# Local Government Energy Audit:
## Energy Audit Report


**Lucy N Holman**

**Elementary School**

125 Manhattan Street

Jackson, NJ 08527

Jackson Township BOE

June 25, 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 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.

# Table of Contents

# Table of Figures

# 1 EXECUTIVE SUMMARY

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

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

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey 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

Lucy N Holman Elementary School is a 56,280 square foot facility comprised of spaces such as classrooms, offices, cafeteria, media center, storage closets, hallways and a mechanical space. This is a single-story facility. The building also has five trailers that are being used as classrooms. The typical hours of operation are between 9:00 AM and 3:15 PM during the week. On Saturdays there are sports activities taking place in the school and on Sunday the school is closed.

Original building was constructed in 1970 and the gymnasium was added in 2004. The school is conditioned using vertical ground source heat pumps located in the attics and closets. Lighting at Lucy N Holman Elementary School consists of linear T8 tubes and a few incandescent lamp fixtures.

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

## 1.2 Your Cost Reduction Opportunities

### Energy Conservation Measures

TRC evaluated nine measures and recommends seven measures which together represent an opportunity for Lucy N Holman Elementary School to reduce annual energy costs by $23,394 and annual greenhouse gas emissions by 172,795 lbs. $CO_2e$. We estimate that if all measures were implemented as recommended, the project would pay for itself in 7.9 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 Lucy N Holman Elementary School's annual energy use by 19%.

*Figure 1 – Previous 12 Month Utility Costs*

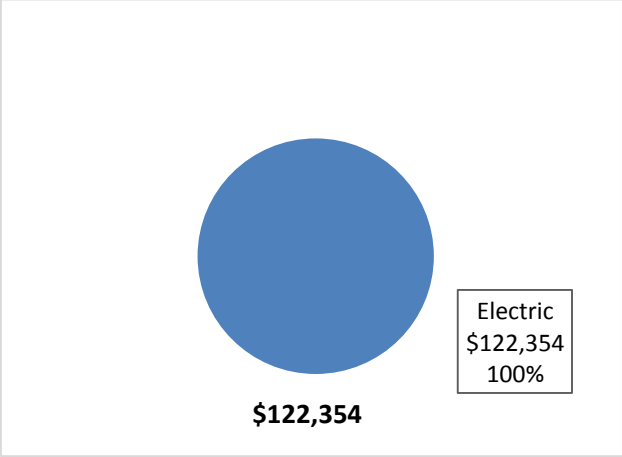
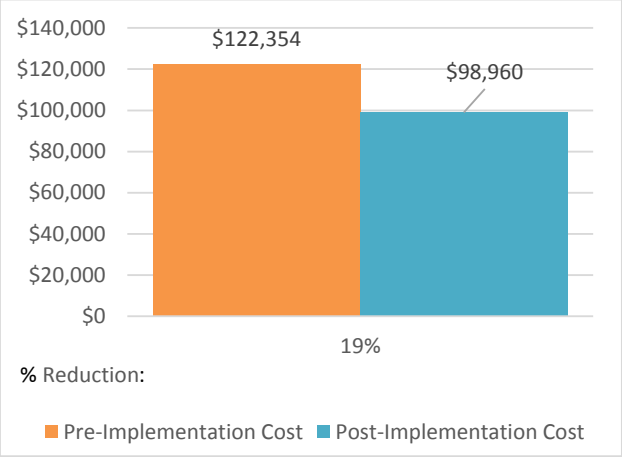



*Figure 2 – Potential Post-Implementation Costs*




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

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

*Figure 3 – Summary of Energy Reduction Opportunities*

| Energy Conservation Measure | | Recommend? | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($)* | Estimated Net Cost ($) | Simple Payback Period (yrs)** | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lighting Upgrades** | | | **123,233** | **24.7** | **0.0** | **$16,800.64** | **$151,897.11** | **$12,030.00** | **$139,867.11** | **8.3** | **124,095** |
| ECM 1 | Install LED Fixtures | Yes | 42,763 | 6.2 | 0.0 | $5,830.00 | $103,895.73 | $6,100.00 | $97,795.73 | 16.8 | 43,062 |
| ECM 2 | Retrofit Fixtures with LED Lamps | Yes | 80,470 | 18.6 | 0.0 | $10,970.64 | $48,001.39 | $5,930.00 | $42,071.39 | 3.8 | 81,033 |
| **Lighting Control Measures** | | | **23,022** | **5.3** | **0.0** | **$3,138.64** | **$31,866.00** | **$5,295.00** | **$26,571.00** | **8.5** | **23,183** |
| ECM 3 | Install Occupancy Sensor Lighting Controls | Yes | 20,635 | 4.7 | 0.0 | $2,813.21 | $26,466.00 | $5,295.00 | $21,171.00 | 7.5 | 20,779 |
| ECM 4 | Install High/Low Lighitng Controls | Yes | 2,387 | 0.5 | 0.0 | $325.43 | $5,400.00 | $0.00 | $5,400.00 | 16.6 | 2,404 |
| **Variable Frequency Drive (VFD) Measures** | | | **15,851** | **3.0** | **0.0** | **$2,161.00** | **$18,368.32** | **$1,040.00** | **$17,328.32** | **8.0** | **15,962** |
| ECM 5 | Install VFDs on Constant Volume (CV) HVAC | Yes | 5,898 | 1.8 | 0.0 | $804.11 | $11,816.62 | $1,040.00 | $10,776.62 | 13.4 | 5,939 |
| ECM 6 | Install VFDs on Hot Water Pumps | Yes | 9,953 | 1.3 | 0.0 | $1,356.89 | $6,551.70 | $0.00 | $6,551.70 | 4.8 | 10,022 |
| **Electric Unitary HVAC Measures** | | | **64,564** | **22.5** | **0.0** | **$8,802.19** | **$247,463.01** | **$8,062.50** | **$239,400.51** | **27.2** | **65,016** |
| | Install High Efficiency Electric AC | No | 3,387 | 2.0 | 0.0 | $461.78 | $22,928.49 | $934.50 | $21,993.99 | 47.6 | 3,411 |
| | Install High Efficiency Heat Pumps | No | 61,177 | 20.5 | 0.0 | $8,340.41 | $224,534.53 | $7,128.00 | $217,406.53 | 26.1 | 61,605 |
| **Domestic Water Heating Upgrade** | | | **9,489** | **0.0** | **0.0** | **$1,293.70** | **$279.63** | **$0.00** | **$279.63** | **0.2** | **9,556** |
| ECM 7 | Install Low-Flow Domestic Hot Water Devices | Yes | 9,489 | 0.0 | 0.0 | $1,293.70 | $279.63 | $0.00 | $279.63 | 0.2 | 9,556 |
| **TOTALS** | | | **236,160** | **55.5** | **0.0** | **$32,196.16** | **$449,874.08** | **$26,427.50** | **$423,446.58** | **13.2** | **237,811** |
| **TOTAL OF ALL RECOMMENDED ECMS** | | | **171,595** | **33** | **0** | **$ 23,393.97** | **$ 202,411.06** | **$ 18,365.00** | **$ 184,046.06** | **7.9** | **172,795** |
| **TOTAL OF ALL NON-RECOMMENDED ECMS** | | | **64,564** | **22** | **0** | **$ 8,802.19** | **$ 247,463.01** | **$ 8,062.50** | **$ 239,400.51** | **27.2** | **65,016** |

