Efficiency Hot Water Boilers | Yes | 0 | 0.0 | 861.6 | $7,182.73 | $167,480.21 | $18,000.00 | $149,480.21 | 20.8 | 100,880 |
| **HVAC System Improvements** | | | **6,381** | **1.4** | **0.0** | **$907.42** | **$1,100.00** | **$250.00** | **$850.00** | **0.9** | **6,425** |
| ECM 11 | Install Dual Enthalpy Outside Economizer Control | Yes | 6,381 | 1.4 | 0.0 | $907.42 | $1,100.00 | $250.00 | $850.00 | 0.9 | 6,425 |
| **Domestic Water Heating Upgrade** | | | **0** | **0.0** | **258.3** | **$2,153.75** | **$67,326.65** | **$2,345.00** | **$64,981.65** | **30.2** | **30,249** |
| | Install High Efficiency Gas Water Heater | No | 0 | 0.0 | 218.9 | $1,825.29 | $67,147.40 | $2,345.00 | $64,802.40 | 35.5 | 25,636 |
| ECM 12 | Install Low-Flow Domestic Hot Water Devices | Yes | 0 | 0.0 | 39.4 | $328.45 | $179.25 | $0.00 | $179.25 | 0.5 | 4,613 |
| **Plug Load Equipment Control - Vending Machine** | | | **12,895** | **0.0** | **0.0** | **$1,833.78** | **$1,840.00** | **$0.00** | **$1,840.00** | **1.0** | **12,985** |
| ECM 13 | Vending Machine Control | Yes | 12,895 | 0.0 | 0.0 | $1,833.78 | $1,840.00 | $0.00 | $1,840.00 | 1.0 | 12,985 |
| **TOTAL OF ALL EVALUATED ECMS** | | | **443,132** | **85.5** | **1,119.9** | **$72,355.00** | **$573,126.63** | **$67,508.67** | **$505,617.96** | **7.0** | **577,360** |
| **TOTAL OF ALL RECOMMENDED ECMS** | | | **436,636** | **81** | **901** | **$69,605.91** | **$427,793.07** | **$62,226.67** | **$365,566.40** | **5.3** | **545,183** |
| **TOTAL OF ALL NON-RECOMMENDED ECMS** | | | **6,496** | **5** | **219** | **$2,749.09** | **$145,333.55** | **$5,282.00** | **$140,051.55** | **50.9** | **32,177** |

* - 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.

**Motor Upgrades** generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

**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.

**Gas Heating** (HVAC/Process) measures generally involve replacing older inefficient hydronic heating systems with modern energy efficient systems. Gas heating systems can provide equivalent heating compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel demands for heating, due to improved combustion and heat transfer 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.

**Domestic Hot Water** upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

**Plug Load Equipment** control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlets when not in use.

## Energy Efficient Practices

TRC also identified 11 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 Deptford Township High School include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Ensure Economizers are Functioning Properly
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Perform Proper Boiler 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 generation for Deptford Township High School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

*Figure 4 – Photovoltaic Potential*

| | | |
|---|---|---|
| **Potential** | High | |
| **System Potential** | 300 | kW DC STC |
| **Electric Generation** | 357,411 | kWh/yr |
| **Displaced Cost** | $31,090 | /yr |
| **Installed Cost** | $780,000 | |

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 Prorgram (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** | | | |
| Mr. William Blatchley | Business Administrator | blatchley.w@deptford.k12.nj.us | 856-232-2700 x3007 |
| **Designated Representative** | | | |
| Samuel Ringelberg | Development Engineer | Sam.Ringelberg@schneider-electric.com | 717-579-0958 |
| **TRC Energy Services** | | | |
| Smruti Srinivasan | Auditor | ssrinivasan@trcsolutions.com | 732-855-0033 |

## 2.2 General Site Information

On April 11, 2017, TRC performed an energy audit at Deptford Township High School located in Deptford, New Jersey. TRC's team met with Roy Greggory and John Fountain to review the facility operations and help focus our investigation on specific energy-using systems.

Deptford Township High School is a 221,992 square foot facility comprised of offices, classrooms, a media center, gymnasiums, locker rooms, team rooms, restrooms, storage areas, janitor closets, kitchen, cafeteria and mechanical spaces. This is a two story facility serving ninth grade to senior high school students. The school functions from 7:00 AM to 5:30 PM on the weekdays. During weekends there are sports activities in the school for about four hours a day.

The building was constructed in 1974. Space heating is provided in three different sections.The IMC section is served by two condensing boilers; A, B, C, D, and E wings are served by three non-condensing boilers. Two non-condensing boilers serve the new gym and part of F-wing. Building space cooling is provided by several packaged units, split AC and window AC units. Lighting at Deptford Township High School consists of aging and inefficient lighting (T8 linear tubes, compact fluorescent lamps (CFL), incandescent lamps) in need of replacement.

## 2.3 Building Occupancy

The typical schedule is presented in the table below. During a typical day, the facility is occupied by approximately 92 teachers, 13 administration staff, 14 teacher aids, 57 maintenance staff and 1,084 students.

*Figure 6 - Building Schedule*

| Building Name | Weekday/Weekend | Operating Schedule |
|---|---|---|
| Deptford High School | Weekday | 7:00 AM - 5:30 PM |
| Deptford High School | Weekend | Saturday: Few hours of sports activity<br>Sunday: No operation |

## 2.4 Building Envelope

The building is constructed of concrete block and structural steel with a brick facade. The buildings have flat roof sections covered with slag. The IMC portion has rubber roof covered with an EPDM membrane. The roof is in good condition. The buildings have single pane windows which are in fair condition. We recommend that the windows be upgraded to double pane insulated windows to reduce excessive air infiltration and heat transfer. The exterior doors are constructed of aluminum and in good condition.

*Image 1 Building Envelope*

## 2.5 On-Site Generation

Deptford Township High School does not have any on-site electric generation systems currently installed.

## 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 mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some CFL and incandescent lamps. Most of the fixtures are 2-lamp or 3-lamp, 4-foot long troffers. Some areas also have 2-foot U-bent fixtures. Spaces including gym hallways, stairwells, auditorium, restrooms, closets and few offices are lit using 18-watt CFL or 60-watt incandescent lamps.

Lighting control in most spaces is provided by manual wall switches. Lighting in the library lavatory is controlled using wall mounted occupancy sensors.

The building's exterior lighting predominantly consists of 100-Watt or 175-Watt metal halide wall pack fixtures. Other places are lit using 50-Watt high pressure sodium wall packs. All exterior lights are controlled using photo cells and timers. The exit signs at the facility are 2-Watt LED fixtures or CFL fixtures.

*Image 2 Interior Lighting*

*Image 3 Exterior Lighting*

## Hot Water Heating System

The space heating is provided by gas-fired boilers serving three different sections. The IMC section has two condensing boilers, and A, B, C, D and E wings are served by three non-condensing boilers. Two more non-condensing boilers provide heat for the new gym and part of F-wing.

The two Aerco Benchmark condensing boilers each have an output capacity of 1290 MBh with a combustion efficiency of 86%. These boilers are six years old. The hot water from these boilers are circulated using two 7.5 hp pumps equipped with variable frequency drives (VFD). The VFDs helps reduce facility energy use by slowing down the pumps. The pumps are six years old. Hot water is supplied at 180°F when the outside air temperature is below 30°F, and the setpoint is modulated until the outside air temperature is 60°F. Above this temperature the boiler is shut off.

Three Gordon Piatt non-condensing boilers serving A, B, C, D and E wings each have an output capacity of 3010 MBh and a combustion efficiency of 73%. These boilers are 61 years old and have been evaluated for replacement. Hot water supplied by these boilers is circulated in two loops served by constant speed 5 hp and 3 hp pumps. There is also a 5 hp back up pump. These pumps are 15 years old and have been evaluated for replacement. Hot water is supplied at 180°F when the outside air temperature is below 55°F, and the setpoint is reset to 155°F when the outside air is above 68°F.

The two HB Smith non-condensing boilers serving the new gymnasium and parts of F wing have an output capacity of 2232 MBh and a combustion efficiency of 77%. The hot water from these boilers are circulated using three constant speed 3 hp hot water pumps (two main and one back up). These pumps are 14 years old and have been evaluated for replacement. Hot water is supplied at 180°F when the outside air temperature is below 30°F and at 140°F when is the outside air temperature is 50°F.

The heated air is distributed in the larger spaces using the air handlers. Unit ventilators distribute heated air to the classrooms. Space temperatures are controlled through the building automation system. In general, the unoccupied heating setpoint in the building is 65°F.

*Image 4 Hot Water Heating System*

## Direct Expansion Air Conditioning System (DX)'

Cafeteria, IMC, ROTC and other large spaces are cooled using rooftop packaged units with cooling capacities ranging from 6 to 25 tons. Space temperatures for these zones are controlled by the building automation system.

Service areas including nurse's office, computer labs, copy rooms, tech rooms, IMC offices, and main offices are cooled using split AC units. Cooling capacities for these units range from 1 to 3.5 tons. Temperatures in the spaces cooled by these units are controlled by programmable thermostats.

Classrooms and maintenance rooms are cooled using window AC units with cooling capacities ranging from 0.5 to 1.25 tons. These units have on-board temperature control systems that are manually controlled by the occupants.

In general, the unoccupied cooling set point in the building is 80°F.

We evaluated replacement of older, less efficient units and the payback was too long to justify replacement on the basis of on energy savings alone.

*Image 5 Air Conditioning System*

## Domestic Water Heating System

The facility domestic water heating system consists of two gas fired water heater, each with an input capacity of 670 MBh and a tank capacity of 2000 gallons. The equipment has 75% efficiency. The water heaters serve the restrooms and the kitchen. These are 20 years old and have been evaluated for replacement.

## Food Service & Refrigeration

The school has a fully commercial kitchen with gas fired and electric equipment. The kitchen serves food for over 1000 students and faculty in the facility. The food service equipment include four convection ovens, one food holding cabinets and two gas steamers.

The refrigerator equipment include stand up refrigerators, freezers and freezer chest. There is also a walk in refrigerator and freezer to store food and ingredients.

## Building Plug Load

There are roughly 315 computer work stations throughout the facility. Other office plug loads include printers and copy machines, paper shredders, projectors, standing fans, space heaters and staff laptops. The kitchenette equipment include refrigerators, microwave oven, coffee machines, toasters and toaster ovens. There is no centralized PC power management software installed.

There are eight refrigerated vending machines and 1 non-refrigerated vending machine at the facilities. The refrigerated vending machines are said to have occupancy sensor controls.

# 2.7 Water-Using Systems

A sampling of restrooms found that all of the faucets are rated for 2.2 gallons per minute (gpm) or higher, the toilets are rated at 1.6 gallons per flush (gpf) and the urinals are rated at 2 gpf.

# 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

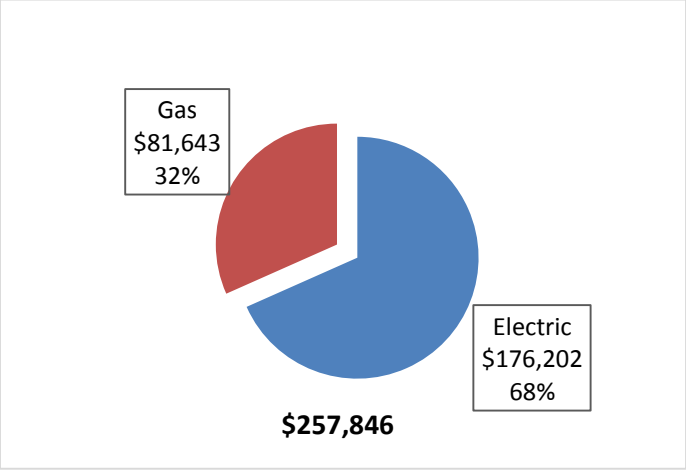
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

*Figure 7 - Utility Summary*

| Utility Summary for Deptford Township High School | | |
|---|---|---|
| **Fuel** | **Usage** | **Cost** |
| Electricity | 1,239,016 kWh | $176,202 |
| Natural Gas | 97,932 Therms | $81,643 |
| **Total** | | **$257,846** |

The current annual energy cost for this facility is $257,846 as shown in the chart below.

*Figure 8 - Energy Cost Breakdown*



## 3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was $0.142/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 third party electric supply is provided by South Jersey Energy Company. The monthly electricity consumption and peak demand are shown in the chart below.

*Figure 9 - Electric Usage & Demand*

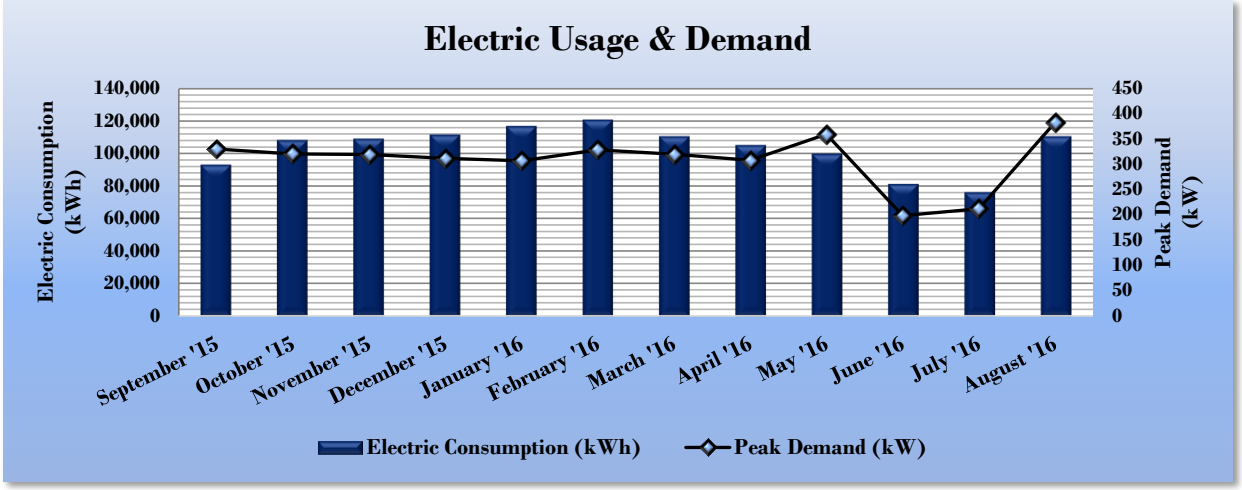



*Figure 10 - Electric Usage & Demand*

| Electric Billing Data for Deptford Township High School | | | | | |
|---|---|---|---|---|---|
| Period Ending | Days in Period | Electric Usage (kWh) | Demand (kW) | Demand Cost | Total Electric Cost |
| 9/24/15 | 30 | 92,742 | 331 | $1,198 | $13,183 |
| 10/23/15 | 29 | 107,861 | 320 | $1,161 | $15,015 |
| 11/23/15 | 31 | 108,741 | 319 | $1,158 | $14,488 |
| 12/24/15 | 31 | 111,238 | 312 | $1,131 | $14,442 |
| 1/26/16 | 33 | 116,478 | 307 | $1,112 | $14,781 |
| 2/25/16 | 30 | 120,400 | 329 | $1,204 | $15,685 |
| 3/28/16 | 32 | 110,161 | 320 | $1,172 | $14,453 |
| 4/26/16 | 29 | 104,760 | 308 | $1,129 | $13,780 |
| 5/25/16 | 29 | 99,497 | 360 | $4,453 | $16,916 |
| 6/24/16 | 30 | 80,990 | 198 | $2,455 | $12,669 |
| 7/26/16 | 32 | 75,952 | 212 | $2,626 | $12,228 |
| 8/24/16 | 29 | 110,196 | 383 | $4,800 | $18,563 |
| **Totals** | **365** | **1,239,016** | **382.9** | **$23,599** | **$176,202** |
| **Annual** | **365** | **1,239,016** | **382.9** | **$23,599** | **$176,202** |

## 3.3 Natural Gas Usage

Natural gas is provided by South Jersey Gas. The average gas cost for the past 12 months is $0.834/therm, which is the blended rate used throughout the analyses in this report. The third party gas supply is provided by Direct Energy. The monthly gas consumption is shown in the chart below.

*Figure 11 - Natural Gas Usage*

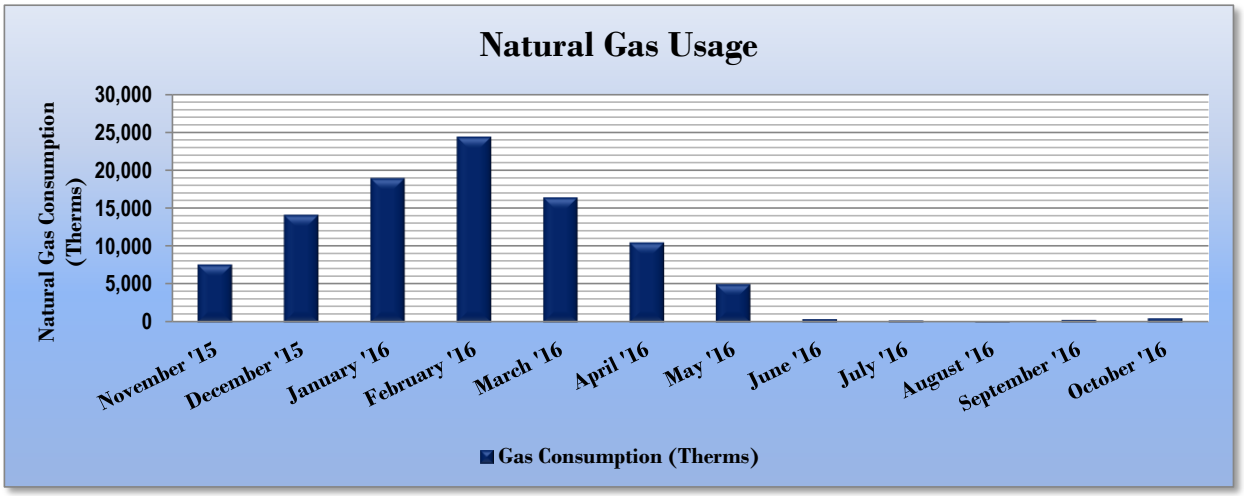



*Figure 12 - Natural Gas Usage*

| Gas Billing Data for Deptford Township High School | | | |
|---|---|---|---|
| Period Ending | Days in Period | Natural Gas Usage (Therms) | Natural Gas Cost |
| 11/19/15 | 30 | 7,599 | $6,423 |
| 12/21/15 | 32 | 14,109 | $11,148 |
| 1/20/16 | 30 | 18,898 | $14,441 |
| 2/18/16 | 29 | 24,332 | $18,320 |
| 3/21/16 | 32 | 16,370 | $12,819 |
| 4/19/16 | 29 | 10,466 | $8,426 |
| 5/20/16 | 31 | 5,017 | $4,491 |
| 6/21/16 | 32 | 425 | $1,304 |
| 7/21/16 | 30 | 228 | $1,098 |
| 8/19/16 | 29 | 178 | $1,029 |
| 9/21/16 | 33 | 324 | $1,260 |
| 10/21/16 | 30 | 523 | $1,330 |
| **Totals** | **367** | **98,469** | **$82,090** |
| **Annual** | **365** | **97,932** | **$81,643** |

## 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 | | |
|---|---|---|
| | Deptford Township High School | National Median Building Type: School (K-12) |
| Source Energy Use Intensity (kBtu/ft$^2$) | 106.1 | 141.4 |
| Site Energy Use Intensity (kBtu/ft$^2$) | 63.2 | 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 | | |
|---|---|---|
| | Deptford Township High School | National Median Building Type: School (K-12) |
| Source Energy Use Intensity (kBtu/ft$^2$) | 80.8 | 141.4 |
| Site Energy Use Intensity (kBtu/ft$^2$) | 52.4 | 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.

Based on the TRC's understanding of the utility data, this facility has a current score of 84. With the amount of equipment and fuel use at the facility, the score seems quite high. Out of the eight utility accounts submitted for this building only two were confirmed by the site to account for the energy consumption of the building. We recommend that the facility review, verify, and confirm the building utilities. If additional utility accounts were applied to building energy use, the ENERGY STAR® score associated with the building would be reduced.