* - 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 measures save energy by reducing the power used by the lighting components due to improved electrical efficiency.

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

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

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

**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.

## Energy Efficient Practices

TRC also identified three 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 Lucy N Holman Elementary School include:

- Use Window Treatments/Coverings
- Perform Proper Water Heater Maintenance
- 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 Lucy N Holman Elementary 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** | 129 | kW DC STC |
| **Electric Generation** | 153,687 | kWh/yr |
| **Displaced Cost** | $13,370 | /yr |
| **Installed Cost** | $335,400 | |

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

## 1.3 Implementation Planning

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

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

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

- SmartStart
- SREC (Solar Renewable Energy Certificate) Registration Program
- 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.

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 8.3 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 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** | | | |
| Michelle Richardson | Business Administrator | mrichardson@jacksond.org | 732-833-4600 |
| **Designated Representative** | | | |
| John Blair | Energy Education Specialist | jblair@jacksond.org | 732-833-4600 ext:4380 |
| **TRC Energy Services** | | | |
| Smruti Srinivasan | Auditor | ssrinivasan@trcsolutions.com | 732-855-0033 |

## 2.2 General Site Information

On October 5, 2017, TRC performed an energy audit at Lucy N Holman Elementary School located in Jackson, New Jersey. TRC's team met with John Blair to review the facility operations and help focus our investigation on specific energy-using systems.

Lucy N Holman Elementary School is a 56,280 square foot facility comprised of spaces such as classrooms, offices, cafeteria, media center, storage closets, hallways and a mechanical space. This is a single-story facility. The building also has five trailers that are being used as classrooms. The typical hours of operation are between 9:00 AM and 3:15 PM during the weekdays. On Saturdays there are sports activities taking place in the school and on Sunday the school is closed.

Original building was constructed in 1970 and the gymnasium was added in 2004. The school is conditioned using vertical ground source heat pumps located in the attics and closets. Lighting at Lucy N Holman Elementary School consists of linear T8 tubes and a few incandescent lamp fixtures.

## 2.3 Building Occupancy

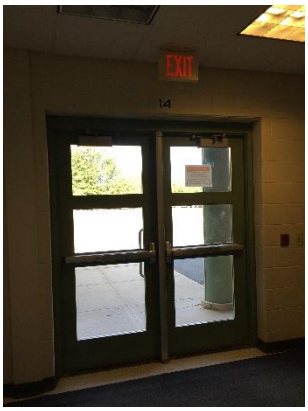
The typical schedule is presented in the table below. During a typical day, approximately 100 full time staff (including teachers, administration and maintenance) and 690 students occupy the facility.

*Figure 6 - Building Schedule*

| Building Name | Weekday/Weekend | Operating Schedule |
|---|---|---|
| Lucy N Holman Elementary School | Weekday | 9:00 AM - 3:15 PM |
| Lucy N Holman Elementary School | Weekend | Saturdays - about 6 hours for sports activities<br>Sunday: remains closed |

## 2.4 Building Envelope

The building is constructed of concrete block and structural steel with a brick facade. The buildings have flat roofs covered with black membrane with a gravel ballast. The building has single pane windows in the older section and double pane windows in the newer addition. The exterior doors are constructed of aluminum and in good condition. The trailers have vinyl and wood construction.




## 2.5 On-Site Generation

Lucy N Holman Elementary School does not have an on-site electric generation system.

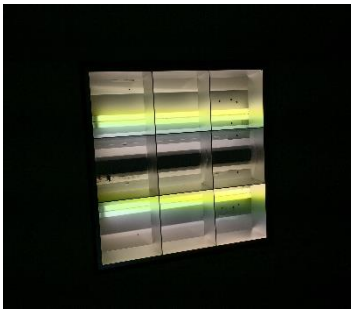
## 2.6 Energy-Using Systems

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 incandescent fixtures. Most of the fixtures are 2-lamp or 4-lamp, 4-foot long troffers and 2-foot U-bent fixtures.