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

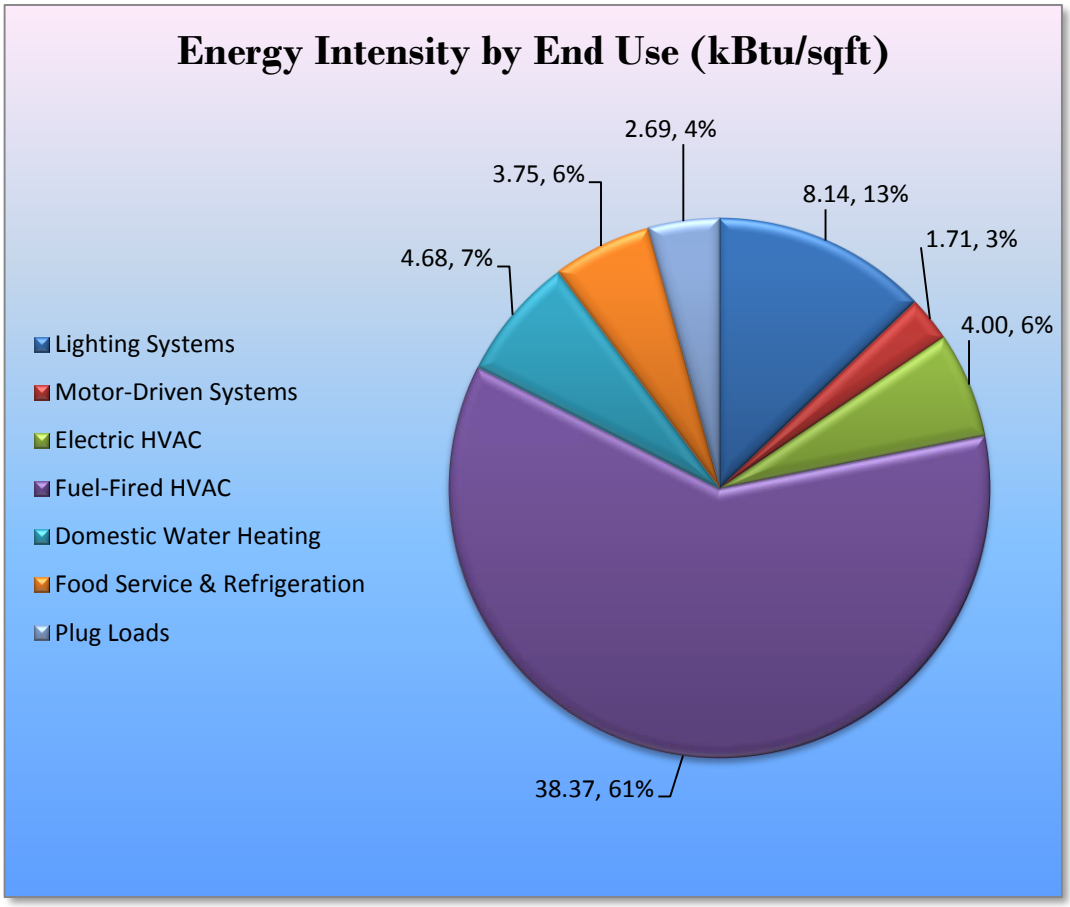
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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 Deptford Township High 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** | | **318,163** | **59.1** | **0.0** | **$45,246.52** | **$182,373.49** | **$33,030.00** | **$149,343.49** | **3.3** | **320,388** |
| ECM 1 | Install LED Fixtures | 14,154 | 1.8 | 0.0 | $2,012.86 | $24,636.47 | $5,000.00 | $19,636.47 | 9.8 | 14,253 |
| ECM 2 | Retrofit Fluorescent Fixtures with LED Lamps and Drivers | 1,018 | 0.1 | 0.0 | $144.74 | $250.29 | $0.00 | $250.29 | 1.7 | 1,025 |
| ECM 3 | Retrofit Fixtures with LED Lamps | 302,891 | 57.1 | 0.0 | $43,074.60 | $157,271.63 | $28,030.00 | $129,241.63 | 3.0 | 305,009 |
| ECM 4 | Install LED Exit Signs | 101 | 0.0 | 0.0 | $14.33 | $215.11 | $0.00 | $215.11 | 15.0 | 101 |
| **Lighting Control Measures** | | **65,545** | **12.3** | **0.0** | **$9,321.31** | **$35,953.33** | **$9,746.67** | **$26,206.67** | **2.8** | **66,004** |
| ECM 5 | Install Occupancy Sensor Lighting Controls | 50,282 | 9.7 | 0.0 | $7,150.63 | $22,420.00 | $3,080.00 | $19,340.00 | 2.7 | 50,633 |
| ECM 6 | Install High/Low Lighitng Controls | 15,264 | 2.7 | 0.0 | $2,170.68 | $13,533.33 | $6,666.67 | $6,866.67 | 3.2 | 15,370 |
| **Motor Upgrades** | | **0** | **0.0** | **0.0** | **$0.00** | **$6,787.38** | **$0.00** | **$6,787.38** | **0.0** | **0** |
| ECM 7 | Premium Efficiency Motors | 0 | 0.0 | 0.0 | $0.00 | $6,787.38 | $0.00 | $6,787.38 | 0.0 | 0 |
| **Variable Frequency Drive (VFD) Measures** | | **33,652** | **7.9** | **0.0** | **$4,785.70** | **$32,079.40** | **$1,200.00** | **$30,879.40** | **6.5** | **33,887** |
| ECM 8 | Install VFDs on Constant Volume (CV) HVAC | 14,742 | 4.1 | 0.0 | $2,096.42 | $7,213.60 | $1,200.00 | $6,013.60 | 2.9 | 14,845 |
| ECM 9 | Install VFDs on Hot Water Pumps | 18,910 | 3.8 | 0.0 | $2,689.28 | $24,865.80 | $0.00 | $24,865.80 | 9.2 | 19,043 |
| **Gas Heating (HVAC/Process) Replacement** | | **0** | **0.0** | **861.6** | **$7,182.73** | **$167,480.21** | **$18,000.00** | **$149,480.21** | **20.8** | **100,880** |
| ECM 10 | Install High Efficiency Hot Water Boilers | 0 | 0.0 | 861.6 | $7,182.73 | $167,480.21 | $18,000.00 | $149,480.21 | 20.8 | 100,880 |
| **HVAC System Improvements** | | **6,381** | **1.4** | **0.0** | **$907.42** | **$1,100.00** | **$250.00** | **$850.00** | **0.9** | **6,425** |
| ECM 11 | Install Dual Enthalpy Outside Economizer Control | 6,381 | 1.4 | 0.0 | $907.42 | $1,100.00 | $250.00 | $850.00 | 0.9 | 6,425 |
| **Domestic Water Heating Upgrade** | | **0** | **0.0** | **39.4** | **$328.45** | **$179.25** | **$0.00** | **$179.25** | **0.5** | **4,613** |
| ECM 12 | Install Low-Flow Domestic Hot Water Devices | 0 | 0.0 | 39.4 | $328.45 | $179.25 | $0.00 | $179.25 | 0.5 | 4,613 |
| **Plug Load Equipment Control - Vending Machine** | | **12,895** | **0.0** | **0.0** | **$1,833.78** | **$1,840.00** | **$0.00** | **$1,840.00** | **1.0** | **12,985** |
| ECM 13 | Vending Machine Control | 12,895 | 0.0 | 0.0 | $1,833.78 | $1,840.00 | $0.00 | $1,840.00 | 1.0 | 12,985 |
| **TOTALS** | | **436,636** | **80.7** | **901.0** | **$69,605.91** | **$427,793.07** | **$62,226.67** | **$365,566.40** | **5.3** | **545,183** |

* - 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** | | **318,163** | **59.1** | **0.0** | **$45,246.52** | **$182,373.49** | **$33,030.00** | **$149,343.49** | **3.3** | **320,388** |
| ECM 1 | Install LED Fixtures | 14,154 | 1.8 | 0.0 | $2,012.86 | $24,636.47 | $5,000.00 | $19,636.47 | 9.8 | 14,253 |
| ECM 2 | Retrofit Fluorescent Fixtures with LED Lamps and Drivers | 1,018 | 0.1 | 0.0 | $144.74 | $250.29 | $0.00 | $250.29 | 1.7 | 1,025 |
| ECM 3 | Retrofit Fixtures with LED Lamps | 302,891 | 57.1 | 0.0 | $43,074.60 | $157,271.63 | $28,030.00 | $129,241.63 | 3.0 | 305,009 |
| ECM 4 | Install LED Exit Signs | 101 | 0.0 | 0.0 | $14.33 | $215.11 | $0.00 | $215.11 | 15.0 | 101 |

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 | 0 | 0.0 | 0.0 | $0.00 | $0.00 | $0.00 | $0.00 | 0.0 | 0 |
| Exterior | 14,154 | 1.8 | 0.0 | $2,012.86 | $24,636.47 | $5,000.00 | $19,636.47 | 9.8 | 14,253 |

*Measure Description*

We recommend replacing existing exterior 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 Fluorescent Fixtures with LED Lamps and Drivers

*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 | 1,018 | 0.1 | 0.0 | $144.74 | $250.29 | $0.00 | $250.29 | 1.7 | 1,025 |
| Exterior | 0 | 0.0 | 0.0 | $0.00 | $0.00 | $0.00 | $0.00 | 0.0 | 0 |

*Measure Description*

We recommend retrofitting existing T12 fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. 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.

## ECM 3: 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 | 300,725 | 56.8 | 0.0 | $42,766.58 | $157,002.86 | $28,005.00 | $128,997.86 | 3.0 | 302,828 |
| Exterior | 2,166 | 0.3 | 0.0 | $308.02 | $268.77 | $25.00 | $243.77 | 0.8 | 2,181 |

*Measure Description*

We recommend retrofitting existing incandescent and linear T8 tube 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.

## ECM 4: Install LED Exit Signs

*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 | 101 | 0.0 | 0.0 | $14.33 | $215.11 | $0.00 | $215.11 | 15.0 | 101 |
| Exterior | 0 | 0.0 | 0.0 | $0.00 | $0.00 | $0.00 | $0.00 | 0.0 | 0 |

*Measure Description*

We recommend replacing all incandescent or compact fluorescent exit signs with LED exit signs. LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output.

### 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** | | **65,545** | **12.3** | **0.0** | **$9,321.31** | **$35,953.33** | **$9,746.67** | **$26,206.67** | **2.8** | **66,004** |
| ECM 5 | Install Occupancy Sensor Lighting Controls | 50,282 | 9.7 | 0.0 | $7,150.63 | $22,420.00 | $3,080.00 | $19,340.00 | 2.7 | 50,633 |
| ECM 6 | Install High/Low Lighitng Controls | 15,264 | 2.7 | 0.0 | $2,170.68 | $13,533.33 | $6,666.67 | $6,866.67 | 3.2 | 15,370 |

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 5: 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) |
|---|---|---|---|---|---|---|---|---|
| 50,282 | 9.7 | 0.0 | $7,150.63 | $22,420.00 | $3,080.00 | $19,340.00 | 2.7 | 50,633 |

*Measure Description*

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, storage rooms, office areas and classrooms. 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.

## ECM 6: Install High/Low 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) |
|---|---|---|---|---|---|---|---|---|
| 15,264 | 2.7 | 0.0 | $2,170.68 | $13,533.33 | $6,666.67 | $6,866.67 | 3.2 | 15,370 |

*Measure Description*

We recommend installing occupancy sensors in hallways to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Typical areas for such lighting control are stairwells, interior corridors, parking lots, and parking garages.

Lighting fixtures with these controls operate at default low levels when the area is not occupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. The lighting systems are switched to full lighting levels whenever an occupant is detected. Fixtures are automatically switched back to low level after an area has been vacant for a preset period of time.

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage needs to be provided to ensure that lights turn on in each area as an occupant approaches.

Additional savings from reduced lighting maintenance may also result from this measure, due to reduced lamp operation.

## 4.1.3 Motor Upgrades

Our recommendations for motor upgrades are summarized in Figure 19 below.

*Figure 19 – Summary of Motor 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Motor Upgrades** | | **3,626** | **1.1** | **0.0** | **$515.66** | **$6,787.38** | **$0.00** | **$6,787.38** | **13.2** | **3,651** |
| ECM 7 | Premium Efficiency Motors | 3,626 | 1.1 | 0.0 | $515.66 | $6,787.38 | $0.00 | $6,787.38 | 13.2 | 3,651 |

### ECM 7: Premium Efficiency Motors

*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) |
|---|---|---|---|---|---|---|---|---|
| 3,626 | 1.1 | 0.0 | $515.66 | $6,787.38 | $0.00 | $6,787.38 | 13.2 | 3,651 |

*Measure Description*

We recommend replacing standard efficiency motors with *NEMA Premium™* efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

Note that no savings have been projected for this measure because no increase in the motor efficiency has been projected. The measure has been included to ensure that sufficient funds are reserved for motors to be replaced with inverter rated motors, if necessary, for the implementation of the Variable Frequency Drive (VFD) measures noted below.

## 4.1.4 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 20 below.

*Figure 20 – 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** | | **33,652** | **7.9** | **0.0** | **$4,785.70** | **$32,079.40** | **$1,200.00** | **$30,879.40** | **6.5** | **33,887** |
| ECM 8 | Install VFDs on Constant Volume (CV) HVAC | 14,742 | 4.1 | 0.0 | $2,096.42 | $7,213.60 | $1,200.00 | $6,013.60 | 2.9 | 14,845 |
| ECM 9 | Install VFDs on Hot Water Pumps | 18,910 | 3.8 | 0.0 | $2,689.28 | $24,865.80 | $0.00 | $24,865.80 | 9.2 | 19,043 |

### ECM 8: Install VFDs on Constant Volume (CV) HVAC

*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) |
|---|---|---|---|---|---|---|---|---|
| 14,742 | 4.1 | 0.0 | $2,096.42 | $7,213.60 | $1,200.00 | $6,013.60 | 2.9 | 14,845 |

*Measure Description*

We recommend installing variable frequency drives (VFDs) on the 7.5 hp supply and return fans on the air handler units supplying the new gym to control supply fan motor speeds to convert a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one. Zone thermostats will cause the VFD to modulate fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature. Energy savings results from reducing fan speed (and power) when there is a reduced load required for the zone. The magnitude of energy savings is based on the estimated amount of time that fan motors operate at partial load.

VAV systems should not be controlled such that the supply air temperature is raised at the expense of the fan power. A common mistake is to reset the supply air temperature to achieve chiller energy savings, which can lead to additional air flow requirements. Supply air temperature should be kept low, e.g. 55°F, until the minimum fan speed (typically about 50%) is met. At this point, it is efficient to raise the supply air temperature as the load decreases, but not such that additional air flow and thus fan energy is required.

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing will have to be determined during the final project design. The control system should be programmed to maintain the minimum air flow whenever the compressor is operating.

## ECM 9: 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) |
|---|---|---|---|---|---|---|---|---|
| 18,910 | 3.8 | 0.0 | $2,689.28 | $24,865.80 | $0.00 | $24,865.80 | 9.2 | 19,043 |

*Measure Description*

We recommend installing a variable frequency drives (VFD) to control the three 5 hp and five 3 hp hot water pumps serving the A, B, C, D, and E sections and new gym. 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.

## 4.1.5 Gas-Fired Heating System Replacements

Our recommendations for gas-fired heating system replacements are summarized in Figure 21 below.

*Figure 21 - Summary of Gas-Fired Heating Replacement 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Gas Heating (HVAC/Process) Replacement** | | **0** | **0.0** | **861.6** | **$7,182.73** | **$167,480.21** | **$18,000.00** | **$149,480.21** | **20.8** | **100,880** |
| ECM 10 | Install High Efficiency Hot Water Boilers | 0 | 0.0 | 861.6 | $7,182.73 | $167,480.21 | $18,000.00 | $149,480.21 | 20.8 | 100,880 |

### ECM 10: Install High Efficiency Hot Water Boilers

*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) |
|---|---|---|---|---|---|---|---|---|
| 0 | 0.0 | 861.6 | $7,182.73 | $167,480.21 | $18,000.00 | $149,480.21 | 20.8 | 100,880 |

*Measure Description*

We recommend replacing the three 61 year old, inefficient Gordon-Piatt hot water boilers with high efficiency hot water boilers. Significant improvements have been made in combustion technology resulting in increased overall boiler efficiency. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

The most notable efficiency improvement is condensing hydronic boilers that can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies of approximately 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. If the return water temperature drops below 130°F, the unit will enter "condensing mode" providing more efficient operation. Please be aware that condensing boilers are typically 10% - 15% more expensive than standard high efficiency boilers and should only be selected if the design conditions support "condensing mode" operation.

In addition to determining the appropriate type of new high efficiency boiler, we recommend consideration be made regarding the new unit size(s) and where appropriate, implementation of multiple (modular) boilers versus larger capacity units. We recommend that the site staff work with the design team to evaluate the heating load for the facility prior to replacing the boilers. The new boilers should be sized to meet the current heating requirements rather than simply installing boilers with the same capacity as the existing boilers. The capital cost of the project can generally be reduced if the overall boiler plant capacity can be reduced. In addition, we recommend that the design team consider designing the plant using several lower capacity modular boilers. Configuring a boiler plant with several modular boilers, rather than one or two high capacity boilers, results in a plant that can more efficiently match and serve the load, provides a high level of redundancy, reduces standby losses, and is more flexible to expand if the heating load increases in the future. Finally, we recommend working with the design team to determine if the updated boiler plant can be operated such that the return water temperature is generally lower than 130 °F so that condensing boilers could be used.

## 4.1.6 HVAC System Upgrades

Our recommendations for HVAC system improvements are summarized in Figure 22 below.

*Figure 22 - 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** | | **6,381** | **1.4** | **0.0** | **$907.42** | **$1,100.00** | **$250.00** | **$850.00** | **0.9** | **6,425** |
| ECM 11 | Install Dual Enthalpy Outside Economizer Control | 6,381 | 1.4 | 0.0 | $907.42 | $1,100.00 | $250.00 | $850.00 | 0.9 | 6,425 |

### ECM 11: 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) |
|---|---|---|---|---|---|---|---|---|
| 6,381 | 1.4 | 0.0 | $907.42 | $1,100.00 | $250.00 | $850.00 | 0.9 | 6,425 |

*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.

## 4.1.7 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 23 below.

*Figure 23 - Summary of Domestic Water Heating 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Domestic Water Heating Upgrade** | | **0** | **0.0** | **39.4** | **$328.45** | **$179.25** | **$0.00** | **$179.25** | **0.5** | **4,613** |
| ECM 12 | Install Low-Flow Domestic Hot Water Devices | 0 | 0.0 | 39.4 | $328.45 | $179.25 | $0.00 | $179.25 | 0.5 | 4,613 |

### ECM 12: Install Low-Flow DHW Devices

*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) |
|---|---|---|---|---|---|---|---|---|
| 0 | 0.0 | 39.4 | $328.45 | $179.25 | $0.00 | $179.25 | 0.5 | 4,613 |

*Measure Description*

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy. Pre-rinse spray valves (PRSVs)—often used in commercial and institutional kitchens—are designed to remove food waste from dishes prior to dishwashing. Replacing standard pre-rinse spray valves with low flow PRSVs will reduce hot water usage and save energy.

Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

## 4.1.8 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment controls are summarized in Figure 24 below.

*Figure 24 - Summary of Plug Load Equipment 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Plug Load Equipment Control - Vending Machine** | | **12,895** | **0.0** | **0.0** | **$1,833.78** | **$1,840.00** | **$0.00** | **$1,840.00** | **1.0** | **12,985** |
| ECM 13 | Vending Machine Control | 12,895 | 0.0 | 0.0 | $1,833.78 | $1,840.00 | $0.00 | $1,840.00 | 1.0 | 12,985 |

## ECM 13: Vending Machine Control

*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) |
|---|---|---|---|---|---|---|---|---|
| 12,895 | 0.0 | 0.0 | $1,833.78 | $1,840.00 | $0.00 | $1,840.00 | 1.0 | 12,985 |

*Measure Description*

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

## 4.2 ECMs Evaluated But Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

*Figure 25 – Summary of Measures Evaluated, But Not Recommended*

| 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** | **6,496** | **4.7** | **0.0** | **$923.80** | **$78,186.15** | **$2,937.00** | **$75,249.15** | **81.5** | **6,541** |
| Install High Efficiency Electric AC | 2,636 | 1.9 | 0.0 | $374.84 | $30,315.90 | $1,312.00 | $29,003.90 | 77.4 | 2,654 |
| Install High Efficiency Packaged Terminal AC/HP | 3,860 | 2.8 | 0.0 | $548.96 | $47,870.25 | $1,625.00 | $46,245.25 | 84.2 | 3,887 |
| **Domestic Water Heating Upgrade** | **0** | **0.0** | **218.9** | **$1,825.29** | **$67,147.40** | **$2,345.00** | **$64,802.40** | **35.5** | **25,636** |
| Install High Efficiency Gas Water Heater | 0 | 0.0 | 218.9 | $1,825.29 | $67,147.40 | $2,345.00 | $64,802.40 | 35.5 | 25,636 |
| **TOTALS** | **6,496** | **4.7** | **218.9** | **$2,749.09** | **$145,333.55** | **$5,282.00** | **$140,051.55** | **50.9** | **32,177** |

* - 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).

### 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) |
|---|---|---|---|---|---|---|---|---|
| 2,636 | 1.9 | 0.0 | $374.84 | $30,315.90 | $1,312.00 | $29,003.90 | 77.4 | 2,654 |

*Measure Description*

We typically recommend replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units when cost effective. 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. 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.

*Reasons for not Recommending*

Although we evaluated the replacements of the older AC units, the payback period for the measure exceeds the useful life of the equipment. When the existing equipment comes to the end of their useful life, we recommend replacing them with high efficiency units.

## Install High Efficiency PTAC/PTHP

*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) |
|---|---|---|---|---|---|---|---|---|
| 3,860 | 2.8 | 0.0 | $548.96 | $47,870.25 | $1,625.00 | $46,245.25 | 84.2 | 3,887 |

*Measure Description*

We typically recommend replacing packaged terminal air conditioners and heat pumps (PTAC and PTHP) with high efficiency PTAC and PTHP when cost effective. 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. A higher EER or SEER rating indicates a more efficient cooling system and a higher HPSF rating indicates more efficient heating mode for heat pumps. 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 heating and cooling loads, and the estimated annual operating hours.

*Reasons for not Recommending*

Although we evaluated the replacements of the older AC units, the payback period for the measure exceeds the useful life of the equipment. When the existing equipment comes to the end of their useful life, we recommend replacing them with high efficiency units.

## Install High Efficiency Gas Water Heater

*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) |
|---|---|---|---|---|---|---|---|---|
| 0 | 0.0 | 218.9 | $1,825.29 | $67,147.40 | $2,345.00 | $64,802.40 | 35.5 | 25,636 |

*Measure Description*

We typically recommend replacing existing tank water heaters with a high efficiency tank water heaters when cost effetive. Improvements in combustion efficiency and reductions in heat losses have improved the overall efficiency of storage water heaters. Energy savings results from using less gas to heat water, due to higher unit efficiency, and fewer run hours to maintain the tank water temperature.

*Reasons for not Recommending*

The payback period associated with replacing the gas-fired water heaters are longer than the average useful life of the equipment. However, many of the units are at or approaching the end of their useful life and high efficiency units should be used when they are replaced.

# 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.

## Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

## Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

## 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.

## 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.

## Ensure Economizers are Functioning Properly

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

## Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

## 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.

## 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 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 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.

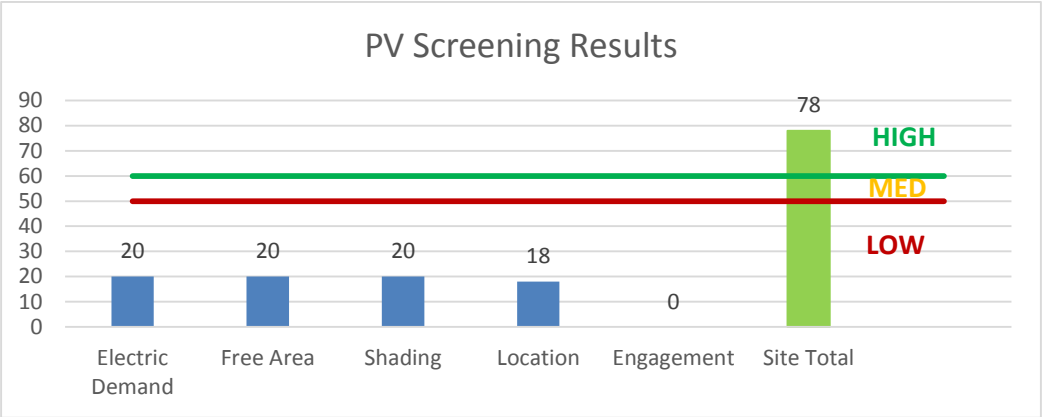
## 6.1 Photovoltaic

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 installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the main building/ground next to the building/over the main parking lot may be feasible. If Deptford Township High School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

*Figure 26 - Photovoltaic Screening*



| | | |
|---|---|---|
| **Potential** | High | |
| **System Potential** | 300 | kW DC STC |
| **Electric Generation** | 357,411 | kWh/yr |
| **Displaced Cost** | $31,090 | /yr |
| **Installed Cost** | $780,000 | |

Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (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 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.

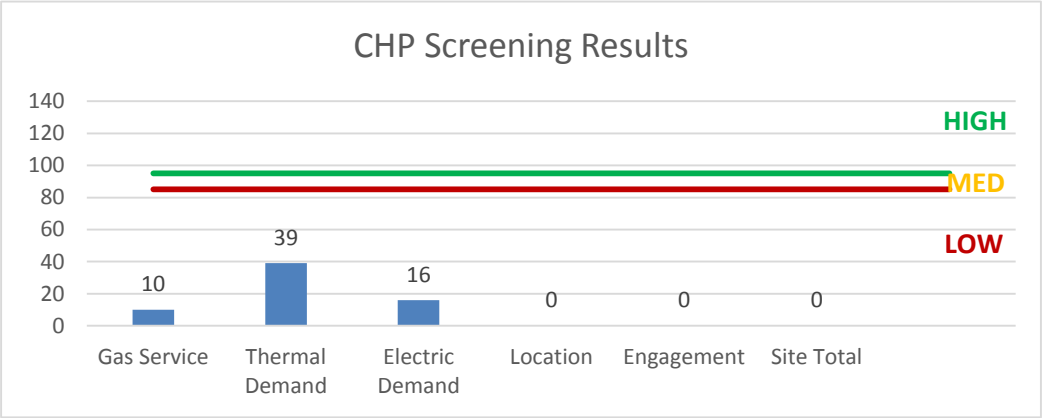
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste 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.