Lighting control in most spaces is provided by wall switches. The building's exterior lighting consists of poles fixtures with 400-Watt high pressure sodium lamps, 150-Watt wall pack fixtures with metal halide lamps, and canopy fixtures with 42-Watt CFL lamps. The exterior lights are controlled by photocells and timers. The exit lights are 2-Watt LED fixtures.


## Air Conditioning System (DX) and Heating System

The heating and cooling is provided using water source heat pumps. Ground source water is circulated throughout the school using constant speed 5HP supply pumps. The classrooms have vertical water source heat pumps from FHP. Typical classrooms units have 2.5-ton Florida Heat Pump (FHP) Manufacturing units. Larger rooms, such as the computer room, media center and the multi-purpose rooms have 6-ton FHP units. These units were installed in 2000 and have been evaluated for replacement. These areas have thermostats in the respective zones which allows the setpoints to be altered by plus or minus 1.5 degrees Fahrenheit. Ventilation to these areas is provided using Greenheck roof top energy recovery ventilation units (ERVs) that precondition the outdoor supply air. Common areas, vestibules and stairwell areas are heated using electric resistance heating.

The gymnasium has two 26-ton Heatex geothermal heat pumps on the roof with 36kW electric backup heating elements.

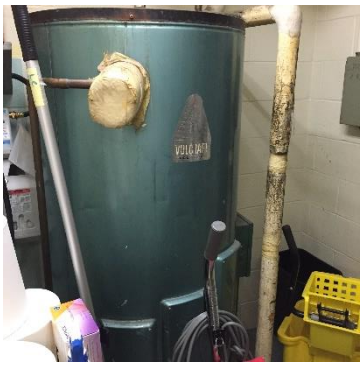
The trailers have packaged electric heating (5kW) and cooling units (3-5 tons) from Bard Manufacturing. The trailers have been in the school since 1990 and hence the HVAC systems are also as old. Each of the trailers have their own thermostat controlling space temperatures.

The HVAC system schedules and space temperatures are controlled via building automation system provided by Johnson Control Metasys. The occupied heating set point is 70°F and occupied cooling set point is 72°F. The unoccupied heating set point is 65°F and the unoccupied cooling set point is 80°F.




## Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of five electric water heaters located in spaces near the points of use. The tank capacities range 40 gallons to 119 gallons. Four out of these five units have past their useful life. Some of these units are rusted and with degraded insulation. It is suggested that these systems be replaced with newer units that are sized to t their respective loads.



### Food Service & Refrigeration

The school has an all-electric kitchen that consists of two convection ovens, food holding cabinets, milk coolers, ice cream chest and commercial refrigerators. The kitchen serves lunch to the students in the facility and operate from September through June.

### Building Plug Load

There are approximately 18 computer work stations throughout the facility. Other office plug loads in the facility include laptops, printer, projectors and smart boards. Spaces such as the teachers' lounge and a few private offices have kitchenette equipment such as microwave over, various sizes of refrigerators, toasters, toaster ovens and coffee machines. Most of these plug loads are ENERGY STAR® rated equipment. There is no centralized PC power management software installed.

The teachers' lounge also has on non-refrigerated and one refrigerated vending machine in the facility. No controls were observed to be installed on them.

## 2.7 Water-Using Systems

The restrooms and classroom faucets were observed to be 2.2 gallons per minute (gpm) or higher, the toilets are rated at 1.6 gallons per flush (gpf). These have been evaluated against having low flow fixtures at the facility.

# 3 SITE ENERGY USE AND COSTS

Utility data for electricity was analyzed to identify opportunities for savings. In addition, data for electricity 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 many 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 3.3 for additional information.

## 3.1 Total Cost of Energy

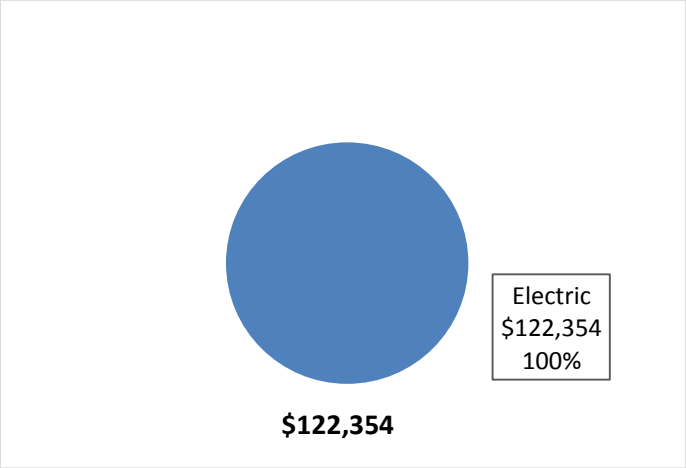
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

*Figure 7 - Utility Summary*

| Utility Summary for Lucy N Holman Elementary School | | |
|---|---|---|
| **Fuel** | **Usage** | **Cost** |
| Electricity | 897,470 kWh | $122,354 |
| **Total** | | **$122,354** |

The current annual energy cost for this facility is $122,354 as shown in the chart below.

*Figure 8 - Energy Cost Breakdown*



## 3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.136/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. Third party electric provider at this facility is Constellation Energy. This is an all-electric building and the consumption pattern looks normal for a typical building such as this. The monthly electricity consumption and peak demand are shown in the chart below. This usage profile (overall pattern) is normal for an all-electric building in this climate.