Low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the 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/

*Figure 27 - Combined Heat and Power Screening*



# 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.

In our opinion this facility is not a good candidate for the 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 28 for a list of the eligible programs identified for each recommended ECM.

*Figure 28 - ECM Incentive Program Eligibility*

| Energy Conservation Measure | | SmartStart Prescriptive | SmartStart Custom | Direct Install | Pay For Performance Existing Buildings | Large Energy Users Program | Combined Heat & Power and Fuel Cell |
|---|---|---|---|---|---|---|---|
| ECM 1 | Install LED Fixtures | x | | | x | | |
| ECM 2 | Retrofit Fluorescent Fixtures with LED Lamps and Drivers | x | | | x | | |
| ECM 3 | Retrofit Fixtures with LED Lamps | x | | | x | | |
| ECM 4 | Install LED Exit Signs | | | | x | | |
| ECM 5 | Install Occupancy Sensor Lighting Controls | x | | | x | | |
| ECM 6 | Install High/Low Lighitng Controls | | | | x | | |
| ECM 7 | Premium Efficiency Motors | x | | | x | | |
| ECM 8 | Install VFDs on Constant Volume (CV) HVAC | x | | | x | | |
| ECM 9 | Install VFDs on Hot Water Pumps | | | | x | | |
| ECM 10 | Install High Efficiency Hot Water Boilers | x | | | x | | |
| ECM 11 | Install Dual Enthalpy Outside Economizer Control | x | | | x | | |
| ECM 12 | Install Low-Flow Domestic Hot Water Devices | x | | | x | | |
| ECM 13 | Vending Machine Control | | | | 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. 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.

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 SS 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 Room IMC | 3 | Linear Fluorescent - T12: 4' T12 (40W) - 2L | Wall Switch | 88 | 5,000 | Fixture Replacement | No | 3 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 5,000 | 0.12 | 1,018 | 0.0 | $144.74 | $250.29 | $0.00 | 1.73 |
| Boiler Room IMC | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 5,000 | Relamp | No | 3 | LED - Linear Tubes: (4) 4' Lamps | Wall Switch | 58 | 5,000 | 0.11 | 966 | 0.0 | $137.38 | $285.40 | $60.00 | 1.64 |
| Boiler Room | 18 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 5,000 | Relamp | No | 18 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 5,000 | 0.39 | 3,416 | 0.0 | $485.72 | $1,053.00 | $180.00 | 1.80 |
| MEZ Boiler room | 18 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 5,000 | Relamp | No | 18 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 5,000 | 0.39 | 3,416 | 0.0 | $485.72 | $1,053.00 | $180.00 | 1.80 |
| Electrical room | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 6 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.13 | 740 | 0.0 | $105.24 | $351.00 | $60.00 | 2.77 |
| Auditorium | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.04 | 247 | 0.0 | $35.08 | $117.00 | $20.00 | 2.77 |
| Custodial Closet | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 30 | Relamp | No | 2 | LED - Linear Tubes: (3) 4' Lamps | Wall Switch | 44 | 30 | 0.06 | 3 | 0.0 | $0.49 | $150.40 | $30.00 | 247.88 |
| Maintenance | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 52 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 52 | 0.35 | 32 | 0.0 | $4.49 | $936.00 | $160.00 | 172.82 |
| Hallway | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 4,390 | Relamp | Yes | 5 | LED - Linear Tubes: (4) 4' Lamps | High/Low Control | 58 | 3,073 | 0.24 | 1,853 | 0.0 | $263.49 | $675.67 | $100.00 | 2.18 |
| Men's restroom | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,920 | 0.04 | 146 | 0.0 | $20.72 | $117.00 | $20.00 | 4.68 |
| E-136 | 27 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 27 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.74 | 4,208 | 0.0 | $598.43 | $1,849.50 | $305.00 | 2.58 |
| E-137 | 48 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 48 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 1.31 | 7,481 | 0.0 | $1,063.88 | $3,078.00 | $515.00 | 2.41 |
| E-139 | 20 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 20 | LED - Linear Tubes: (4) 4' Lamps | Occupancy Sensor | 58 | 2,275 | 0.96 | 5,487 | 0.0 | $780.27 | $2,172.67 | $435.00 | 2.23 |
| Auxillary Gym | 46 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 46 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 1.26 | 7,169 | 0.0 | $1,019.55 | $3,231.00 | $530.00 | 2.65 |
| Transport office | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.04 | 247 | 0.0 | $35.08 | $117.00 | $20.00 | 2.77 |
| Transport office | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 12 | LED - Linear Tubes: (4) 4' Lamps | Occupancy Sensor | 58 | 2,275 | 0.58 | 3,292 | 0.0 | $468.16 | $1,257.60 | $260.00 | 2.13 |
| E141 | 29 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 29 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.79 | 4,520 | 0.0 | $642.76 | $1,812.50 | $310.00 | 2.34 |
| E142 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | No | 2 | LED - Linear Tubes: (4) 4' Lamps | Wall Switch | 58 | 3,250 | 0.07 | 419 | 0.0 | $59.53 | $190.27 | $40.00 | 2.52 |
| ROTC | 31 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 31 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.85 | 4,831 | 0.0 | $687.09 | $2,045.50 | $350.00 | 2.47 |
| E-143 | 20 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 20 | LED - Linear Tubes: (4) 4' Lamps | Occupancy Sensor | 58 | 2,275 | 0.96 | 5,487 | 0.0 | $780.27 | $2,134.67 | $440.00 | 2.17 |
| E-144 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.27 | 1,559 | 0.0 | $221.64 | $701.00 | $120.00 | 2.62 |
| Hallway | 14 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 14 | LED - Linear Tubes: (4) 4' Lamps | High/Low Control | 58 | 2,275 | 0.67 | 3,841 | 0.0 | $546.19 | $2,131.87 | $280.00 | 3.39 |
| Old Gym | 7 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 7 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.15 | 863 | 0.0 | $122.78 | $409.50 | $70.00 | 2.77 |
| Girl's Locker Room | 18 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,440 | Relamp | Yes | 18 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,008 | 0.49 | 1,243 | 0.0 | $176.77 | $1,593.00 | $250.00 | 7.60 |
| Girl's Locker Room | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 1,440 | Relamp | Yes | 6 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,008 | 0.25 | 621 | 0.0 | $88.38 | $721.20 | $125.00 | 6.75 |

| | 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 |
| Boy's Locker Room | 18 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,440 | Relamp | Yes | 18 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,008 | 0.49 | 1,243 | 0.0 | $176.77 | $1,593.00 | $250.00 | 7.60 |
| Boy's Locker Room | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 1,440 | Relamp | Yes | 6 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,008 | 0.25 | 621 | 0.0 | $88.38 | $721.20 | $125.00 | 6.75 |
| F152 | 45 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 45 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 1.23 | 7,013 | 0.0 | $997.39 | $3,172.50 | $520.00 | 2.66 |
| F-154 | 18 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 18 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.49 | 2,805 | 0.0 | $398.96 | $1,593.00 | $250.00 | 3.37 |
| F165-166-167 | 45 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | Yes | 45 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 2,275 | 1.85 | 10,520 | 0.0 | $1,496.08 | $4,194.00 | $780.00 | 2.28 |
| Exterior | 5 | High-Pressure Sodium: (1) 100W Lamp | Wall Switch | 138 | 4,380 | Fixture Replacement | No | 5 | LED - Fixtures: Parking Garage Fixture | Wall Switch | 30 | 4,380 | 0.35 | 2,720 | 0.0 | $386.81 | $7,056.00 | $500.00 | 16.95 |
| Stairwell | 2 | Compact Fluorescent: 1 lamp | Wall Switch | 18 | 4,380 | None | No | 2 | Compact Fluorescent: 1 lamp | Wall Switch | 18 | 4,380 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Auditorium | 22 | Incandescent: 1 lamp | Wall Switch | 60 | 3,250 | Relamp | No | 22 | LED Screw-In Lamps: 1 lamp | Wall Switch | 13 | 3,250 | 0.68 | 3,897 | 0.0 | $554.26 | $1,182.57 | $110.00 | 1.94 |
| G122 | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | Yes | 9 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 2,275 | 0.37 | 2,104 | 0.0 | $299.22 | $792.80 | $155.00 | 2.13 |
| G124 | 15 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | Yes | 15 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 2,275 | 0.62 | 3,507 | 0.0 | $498.69 | $1,244.00 | $245.00 | 2.00 |
| Hallway | 8 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 8 | LED - Linear Tubes: (4) 4' Lamps | High/Low Control | 58 | 2,275 | 0.38 | 2,195 | 0.0 | $312.11 | $961.07 | $160.00 | 2.57 |
| Girl's team room | 19 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,440 | Relamp | Yes | 19 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,008 | 0.52 | 1,312 | 0.0 | $186.59 | $1,381.50 | $225.00 | 6.20 |
| Girl's team room | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 1,440 | Relamp | No | 4 | LED - Linear Tubes: (3) 4' Lamps | Wall Switch | 44 | 1,440 | 0.13 | 328 | 0.0 | $46.63 | $300.80 | $60.00 | 5.16 |
| Boy's team room | 20 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,440 | Relamp | Yes | 20 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,008 | 0.55 | 1,381 | 0.0 | $196.41 | $1,440.00 | $235.00 | 6.14 |
| Boy's team room | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 1,440 | Relamp | No | 4 | LED - Linear Tubes: (3) 4' Lamps | Wall Switch | 44 | 1,440 | 0.13 | 328 | 0.0 | $46.63 | $300.80 | $60.00 | 5.16 |
| Visitor's locker room | 19 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 19 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.52 | 2,961 | 0.0 | $421.12 | $1,381.50 | $225.00 | 2.75 |
| Visitor's locker room | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | No | 4 | LED - Linear Tubes: (3) 4' Lamps | Wall Switch | 44 | 3,250 | 0.13 | 740 | 0.0 | $105.24 | $300.80 | $60.00 | 2.29 |
| New Gym | 72 | Linear Fluorescent - T5: 4' T5 (28W) - 4L | Wall Switch | 120 | 3,250 | Relamp | Yes | 72 | LED - Linear Tubes: (4) 4' Lamps | Occupancy Sensor | 58 | 2,275 | 3.75 | 21,367 | 0.0 | $3,038.57 | $7,929.60 | $1,580.00 | 2.09 |
| Hallway gym | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 9 | LED - Linear Tubes: (2) 4' Lamps | High/Low Control | 29 | 2,275 | 0.25 | 1,403 | 0.0 | $199.48 | $726.50 | $90.00 | 3.19 |
| G107 | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | Yes | 3 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 2,275 | 0.12 | 701 | 0.0 | $99.74 | $341.60 | $65.00 | 2.77 |
| G107 | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | No | 1 | LED - Linear Tubes: (4) 4' Lamps | Wall Switch | 58 | 3,250 | 0.04 | 209 | 0.0 | $29.76 | $95.13 | $20.00 | 2.52 |
| Cafeteria | 45 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 45 | LED - Linear Tubes: (4) 4' Lamps | Occupancy Sensor | 58 | 2,275 | 2.17 | 12,345 | 0.0 | $1,755.60 | $5,091.00 | $1,005.00 | 2.33 |
| Kicthen | 57 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 57 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 1.23 | 7,030 | 0.0 | $999.78 | $3,334.50 | $570.00 | 2.77 |
| Kicthen | 8 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 3,250 | Relamp | No | 8 | LED - Linear Tubes: (1) 4' Lamp | Wall Switch | 15 | 3,250 | 0.09 | 523 | 0.0 | $74.41 | $287.20 | $40.00 | 3.32 |
| IMC hallway | 14 | Linear Fluorescent - T8: 2' T8 (17W) - 4L | Wall Switch | 63 | 3,250 | Relamp | Yes | 14 | LED - Linear Tubes: (4) 2' Lamps | High/Low Control | 34 | 2,275 | 0.36 | 2,051 | 0.0 | $291.70 | $1,871.47 | $280.00 | 5.46 |

| | 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 |
| IMC | 79 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | Yes | 79 | LED - Linear Tubes: (3) 4' Lamps | High/Low Control | 44 | 2,275 | 3.24 | 18,469 | 0.0 | $2,626.46 | $8,574.13 | $3,950.00 | 1.76 |
| IMC | 18 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 18 | LED - Linear Tubes: (2) 4' Lamps | High/Low Control | 29 | 2,275 | 0.49 | 2,805 | 0.0 | $398.96 | $1,653.00 | $810.00 | 2.11 |
| IMC | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 3,250 | Relamp | Yes | 10 | LED - Linear Tubes: (1) 4' Lamp | High/Low Control | 15 | 2,275 | 0.14 | 817 | 0.0 | $116.14 | $692.33 | $400.00 | 2.52 |
| IMC | 93 | Linear Fluorescent - T8: 2' T8 (17W) - 4L | Wall Switch | 63 | 3,250 | Relamp | Yes | 93 | LED - Linear Tubes: (4) 2' Lamps | High/Low Control | 34 | 2,275 | 2.39 | 13,625 | 0.0 | $1,937.69 | $10,217.60 | $5,115.00 | 2.63 |
| Library laboratary | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 1,920 | Relamp | No | 16 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,920 | 0.52 | 1,749 | 0.0 | $248.69 | $1,203.20 | $240.00 | 3.87 |
| Library laboratary | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 1,920 | Relamp | No | 6 | LED - Linear Tubes: (1) 4' Lamp | Wall Switch | 15 | 1,920 | 0.07 | 232 | 0.0 | $32.97 | $215.40 | $30.00 | 5.62 |
| Library laboratary | 27 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | No | 27 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,920 | 0.58 | 1,967 | 0.0 | $279.78 | $1,579.50 | $270.00 | 4.68 |
| Library laboratary | 8 | Linear Fluorescent - T8: 2' T8 (17W) - 3L | Wall Switch | 53 | 1,920 | Relamp | No | 8 | LED - Linear Tubes: (3) 2' Lamps | Wall Switch | 26 | 1,920 | 0.14 | 486 | 0.0 | $69.08 | $493.60 | $120.00 | 5.41 |
| Lavatory | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.04 | 247 | 0.0 | $35.08 | $117.00 | $20.00 | 2.77 |
| Library office | 8 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 8 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.22 | 1,247 | 0.0 | $177.31 | $738.00 | $115.00 | 3.51 |
| Girls' restroom | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 1,920 | Relamp | No | 2 | LED - Linear Tubes: (3) 4' Lamps | Wall Switch | 44 | 1,920 | 0.06 | 219 | 0.0 | $31.09 | $150.40 | $30.00 | 3.87 |
| Girls' restroom | 1 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | No | 1 | LED - Linear Tubes: (2) U-Lamp | Wall Switch | 33 | 1,920 | 0.02 | 64 | 0.0 | $9.11 | $63.20 | $0.00 | 6.94 |
| Boys' restroom | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 1,920 | Relamp | No | 2 | LED - Linear Tubes: (3) 4' Lamps | Wall Switch | 44 | 1,920 | 0.06 | 219 | 0.0 | $31.09 | $150.40 | $30.00 | 3.87 |
| Boys' restroom | 1 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | No | 1 | LED - Linear Tubes: (2) U-Lamp | Wall Switch | 33 | 1,920 | 0.02 | 64 | 0.0 | $9.11 | $63.20 | $0.00 | 6.94 |
| L142 | 24 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 3,250 | Relamp | Yes | 24 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 2,275 | 0.34 | 1,960 | 0.0 | $278.73 | $1,401.60 | $190.00 | 4.35 |
| L142 | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | No | 3 | LED - Linear Tubes: (3) 4' Lamps | Wall Switch | 44 | 3,250 | 0.10 | 555 | 0.0 | $78.93 | $225.60 | $45.00 | 2.29 |
| L142 | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 4 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.09 | 493 | 0.0 | $70.16 | $234.00 | $40.00 | 2.77 |
| L144, L145, L143, L146 | 64 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | Yes | 64 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 2,275 | 2.62 | 14,962 | 0.0 | $2,127.76 | $5,892.80 | $1,100.00 | 2.25 |
| Hallway | 8 | Compact Fluorescent: 2 lamps | Wall Switch | 36 | 3,250 | Relamp | Yes | 8 | LED Screw-In Lamps: 2 lamps | High/Low Control | 25 | 2,275 | 0.10 | 549 | 0.0 | $78.07 | $1,060.05 | $0.00 | 13.58 |
| Hallway gym | 19 | Compact Fluorescent: 2 lamps | Wall Switch | 36 | 3,250 | Relamp | Yes | 19 | LED Screw-In Lamps: 2 lamps | High/Low Control | 25 | 2,275 | 0.23 | 1,304 | 0.0 | $185.41 | $3,842.61 | $0.00 | 20.72 |
| G107 | 27 | Compact Fluorescent: 2 lamps | Wall Switch | 36 | 3,250 | Relamp | No | 27 | LED Screw-In Lamps: 2 lamps | Wall Switch | 25 | 3,250 | 0.19 | 1,090 | 0.0 | $154.99 | $2,902.66 | $0.00 | 18.73 |
| G107 | 4 | Compact Fluorescent: 4 lamps | Wall Switch | 72 | 3,250 | Relamp | No | 4 | LED Screw-In Lamps: 2 lamps | Wall Switch | 50 | 3,250 | 0.06 | 323 | 0.0 | $45.92 | $860.05 | $0.00 | 18.73 |
| IMC | 18 | Compact Fluorescent: 2 lamps | Wall Switch | 36 | 3,250 | Relamp | No | 18 | LED Screw-In Lamps: 2 lamps | Wall Switch | 25 | 3,250 | 0.13 | 727 | 0.0 | $103.33 | $1,935.11 | $0.00 | 18.73 |
| Main Office | 22 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 22 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.48 | 2,713 | 0.0 | $385.88 | $1,287.00 | $220.00 | 2.77 |
| Main Office | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | No | 4 | LED - Linear Tubes: (3) 4' Lamps | Wall Switch | 44 | 3,250 | 0.13 | 740 | 0.0 | $105.24 | $300.80 | $60.00 | 2.29 |

| | 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 |
| Main Office | 1 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 3,250 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.00 | 15 | 0.0 | $2.13 | $58.50 | $10.00 | 22.81 |
| Guidance Office | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.33 | 1,870 | 0.0 | $265.97 | $818.00 | $140.00 | 2.55 |
| Main office hallway | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.26 | 1,480 | 0.0 | $210.48 | $702.00 | $120.00 | 2.77 |
| Main office hallway | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.02 | 123 | 0.0 | $17.54 | $58.50 | $10.00 | 2.77 |
| Main office hallway | 4 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 3,250 | Relamp | No | 4 | LED - Linear Tubes: (2) 2' Lamps | Wall Switch | 17 | 3,250 | 0.04 | 239 | 0.0 | $34.02 | $192.80 | $40.00 | 4.49 |
| Hallway | 7 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | Yes | 7 | LED - Linear Tubes: (3) 4' Lamps | High/Low Control | 44 | 2,275 | 0.29 | 1,636 | 0.0 | $232.72 | $726.40 | $105.00 | 2.67 |
| E133 | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | No | 4 | LED - Linear Tubes: (4) 4' Lamps | Wall Switch | 58 | 3,250 | 0.15 | 837 | 0.0 | $119.06 | $380.53 | $80.00 | 2.52 |
| E134 | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.02 | 123 | 0.0 | $17.54 | $58.50 | $10.00 | 2.77 |
| AD's office | 15 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | Yes | 15 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 2,275 | 0.62 | 3,507 | 0.0 | $498.69 | $1,244.00 | $245.00 | 2.00 |
| AD's office | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.33 | 1,870 | 0.0 | $265.97 | $818.00 | $140.00 | 2.55 |
| C- hallway | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 16 | LED - Linear Tubes: (4) 4' Lamps | High/Low Control | 58 | 2,275 | 0.77 | 4,389 | 0.0 | $624.21 | $2,055.47 | $320.00 | 2.78 |
| Men's restroom | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,920 | 0.04 | 146 | 0.0 | $20.72 | $117.00 | $20.00 | 4.68 |
| Women's restroom | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,920 | 0.04 | 146 | 0.0 | $20.72 | $117.00 | $20.00 | 4.68 |
| C135 | 8 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | Yes | 8 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 2,275 | 0.33 | 1,870 | 0.0 | $265.97 | $717.60 | $140.00 | 2.17 |
| C130, C131, C129, C128, C126, C127, C124, C125, C122, C123 | 120 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | Yes | 120 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,344 | 3.28 | 11,049 | 0.0 | $1,571.27 | $9,720.00 | $1,550.00 | 5.20 |
| C120 | 22 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 22 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.60 | 3,429 | 0.0 | $487.61 | $1,557.00 | $255.00 | 2.67 |
| C121 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.04 | 247 | 0.0 | $35.08 | $117.00 | $20.00 | 2.77 |
| C117 - copy room | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | Yes | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,344 | 0.11 | 368 | 0.0 | $52.38 | $350.00 | $60.00 | 5.54 |
| C118 - office | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.11 | 623 | 0.0 | $88.66 | $350.00 | $60.00 | 3.27 |
| C113 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.33 | 1,870 | 0.0 | $265.97 | $972.00 | $155.00 | 3.07 |
| A111B | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 16 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.44 | 2,494 | 0.0 | $354.63 | $1,052.00 | $180.00 | 2.46 |
| A111C | 20 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 20 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.55 | 3,117 | 0.0 | $443.28 | $1,286.00 | $220.00 | 2.40 |
| A109B | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.27 | 1,559 | 0.0 | $221.64 | $701.00 | $120.00 | 2.62 |
| A109D | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.27 | 1,559 | 0.0 | $221.64 | $701.00 | $120.00 | 2.62 |
| A109C, A109A | 8 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 8 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.22 | 1,247 | 0.0 | $177.31 | $584.00 | $100.00 | 2.73 |