*Figure 9 - Electric Usage & Demand*

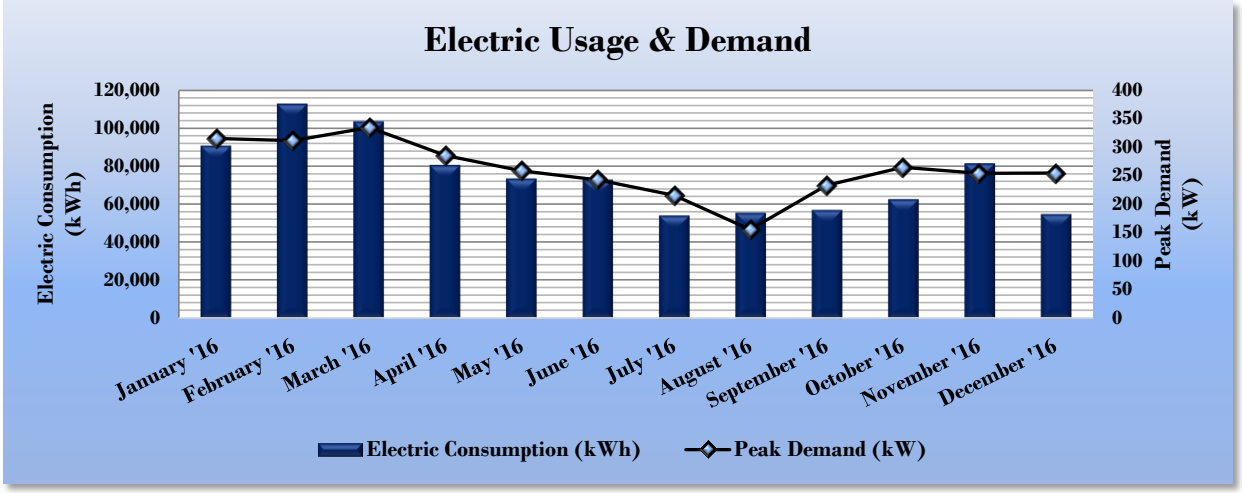



*Figure 10 - Electric Usage & Demand*

| Electric Billing Data for Lucy N Holman Elementary School | | | | | |
|---|---|---|---|---|---|
| Period Ending | Days in Period | Electric Usage (kWh) | Demand (kW) | Demand Cost | Total Electric Cost |
| 1/31/16 | 30 | 90,586 | 316 | | $12,230 |
| 2/28/16 | 28 | 112,531 | 311 | | $14,663 |
| 3/31/16 | 32 | 103,219 | 335 | | $13,775 |
| 4/30/16 | 30 | 80,442 | 286 | | $11,031 |
| 5/31/16 | 31 | 73,380 | 258 | | $9,877 |
| 6/30/16 | 30 | 72,684 | 242 | | $10,032 |
| 7/31/16 | 31 | 53,883 | 215 | | $7,637 |
| 8/31/16 | 31 | 55,407 | 155 | | $7,381 |
| 9/30/16 | 30 | 56,820 | 233 | | $7,973 |
| 10/31/16 | 31 | 62,487 | 265 | | $8,839 |
| 11/30/16 | 30 | 81,322 | 254 | | $11,108 |
| 12/31/16 | 31 | 54,709 | 255 | | $7,809 |
| **Totals** | **365** | **897,470** | **334.7** | **$0** | **$122,354** |
| **Annual** | **365** | **897,470** | **334.7** | **$0** | **$122,354** |

## 3.3 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 11 - Energy Use Intensity Comparison – Existing Conditions*

| Energy Use Intensity Comparison - Existing Conditions | | |
|---|---|---|
| | Lucy N Holman Elementary School | National Median Building Type: School (K-12) |
| Source Energy Use Intensity (kBtu/ft$^2$) | 170.8 | 141.4 |
| Site Energy Use Intensity (kBtu/ft$^2$) | 54.4 | 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 12 - Energy Use Intensity Comparison – Following Installation of Recommended Measures*

| Energy Use Intensity Comparison - Following Installation of Recommended Measures | | |
|---|---|---|
| | Lucy N Holman Elementary School | National Median Building Type: School (K-12) |
| Source Energy Use Intensity (kBtu/ft$^2$) | 138.2 | 141.4 |
| Site Energy Use Intensity (kBtu/ft$^2$) | 44.0 | 58.2 |

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 39.

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

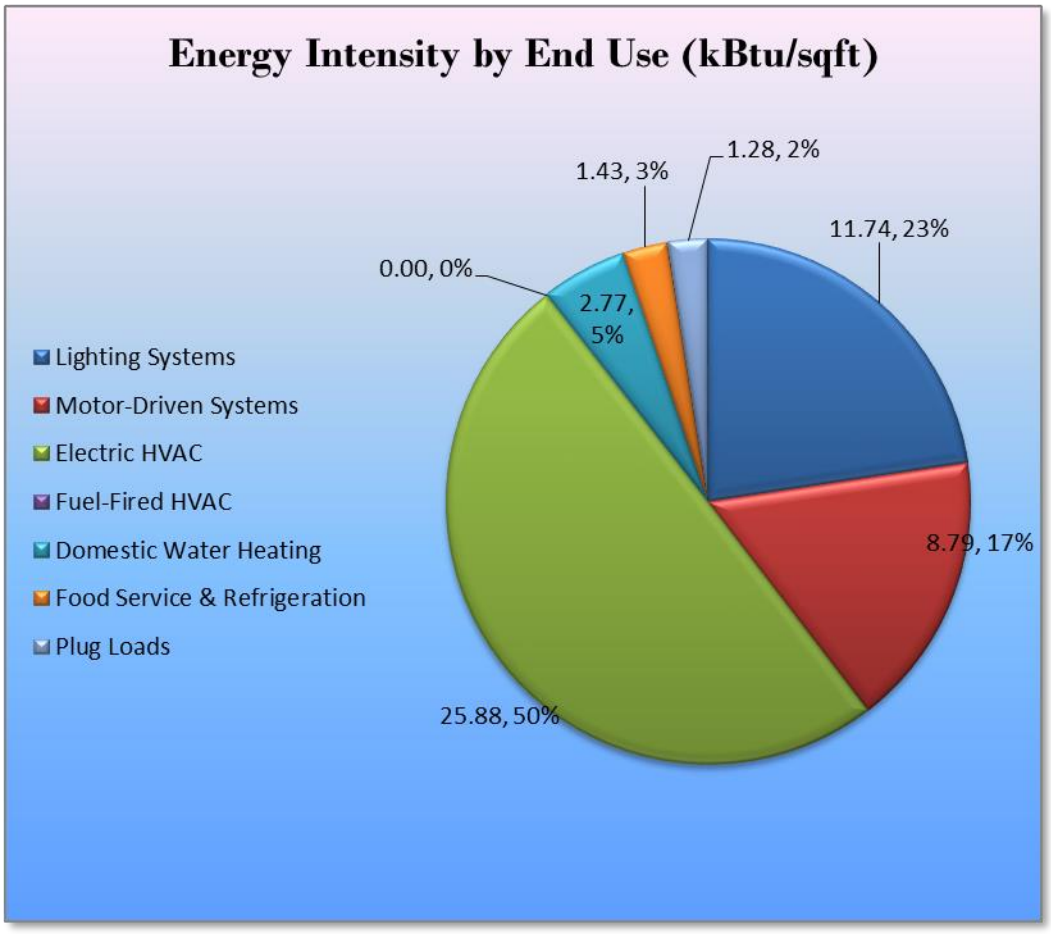
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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.

## 3.4 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 13 - 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 Lucy N Holman Elementary School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

## 4.1 Recommended ECMs

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

*Figure 14 – 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** | | **123,233** | **24.7** | **0.0** | **$16,800.64** | **$151,897.11** | **$12,030.00** | **$139,867.11** | **8.3** | **124,095** |
| ECM 1 | Install LED Fixtures | 42,763 | 6.2 | 0.0 | $5,830.00 | $103,895.73 | $6,100.00 | $97,795.73 | 16.8 | 43,062 |
| ECM 2 | Retrofit Fixtures with LED Lamps | 80,470 | 18.6 | 0.0 | $10,970.64 | $48,001.39 | $5,930.00 | $42,071.39 | 3.8 | 81,033 |
| **Lighting Control Measures** | | **23,022** | **5.3** | **0.0** | **$3,138.64** | **$31,866.00** | **$5,295.00** | **$26,571.00** | **8.5** | **23,183** |
| ECM 3 | Install Occupancy Sensor Lighting Controls | 20,635 | 4.7 | 0.0 | $2,813.21 | $26,466.00 | $5,295.00 | $21,171.00 | 7.5 | 20,779 |
| ECM 4 | Install High/Low Lighitng Controls | 2,387 | 0.5 | 0.0 | $325.43 | $5,400.00 | $0.00 | $5,400.00 | 16.6 | 2,404 |
| **Variable Frequency Drive (VFD) Measures** | | **15,851** | **3.0** | **0.0** | **$2,161.00** | **$18,368.32** | **$1,040.00** | **$17,328.32** | **8.0** | **15,962** |
| ECM 5 | Install VFDs on Constant Volume (CV) HVAC | 5,898 | 1.8 | 0.0 | $804.11 | $11,816.62 | $1,040.00 | $10,776.62 | 13.4 | 5,939 |
| ECM 6 | Install VFDs on Hot Water Pumps | 9,953 | 1.3 | 0.0 | $1,356.89 | $6,551.70 | $0.00 | $6,551.70 | 4.8 | 10,022 |
| **Domestic Water Heating Upgrade** | | **9,489** | **0.0** | **0.0** | **$1,293.70** | **$279.63** | **$0.00** | **$279.63** | **0.2** | **9,556** |
| ECM 7 | Install Low-Flow Domestic Hot Water Devices | 9,489 | 0.0 | 0.0 | $1,293.70 | $279.63 | $0.00 | $279.63 | 0.2 | 9,556 |
| **TOTAL OF ALL RECOMMENDED ECMS** | | **171,595** | **33** | **0** | **$ 23,393.97** | **$ 202,411.06** | **$ 18,365.00** | **$ 184,046.06** | **7.9** | **172,795** |

### 4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 15 below.

*Figure 15 – 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** | | **123,233** | **24.7** | **0.0** | **$16,800.64** | **$151,897.11** | **$12,030.00** | **$139,867.11** | **8.3** | **124,095** |
| ECM 1 | Install LED Fixtures | 42,763 | 6.2 | 0.0 | $5,830.00 | $103,895.73 | $6,100.00 | $97,795.73 | 16.8 | 43,062 |
| ECM 2 | Retrofit Fixtures with LED Lamps | 80,470 | 18.6 | 0.0 | $10,970.64 | $48,001.39 | $5,930.00 | $42,071.39 | 3.8 | 81,033 |

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 | 5,925 | 1.4 | 0.0 | $807.70 | $64,444.80 | $3,600.00 | $60,844.80 | 75.3 | 5,966 |
| Exterior | 36,839 | 4.8 | 0.0 | $5,022.30 | $39,450.93 | $2,500.00 | $36,950.93 | 7.4 | 37,096 |

*Measure Description*

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

Additional savings from lighting maintenance can be anticipated since LEDs have life cycles which are more than most other lighting technologies.