| | 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 |
| Hallway | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 4 | LED - Linear Tubes: (2) 4' Lamps | High/Low Control | 29 | 2,275 | 0.11 | 623 | 0.0 | $88.66 | $434.00 | $40.00 | 4.44 |
| A102 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 2 | LED - Linear Tubes: (4) 4' Lamps | Occupancy Sensor | 58 | 2,275 | 0.10 | 549 | 0.0 | $78.03 | $306.27 | $60.00 | 3.16 |
| Main office | 1 | Incandescent: 1 lamp | Wall Switch | 60 | 3,250 | Relamp | No | 1 | LED Screw-In Lamps: 1 lamp | Wall Switch | 9 | 3,250 | 0.03 | 191 | 0.0 | $27.11 | $53.75 | $5.00 | 1.80 |
| Men's restroom, Women's restroom | 2 | Incandescent: 1 lamp | Wall Switch | 60 | 1,920 | Relamp | No | 2 | LED Screw-In Lamps: 1 lamp | Wall Switch | 9 | 1,920 | 0.07 | 225 | 0.0 | $32.03 | $107.51 | $10.00 | 3.04 |
| C135 | 1 | Incandescent: 1 lamp | Wall Switch | 60 | 3,250 | Relamp | No | 1 | LED Screw-In Lamps: 1 lamp | Wall Switch | 9 | 3,250 | 0.03 | 191 | 0.0 | $27.11 | $53.75 | $5.00 | 1.80 |
| Closet | 1 | Incandescent: 1 lamp | Wall Switch | 60 | 52 | Relamp | No | 1 | LED Screw-In Lamps: 1 lamp | Wall Switch | 9 | 52 | 0.03 | 3 | 0.0 | $0.43 | $53.75 | $5.00 | 112.41 |
| Faculty bathroom | 1 | Incandescent: 1 lamp | Wall Switch | 60 | 1,920 | Relamp | No | 1 | LED Screw-In Lamps: 1 lamp | Wall Switch | 9 | 1,920 | 0.03 | 113 | 0.0 | $16.01 | $53.75 | $5.00 | 3.04 |
| Kitchen office | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | No | 4 | LED - Linear Tubes: (3) 4' Lamps | Wall Switch | 44 | 3,250 | 0.13 | 740 | 0.0 | $105.24 | $300.80 | $60.00 | 2.29 |
| A104 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 5 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.11 | 617 | 0.0 | $87.70 | $292.50 | $50.00 | 2.77 |
| A106 | 14 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 14 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.38 | 2,182 | 0.0 | $310.30 | $935.00 | $160.00 | 2.50 |
| A107 | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 9 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.25 | 1,403 | 0.0 | $199.48 | $642.50 | $110.00 | 2.67 |
| Hallway | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | High/Low Control | 29 | 2,275 | 0.27 | 1,559 | 0.0 | $221.64 | $1,251.67 | $100.00 | 5.20 |
| A108, A110 | 36 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 36 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.98 | 5,611 | 0.0 | $797.91 | $2,338.00 | $400.00 | 2.43 |
| A112 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 6 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.16 | 935 | 0.0 | $132.99 | $467.00 | $80.00 | 2.91 |
| A114 | 15 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 15 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.41 | 2,338 | 0.0 | $332.46 | $993.50 | $170.00 | 2.48 |
| A116 | 8 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 8 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.22 | 1,247 | 0.0 | $177.31 | $584.00 | $100.00 | 2.73 |
| A115 | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.11 | 623 | 0.0 | $88.66 | $350.00 | $60.00 | 3.27 |
| Men's restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,920 | 0.02 | 73 | 0.0 | $10.36 | $58.50 | $10.00 | 4.68 |
| Men's restroom | 1 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 1,920 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,920 | 0.00 | 9 | 0.0 | $1.26 | $58.50 | $10.00 | 38.61 |
| Women's restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,920 | 0.02 | 73 | 0.0 | $10.36 | $58.50 | $10.00 | 4.68 |
| Women's restroom | 1 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 1,920 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,920 | 0.00 | 9 | 0.0 | $1.26 | $58.50 | $10.00 | 38.61 |
| A117 | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.02 | 123 | 0.0 | $17.54 | $58.50 | $10.00 | 2.77 |
| A119 | 15 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 3,250 | Relamp | Yes | 15 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 2,275 | 0.62 | 3,507 | 0.0 | $498.69 | $1,244.00 | $245.00 | 2.00 |
| A118 - Home Ec | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 16 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.44 | 2,494 | 0.0 | $354.63 | $1,052.00 | $180.00 | 2.46 |
| M-hallway | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 9 | LED - Linear Tubes: (4) 4' Lamps | High/Low Control | 58 | 2,275 | 0.43 | 2,469 | 0.0 | $351.12 | $1,056.20 | $180.00 | 2.50 |

| | 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 |
| M4 | 24 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | No | 24 | LED - Linear Tubes: (4) 4' Lamps | Wall Switch | 58 | 3,250 | 0.88 | 5,023 | 0.0 | $714.36 | $2,283.20 | $480.00 | 2.52 |
| M4 | 14 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 14 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.30 | 1,727 | 0.0 | $245.56 | $819.00 | $140.00 | 2.77 |
| M4 | 4 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 3,250 | Relamp | No | 4 | LED - Linear Tubes: (2) 2' Lamps | Wall Switch | 17 | 3,250 | 0.04 | 239 | 0.0 | $34.02 | $192.80 | $40.00 | 4.49 |
| M5,M3 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 6 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.13 | 740 | 0.0 | $105.24 | $351.00 | $60.00 | 2.77 |
| M1 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.26 | 1,480 | 0.0 | $210.48 | $702.00 | $120.00 | 2.77 |
| Men's restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,920 | 0.02 | 73 | 0.0 | $10.36 | $58.50 | $10.00 | 4.68 |
| Women's restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,920 | 0.02 | 73 | 0.0 | $10.36 | $58.50 | $10.00 | 4.68 |
| Stairwells | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | No | 16 | LED - Linear Tubes: (4) 4' Lamps | Wall Switch | 58 | 3,250 | 0.59 | 3,349 | 0.0 | $476.24 | $1,522.13 | $320.00 | 2.52 |
| B202, B204, B206, B208 | 72 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 72 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 1.97 | 11,221 | 0.0 | $1,595.82 | $5,292.00 | $860.00 | 2.78 |
| B-hallway | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 9 | LED - Linear Tubes: (4) 4' Lamps | High/Low Control | 58 | 2,275 | 0.43 | 2,469 | 0.0 | $351.12 | $1,056.20 | $180.00 | 2.50 |
| B203, B215 | 28 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 28 | LED - Linear Tubes: (4) 4' Lamps | Occupancy Sensor | 58 | 2,275 | 1.35 | 7,681 | 0.0 | $1,092.37 | $3,203.73 | $630.00 | 2.36 |
| B203, B215 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 5 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.11 | 617 | 0.0 | $87.70 | $292.50 | $50.00 | 2.77 |
| B207 | 21 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | No | 21 | LED - Linear Tubes: (4) 4' Lamps | Wall Switch | 58 | 3,250 | 0.77 | 4,395 | 0.0 | $625.06 | $1,997.80 | $420.00 | 2.52 |
| B209, 214 | 32 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 32 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.69 | 3,947 | 0.0 | $561.28 | $1,872.00 | $320.00 | 2.77 |
| B207 | 21 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 21 | LED - Linear Tubes: (4) 4' Lamps | Occupancy Sensor | 58 | 2,275 | 1.01 | 5,761 | 0.0 | $819.28 | $2,537.80 | $490.00 | 2.50 |
| B210 | 8 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 8 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.17 | 987 | 0.0 | $140.32 | $468.00 | $80.00 | 2.77 |
| B212 | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.35 | 1,973 | 0.0 | $280.64 | $936.00 | $160.00 | 2.77 |
| B213 | 21 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 21 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.57 | 3,273 | 0.0 | $465.45 | $1,768.50 | $280.00 | 3.20 |
| D hallway | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | Yes | 10 | LED - Linear Tubes: (4) 4' Lamps | High/Low Control | 58 | 2,275 | 0.48 | 2,743 | 0.0 | $390.13 | $1,618.00 | $200.00 | 3.63 |
| D217-store | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 4L | Wall Switch | 114 | 3,250 | Relamp | No | 2 | LED - Linear Tubes: (4) 4' Lamps | Wall Switch | 58 | 3,250 | 0.07 | 419 | 0.0 | $59.53 | $190.27 | $40.00 | 2.52 |
| Science office | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | No | 4 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 3,250 | 0.09 | 493 | 0.0 | $70.16 | $234.00 | $40.00 | 2.77 |
| D220 | 18 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 18 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.49 | 2,805 | 0.0 | $398.96 | $1,169.00 | $200.00 | 2.43 |
| D223 | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.11 | 623 | 0.0 | $88.66 | $350.00 | $60.00 | 3.27 |
| Men's restroom | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,920 | 0.04 | 146 | 0.0 | $20.72 | $117.00 | $20.00 | 4.68 |
| Women's restroom | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,920 | 0.04 | 146 | 0.0 | $20.72 | $117.00 | $20.00 | 4.68 |

| | 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 |
| D224 | 14 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 14 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.38 | 2,182 | 0.0 | $310.30 | $1,089.00 | $175.00 | 2.95 |
| D225, D226, D227,D228, D229, D231, D230, D233, D232, D235 | 120 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,920 | Relamp | Yes | 120 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,344 | 3.28 | 11,049 | 0.0 | $1,571.27 | $9,720.00 | $1,550.00 | 5.20 |
| English office | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 3,250 | Relamp | Yes | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,275 | 0.11 | 623 | 0.0 | $88.66 | $350.00 | $60.00 | 3.27 |
| Exterior lights | 5 | Incandescent: 1 lamp | Wall Switch | 100 | 4,380 | Relamp | No | 5 | LED Screw-In Lamps: 1 lamp | Wall Switch | 14 | 4,380 | 0.28 | 2,166 | 0.0 | $308.02 | $268.77 | $25.00 | 0.79 |
| Exterior lights | 1 | Metal Halide: (1) 100W Lamp | Wall Switch | 128 | 4,380 | Fixture Replacement | No | 1 | LED - Fixtures: Outdoor Wall-Mounted Area Fixture | Wall Switch | 48 | 4,380 | 0.05 | 403 | 0.0 | $57.31 | $390.68 | $100.00 | 5.07 |
| Exterior lights | 43 | High-Pressure Sodium: (1) 50W Lamp | Wall Switch | 66 | 4,380 | Fixture Replacement | No | 43 | LED - Fixtures: Outdoor Wall-Mounted Area Fixture | Wall Switch | 18 | 4,380 | 1.35 | 10,396 | 0.0 | $1,478.48 | $16,799.11 | $4,300.00 | 8.45 |
| Exterior lights | 1 | Metal Halide: (1) 175W Lamp | Wall Switch | 215 | 4,380 | Fixture Replacement | No | 1 | LED - Fixtures: Outdoor Wall-Mounted Area Fixture | Wall Switch | 89 | 4,380 | 0.08 | 635 | 0.0 | $90.26 | $390.68 | $100.00 | 3.22 |
| All school | 63 | Exit Signs: LED - 2 W Lamp | Wall Switch | 6 | 8,760 | None | No | 63 | Exit Signs: LED - 2 W Lamp | Wall Switch | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| All school | 2 | Exit Signs: Fluorescent | Wall Switch | 11 | 8,760 | Fixture Replacement | No | 2 | LED Exit Signs: 2 W Lamp | Wall Switch | 6 | 8,760 | 0.01 | 101 | 0.0 | $14.33 | $215.11 | $0.00 | 15.01 |