## ECM 2: Retrofit Fixtures with LED Lamps

*Summary of Measure Economics*

| Interior/ Exterior | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| Interior | 79,201 | 18.4 | 0.0 | $10,797.59 | $46,926.33 | $5,930.00 | $40,996.33 | 3.8 | 79,754 |
| Exterior | 1,269 | 0.2 | 0.0 | $173.05 | $1,075.06 | $0.00 | $1,075.06 | 6.2 | 1,278 |

*Measure Description*

We recommend retrofitting existing incandescent and linear T8 (4-foot and 2-foot) 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 life cycles which are more than twice that of fluorescent tubes.

### 4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 16 below.

***Figure 16 – 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** | | **23,022** | **5.3** | **0.0** | **$3,138.64** | **$31,866.00** | **$5,295.00** | **$26,571.00** | **8.5** | **23,183** |
| ECM 3 | Install Occupancy Sensor Lighting Controls | 20,635 | 4.7 | 0.0 | $2,813.21 | $26,466.00 | $5,295.00 | $21,171.00 | 7.5 | 20,779 |
| ECM 4 | Install High/Low Lighitng Controls | 2,387 | 0.5 | 0.0 | $325.43 | $5,400.00 | $0.00 | $5,400.00 | 16.6 | 2,404 |

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 3: Install Occupancy Sensor Lighting Controls

*Summary of Measure Economics*

| Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|
| 20,635 | 4.7 | 0.0 | $2,813.21 | $26,466.00 | $5,295.00 | $21,171.00 | 7.5 | 20,779 |

*Measure Description*

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in the restrooms, storage rooms, classrooms and offices areas. 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 4: 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) |
|---|---|---|---|---|---|---|---|---|
| 2,387 | 0.5 | 0.0 | $325.43 | $5,400.00 | $0.00 | $5,400.00 | 16.6 | 2,404 |

*Measure Description*

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in the hallways 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 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 17 below.

*Figure 17 – 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** | | **15,851** | **3.0** | **0.0** | **$2,161.00** | **$18,368.32** | **$1,040.00** | **$17,328.32** | **8.0** | **15,962** |
| ECM 5 | Install VFDs on Constant Volume (CV) HVAC | 5,898 | 1.8 | 0.0 | $804.11 | $11,816.62 | $1,040.00 | $10,776.62 | 13.4 | 5,939 |
| ECM 6 | Install VFDs on Hot Water Pumps | 9,953 | 1.3 | 0.0 | $1,356.89 | $6,551.70 | $0.00 | $6,551.70 | 4.8 | 10,022 |

### ECM 5: 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) |
|---|---|---|---|---|---|---|---|---|
| 5,898 | 1.8 | 0.0 | $804.11 | $11,816.62 | $1,040.00 | $10,776.62 | 13.4 | 5,939 |

*Measure Description*

We recommend installing variable frequency drives (VFDs) to control supply fan motor speeds to convert a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system in the gym. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if present. 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.

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 6: 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) |
|---|---|---|---|---|---|---|---|---|
| 9,953 | 1.3 | 0.0 | $1,356.89 | $6,551.70 | $0.00 | $6,551.70 | 4.8 | 10,022 |

*Measure Description*

We recommend installing a variable frequency drives (VFD) to control the 5 HP water source heat-pump circulation pumps. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

## 4.1.4 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 18 below.

*Figure 18 - 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** | | **9,489** | **0.0** | **0.0** | **$1,293.70** | **$279.63** | **$0.00** | **$279.63** | **0.2** | **9,556** |
| ECM 7 | Install Low-Flow Domestic Hot Water Devices | 9,489 | 0.0 | 0.0 | $1,293.70 | $279.63 | $0.00 | $279.63 | 0.2 | 9,556 |

### ECM 7: 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) |
|---|---|---|---|---|---|---|---|---|
| 9,489 | 0.0 | 0.0 | $1,293.70 | $279.63 | $0.00 | $279.63 | 0.2 | 9,556 |

*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.

Low-flow devices reduce the overall water flow from the fixtures having a flow rate of 2.2 gpm or higher, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

## 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 19 – 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** | **70,432** | **22.5** | **0.0** | **$9,602.19** | **$247,463.01** | **$8,062.50** | **$239,400.51** | **24.9** | **70,925** |
| Install High Efficiency Electric AC | 3,387 | 2.0 | 0.0 | $461.78 | $22,928.49 | $934.50 | $21,993.99 | 47.6 | 3,411 |
| Install High Efficiency Heat Pumps | 67,045 | 20.5 | 0.0 | $9,140.42 | $224,534.53 | $7,128.00 | $217,406.53 | 23.8 | 67,514 |
| **TOTALS** | **70,432** | **22.5** | **0.0** | **$9,602.19** | **$247,463.01** | **$8,062.50** | **$239,400.51** | **24.9** | **70,925** |

* - 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) |
|---|---|---|---|---|---|---|---|---|
| 3,387 | 2.0 | 0.0 | $461.78 | $22,928.49 | $934.50 | $21,993.99 | 47.6 | 3,411 |

*Measure Description*

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

## Install High Efficiency Heat 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) |
|---|---|---|---|---|---|---|---|---|
| 67,045 | 20.5 | 0.0 | $9,140.42 | $224,534.53 | $7,128.00 | $217,406.53 | 23.8 | 67,514 |

*Measure Description*

We evaluated replacing standard efficiency ground source heat pumps with high efficiency heat pumps. 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 co-efficient of performance rating indicates more efficient heating mode. 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 these units are old enough to be evaluated for replacement, the payback period on this investment is higher than the useful life of the equipment themselves. When these units are due for replacement we suggest that they be replaced with a higher efficiency equipment at the time.