## 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 IMC | Boiler | 2 | Heating Hot Water Pump | 7.5 | 91.0% | Yes | 1,696 | No | 91.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Main Boiler room | Main section | 2 | Heating Hot Water Pump | 5.0 | 89.5% | No | 1,373 | Yes | 89.5% | Yes | 2 | 1.26 | 4,976 | 0.0 | $707.71 | $8,393.82 | $0.00 | 11.86 |
| Main Boiler room | Main section | 2 | Heating Hot Water Pump | 3.0 | 89.5% | No | 1,373 | Yes | 89.5% | Yes | 2 | 0.75 | 2,986 | 0.0 | $424.62 | $7,624.98 | $0.00 | 17.96 |
| Main Boiler room | Main section | 1 | Heating Hot Water Pump | 5.0 | 89.5% | No | 2,745 | Yes | 89.5% | Yes | 1 | 0.63 | 4,976 | 0.0 | $707.71 | $4,196.91 | $0.00 | 5.93 |
| Main Boiler room | Air Compressor | 2 | Air Compressor | 2.0 | 86.5% | No | 690 | No | 86.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Mez boiler room | Mez section | 2 | Heating Hot Water Pump | 3.0 | 89.5% | No | 1,373 | Yes | 89.5% | Yes | 2 | 0.75 | 2,986 | 0.0 | $424.62 | $7,624.98 | $0.00 | 17.96 |
| Mez boiler room | Mez section | 1 | Heating Hot Water Pump | 3.0 | 89.5% | No | 2,745 | Yes | 89.5% | Yes | 1 | 0.38 | 2,986 | 0.0 | $424.62 | $3,812.49 | $0.00 | 8.98 |
| Mez boiler room | Mez section | 2 | Other | 0.3 | 57.0% | No | 2,745 | No | 57.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| New gym | AHU | 1 | Supply Fan | 7.5 | 91.7% | No | 3,391 | No | 91.7% | Yes | 1 | 2.05 | 7,371 | 0.0 | $1,048.21 | $3,606.80 | $600.00 | 2.87 |
| New gym | AHU | 1 | Return Fan | 7.5 | 91.7% | No | 3,391 | No | 91.7% | Yes | 1 | 2.05 | 7,371 | 0.0 | $1,048.21 | $3,606.80 | $600.00 | 2.87 |
| Hallway G | 1 | 2 | Supply Fan | 1.5 | 86.5% | No | 2,745 | No | 86.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Football team room, Girls' team room, Visiting team room, Front corridor, old gym, locker rooms, kitchen, lobby | AHU supply fans | 7 | Supply Fan | 1.0 | 80.0% | No | 2,745 | No | 80.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Kitchen exhaust | 1 | Exhaust Fan | 5.0 | 85.0% | No | 2,745 | No | 85.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Classrooms and hallway | Unit Ventilators and Fan coil units | 49 | Supply Fan | 0.3 | 60.0% | No | 2,745 | No | 60.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Rooftop | Exhaust fan | 8 | Exhaust Fan | 0.5 | 80.0% | No | 2,745 | No | 80.0% | 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 | Coach's office | 1 | Packaged AC | 6.00 | | Yes | 1 | Packaged AC | 6.00 | | 13.00 | | No | 0.12 | 162 | 0.0 | $23.00 | $10,692.63 | $438.00 | 445.78 |
| Roof | Coach's office | 1 | Packaged AC | 2.00 | | Yes | 1 | Packaged AC | 2.00 | | 14.00 | | No | 0.31 | 430 | 0.0 | $61.17 | $4,537.92 | $184.00 | 71.18 |
| Roof | Maintenance office, coach office | 2 | Split-System AC | 1.50 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | AD office | 1 | Split-System AC | 2.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | AD office | 1 | Packaged AC | 4.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Art room | 2 | Packaged AC | 2.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Locker room and lobby | 2 | Packaged AC | 3.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | E-hallway | 1 | Split-System AC | 2.50 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Art class | 1 | Packaged AC | 1.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | ROTC | 1 | Packaged AC | 8.50 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | ROTC | 1 | Packaged AC | 5.00 | | Yes | 1 | Packaged AC | 5.00 | | 14.00 | | No | 1.07 | 1,469 | 0.0 | $208.90 | $11,344.80 | $460.00 | 52.11 |
| Roof | Science Lab | 1 | Packaged AC | 5.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Copy room | Copy room | 1 | Split-System AC | 2.50 | | Yes | 1 | Split-System AC | 2.50 | | 16.00 | | No | 0.42 | 575 | 0.0 | $81.77 | $3,740.55 | $230.00 | 42.93 |
| Computer lab | Computer lab | 2 | Split-System AC | 3.50 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Room 205 | Room 205 | 1 | Split-System AC | 1.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| A109 | A109 | 1 | Split-System AC | 2.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Room 207 | Room 207 | 2 | Split-System AC | 3.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Rooftop | Nurse's office | 1 | Packaged AC | 3.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Rooftop | Guidance office | 1 | Packaged AC | 4.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Rooftop | Cafeteria | 1 | Packaged AC | 25.00 | | Yes | 1 | Packaged Terminal AC | 25.00 | | 13.00 | | Yes | 4.25 | 10,241 | 0.0 | $1,456.38 | $48,970.25 | $1,875.00 | 32.34 |

| | | 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 |
| Rooftop | office - IMC | 2 | Split-System AC | 3.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Rooftop | CR-IMC | 2 | Packaged AC | 3.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| AC3, AC, AC12 | CR-IMC | 3 | Packaged AC | 5.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| AC13, AC8 | CR-IMC | 2 | Packaged AC | 4.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| AC15 | CR-IMC | 1 | Packaged AC | 10.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| AC11 | CR-IMC | 1 | Packaged AC | 8.50 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Server room | 1 | Split-System AC | 3.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| AC6,7 | CR-IMC | 2 | Packaged AC | 7.67 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| AC4,9 | CR-IMC | 2 | Packaged AC | 3.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| AC10 | CR-IMC | 1 | Packaged AC | 5.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Computer room | Computer room | 1 | Split-System AC | 3.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| AC14 | IMC | 1 | Packaged AC | 12.58 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Maintenance office, E136, Transport office | Maintenance office, E136, Transport office | 3 | Window AC | 1.50 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Offices | Offices | 2 | Split-System AC | 1.50 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Principal office | Principal office | 1 | Split-System AC | 1.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| C133 | C133 | 1 | Split-System AC | 2.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| C130,131,129,128,124,125 | C130,131,129,128,124,125 | 6 | Window AC | 1.25 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Attendance | Attendance | 1 | Window AC | 0.67 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| A106,107,108,110 | A106,107,108,110 | 5 | Window AC | 1.25 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| A112,A118,B202,B203,B204,B208, B209,B212,B213,B214,B215,D220,D227,D226,D228,D229, D232,D237 | A112,A118,B202,B203,B204,B208, B209,B212,B213,B214,B215,D220,D227,D226,D228,D229, D232,D237 | 21 | Window AC | 1.25 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

| | | 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 |
| D237 | D237 | 1 | Window AC | 0.75 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Maintenance room | Maintenance room | 1 | Window AC | 1.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## 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 room IMC | IMC section | 2 | Condensing Hot Water Boiler | 1,290.00 | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Old Main boiler room | Most of the high school - A, B, C, D, some E wing | 3 | Non-Condensing Hot Water Boiler | 3,010.00 | Yes | 3 | Condensing Hot Water Boiler | 3,000.00 | 93.00% | Ec | 0.00 | 0 | 861.6 | $7,182.73 | $167,480.21 | $18,000.00 | 20.81 |
| Mez boiler room | New gym, part of F wing | 2 | Non-Condensing Hot Water Boiler | 2,232.00 | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Boiler room IMC | IMC section | 1 | Warm Air Unit Heater | 60.00 | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Art room | 2 | Furnace | 62.40 | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## 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 |
| Main boiler room | Main section | 2 | Storage Tank Water Heater (> 50 Gal) | Yes | 2 | Storage Tank Water Heater (> 50 Gal) | Natural Gas | 95.00% | Et | 0.00 | 0 | 218.9 | $1,825.29 | $67,147.40 | $2,345.00 | 35.50 |

## Low-Flow Device Recommendations

| | Recommedation Inputs | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Device Quantity | Device Type | Existing Flow Rate (gpm) | Proposed Flow Rate (gpm) | 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 |
| MRR, ROTC, Girls locker room, boys locker room, library lavatory, Principal office, MRR, WRR, | 13 | Faucet Aerator (Lavatory) | 2.50 | 1.00 | 0.00 | 0 | 33.3 | $277.27 | $93.21 | $0.00 | 0.34 |
| E143,Library, Teachers lounge, Home ec room | 12 | Faucet Aerator (Kitchen) | 2.50 | 2.20 | 0.00 | 0 | 6.1 | $51.19 | $86.04 | $0.00 | 1.68 |

## Walk-In Cooler/Freezer Inventory & Recommendations

| | Existing Conditions | | Proposed Conditions | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Cooler/ Freezer Quantity | Case Type/Temperature | Install EC Evaporator Fan Motors? | Install Electric Defrost Control? | Install Evaporator Fan Control? | 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 | Cooler (35F to 55F) | No | No | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Kitchen | 2 | Low Temp Freezer (-35F to -5F) | No | No | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Commercial Refrigerator/Freezer Inventory & Recommendations

| | Existing Conditions | | | Proposed Condi | 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 Freezer, Solid Door (16 - 30 cu. ft.) | Yes | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Kitchen | 3 | Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.) | Yes | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Kitchen | 2 | Stand-Up Freezer, Glass Door (31 - 50 cu. ft.) | Yes | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Kitchen | 1 | Freezer Chest | Yes | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Commercial Ice Maker Inventory & Recommendations

| | Existing Conditions | | | Proposed Condi | 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 |
| Trainer's office | 3 | Ice Making Head (<450 lbs/day), Batch | Yes | 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 | Gas Steamer | Yes | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Kitchen | 4 | Gas Convection Oven (Half Size) | Yes | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Kitchen | 1 | Insulated Food Holding Cabinet (Full Size) | Yes | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Dishwasher Inventory & Recommendations

| | Existing Conditions | | | | | Proposed Conditions | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Quantity | Dishwasher Type | Water Heater Fuel Type | Booster Heater Fuel 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 | Payback w/ Incentives in Years |
| Kitchen | 1 | Multi-Tank Conveyor (High Temp) | Electric | Electric | Yes | 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? |
| Deptford high school | 315 | Computer | 150.0 | Yes |
| Deptford high school | 7 | Laptop | 45.0 | Yes |
| Deptford high school | 55 | Printer - Small | 20.0 | Yes |
| Deptford high school | 27 | Printer - medium | 60.0 | Yes |
| Deptford high school | 10 | Printer Big | 200.0 | Yes |
| Deptford high school | 1 | Paper shredder | 150.0 | Yes |
| Deptford high school | 53 | Projector | 200.0 | Yes |
| Deptford high school | 23 | Microwave | 1,000.0 | No |
| Deptford high school | 2 | Refrigerator- Small | 153.0 | No |
| Deptford high school | 7 | Refrigerator - medium | 156.0 | No |
| Deptford high school | 8 | Refrigerator - large | 172.0 | No |
| Deptford high school | 8 | Coffee machine | 900.0 | Yes |
| Deptford high school | 4 | Toaster | 850.0 | Yes |
| Deptford high school | 1 | Toaster oven | 1,200.0 | Yes |
| Deptford high school | 4 | Ceiling fan | 100.0 | Yes |
| Deptford high school | 4 | Clothes washer | 900.0 | Yes |
| Deptford high school | 1 | Clothes dryer | 1,500.0 | Yes |
| Deptford high school | 2 | CRT/DLP | 120.0 | No |
| Deptford high school | 4 | LCD 42-inch | 71.0 | Yes |
| Deptford high school | 3 | LCD 50-inch | 100.0 | Yes |
| Deptford high school | 50 | Smart Board | 5.0 | Yes |
| Deptford high school | 5 | Induction stove | 3,000.0 | No |

## Vending Machine Inventory & Recommendations

| | Existing Conditions | | Proposed Conditions | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Location | Quantity | Vending Machine Type | Install Controls? | 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 |
| Gym area | 3 | Refrigerated | Yes | 0.00 | 4,836 | 0.0 | $687.67 | $690.00 | $0.00 | 1.00 |
| Kitchen | 5 | Refrigerated | Yes | 0.00 | 8,059 | 0.0 | $1,146.11 | $1,150.00 | $0.00 | 1.00 |
| Kitchen | 1 | Non-Refrigerated | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

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

## ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

**84**

**ENERGY STAR® Score**[1]

### Deptford Township High School

**Primary Property Type:** K-12 School
**Gross Floor Area (ft²):** 221,992
**Built:** 1974

**For Year Ending:** October 31, 2016
**Date Generated:** January 08, 2018

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

### Property & Contact Information

| Property Address | Property Owner | Primary Contact |
|---|---|---|
| Deptford Township High School<br>575 Fox Run Road<br>Deptford, New Jersey 08096 | _____<br>,<br>(___)___-____ | ___ _____<br>,<br>(___)___-____<br>_____ |

**Property ID:** 6135220

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

**Site EUI**
63.5 kBtu/ft²

**Source EUI**
106.8 kBtu/ft²

| Annual Energy by Fuel | |
|---|---|
| Electric - Grid (kBtu) | 4,257,504 (30%) |
| Natural Gas (kBtu) | 9,841,888 (70%) |

| National Median Comparison | |
|---|---|
| National Median Site EUI (kBtu/ft²) | 92 |
| National Median Source EUI (kBtu/ft²) | 154.7 |
| % Diff from National Median Source EUI | -31% |
| **Annual Emissions** | |
| Greenhouse Gas Emissions (Metric Tons CO2e/year) | 995 |

### 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)**