# 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.

## 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.

## Perform Proper Water Heater Maintenance

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

## 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).

Refer to Section 4.1.4 for any low-flow ECM recommendations.

# 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 deciding 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.

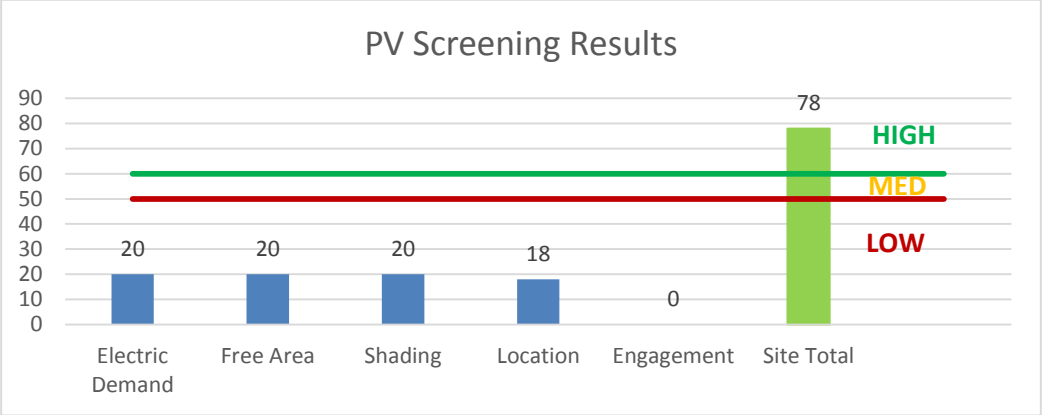
## 6.1 Photovoltaic

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 Lucy N Holman Elementary School, being an all-electric building, is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted. There is a good potential to offset the usage and the demand.

*Figure 20 - Photovoltaic Screening*



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 8.2 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.

Lack of gas service is the most significant factor 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/.

# 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 building is not a good candidate for 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 21 for a list of the eligible programs identified for each recommended ECM.

*Figure 21 - ECM Incentive Program Eligibility*

| Energy Conservation Measure | | SmartStart Prescriptive | SmartStart Custom |
|---|---|---|---|
| ECM 1 | Install LED Fixtures | x | |
| ECM 2 | Retrofit Fixtures with LED Lamps | x | |
| ECM 3 | Install Occupancy Sensor Lighting Controls | x | |
| ECM 4 | Install High/Low Lighitng Controls | | |
| ECM 5 | Install VFDs on Constant Volume (CV) HVAC | x | |
| ECM 6 | Install VFDs on Hot Water Pumps | | x |
| ECM 7 | Install Low-Flow Domestic Hot Water Devices | | |

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.

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

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

## 8.1 SmartStart

**Overview**

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

**Equipment with Prescriptive Incentives Currently Available:**

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

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

**Incentives**

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

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

**How to Participate**

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

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

## 8.2 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.

## 8.3 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 |
| Gym | 24 | Compact Fluorescent: Ceiling mount fixture - 8 lamps | Wall Switch | 336 | 2,496 | Fixture Replacement | Yes | 24 | LED - Fixtures: High-Bay | Occupancy Sensor | 250 | 1,747 | 2.53 | 11,091 | 0.0 | $1,512.09 | $69,724.80 | $4,440.00 | 43.18 |
| District storage | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,747 | 0.25 | 1,077 | 0.0 | $146.87 | $567.20 | $110.00 | 3.11 |
| Holman Storage | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,747 | 0.25 | 1,077 | 0.0 | $146.87 | $567.20 | $110.00 | 3.11 |
| Mechanical Room | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 520 | Relamp | No | 3 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 520 | 0.06 | 59 | 0.0 | $8.07 | $175.50 | $30.00 | 18.03 |
| Coach's office | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 3 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.08 | 359 | 0.0 | $48.96 | $291.50 | $50.00 | 4.93 |
| Coach's office restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Wall Switch | 93 | 2,496 | Relamp | Yes | 1 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 1,747 | 0.04 | 180 | 0.0 | $24.48 | $191.20 | $15.00 | 7.20 |
| New Entrance | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | No | 6 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 2,496 | 0.13 | 568 | 0.0 | $77.48 | $351.00 | $60.00 | 3.76 |
| New Entrance | 3 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | No | 3 | LED - Linear Tubes: (2) U-Lamp | Wall Switch | 33 | 2,496 | 0.09 | 405 | 0.0 | $55.18 | $189.60 | $0.00 | 3.44 |
| New Entrance hall | 7 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | No | 7 | LED - Linear Tubes: (2) U-Lamp | Wall Switch | 33 | 2,496 | 0.22 | 944 | 0.0 | $128.75 | $442.40 | $0.00 | 3.44 |
| Girls' restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 1 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.01 | 63 | 0.0 | $8.55 | $151.90 | $5.00 | 17.18 |
| Girls' restroom | 4 | U-Bend Fluorescent - T8: U T8 (32W) - 3L | Wall Switch | 120 | 2,496 | Relamp | Yes | 4 | LED - Linear Tubes: (3) U-Lamp | Occupancy Sensor | 50 | 1,747 | 0.22 | 980 | 0.0 | $133.60 | $589.60 | $35.00 | 4.15 |
| Boys' restroom | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 1 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.01 | 63 | 0.0 | $8.55 | $151.90 | $5.00 | 17.18 |
| Boys' restroom | 4 | U-Bend Fluorescent - T8: U T8 (32W) - 3L | Wall Switch | 120 | 2,496 | Relamp | Yes | 4 | LED - Linear Tubes: (3) U-Lamp | Occupancy Sensor | 50 | 1,747 | 0.22 | 980 | 0.0 | $133.60 | $589.60 | $35.00 | 4.15 |
| Hallway | 6 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (2) U-Lamp | High/Low Control | 33 | 1,747 | 0.22 | 980 | 0.0 | $133.60 | $579.20 | $0.00 | 4.34 |
| Hallway | 16 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 16 | LED - Linear Tubes: (2) U-Lamp | High/Low Control | 33 | 1,747 | 0.60 | 2,613 | 0.0 | $356.26 | $2,611.20 | $0.00 | 7.33 |
| Girls' restroom | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.14 | 598 | 0.0 | $81.59 | $562.50 | $85.00 | 5.85 |
| Boys' restroom | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.14 | 598 | 0.0 | $81.59 | $562.50 | $85.00 | 5.85 |
| Faculty restroom | 1 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 2,496 | None | No | 1 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 2,496 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| CR101 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR101 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.07 | 314 | 0.0 | $42.75 | $179.50 | $60.00 | 2.80 |
| CR111 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR111 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.07 | 314 | 0.0 | $42.75 | $179.50 | $60.00 | 2.80 |
| CR102 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR102 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.07 | 314 | 0.0 | $42.75 | $179.50 | $60.00 | 2.80 |
| CR112 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |

| | 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 |
| CR112 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.07 | 314 | 0.0 | $42.75 | $179.50 | $60.00 | 2.80 |
| CR103 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR103 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.07 | 314 | 0.0 | $42.75 | $179.50 | $60.00 | 2.80 |
| CR104 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR104 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.07 | 314 | 0.0 | $42.75 | $179.50 | $60.00 | 2.80 |
| CR113 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR113 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.07 | 314 | 0.0 | $42.75 | $179.50 | $60.00 | 2.80 |
| CR105 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR105 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.07 | 314 | 0.0 | $42.75 | $179.50 | $60.00 | 2.80 |
| CR114 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR114 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.07 | 314 | 0.0 | $42.75 | $179.50 | $60.00 | 2.80 |
| Hallway | 8 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 8 | LED - Linear Tubes: (2) U-Lamp | High/Low Control | 33 | 1,747 | 0.30 | 1,307 | 0.0 | $178.13 | $705.60 | $0.00 | 3.96 |
| Computer lab | 20 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 20 | LED - Linear Tubes: (2) U-Lamp | Occupancy Sensor | 33 | 1,747 | 0.75 | 3,267 | 0.0 | $445.33 | $1,534.00 | $35.00 | 3.37 |
| Office computer lab | 2 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 2 | LED - Linear Tubes: (2) U-Lamp | Occupancy Sensor | 33 | 1,747 | 0.07 | 327 | 0.0 | $44.53 | $242.40 | $20.00 | 4.99 |
| Office computer lab | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.11 | 479 | 0.0 | $65.27 | $350.00 | $60.00 | 4.44 |
| 329 room | 2 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 2 | LED - Linear Tubes: (2) U-Lamp | Occupancy Sensor | 33 | 1,747 | 0.05 | 223 | 0.0 | $30.45 | $242.40 | $20.00 | 7.30 |
| 312 office | 2 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 2 | LED - Linear Tubes: (2) U-Lamp | Occupancy Sensor | 33 | 1,747 | 0.05 | 223 | 0.0 | $30.45 | $242.40 | $20.00 | 7.30 |
| Library | 6 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | No | 6 | LED - Linear Tubes: (2) U-Lamp | Wall Switch | 33 | 2,496 | 0.11 | 499 | 0.0 | $68.09 | $379.20 | $0.00 | 5.57 |
| Library | 40 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 40 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 1.09 | 4,788 | 0.0 | $652.73 | $3,740.00 | $1,800.00 | 2.97 |
| Cafeteria | 25 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 25 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.68 | 2,992 | 0.0 | $407.96 | $2,262.50 | $1,125.00 | 2.79 |
| 322 - closet | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 52 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 52 | 0.04 | 4 | 0.0 | $0.54 | $117.00 | $20.00 | 180.27 |
| Kitchen | 18 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,440 | Relamp | No | 18 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,440 | 0.39 | 984 | 0.0 | $134.10 | $1,053.00 | $180.00 | 6.51 |
| Kitchen office | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,440 | Relamp | Yes | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,008 | 0.03 | 69 | 0.0 | $9.41 | $174.50 | $30.00 | 15.35 |
| Kitchen restroom | 1 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 1,440 | Relamp | No | 1 | LED - Linear Tubes: (2) 2' Lamps | Wall Switch | 17 | 1,440 | 0.01 | 26 | 0.0 | $3.61 | $48.20 | $10.00 | 10.58 |
| Kitchen storage | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,440 | Relamp | Yes | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,008 | 0.03 | 69 | 0.0 | $9.41 | $174.50 | $10.00 | 17.47 |

| | 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 | 9 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 9 | LED - Linear Tubes: (2) U-Lamp | High/Low Control | 33 | 1,747 | 0.23 | 1,005 | 0.0 | $137.00 | $768.80 | $0.00 | 5.61 |
| Custodian main office | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | No | 3 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 2,496 | 0.06 | 284 | 0.0 | $38.74 | $175.50 | $30.00 | 3.76 |
| Faculty lounge | 7 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 7 | LED - Linear Tubes: (2) U-Lamp | Occupancy Sensor | 33 | 1,747 | 0.26 | 1,143 | 0.0 | $155.87 | $558.40 | $20.00 | 3.45 |
| Faculty lounge restroom | 2 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 2,496 | None | No | 2 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 2,496 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| CR211 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR211 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.09 | 376 | 0.0 | $51.30 | $485.40 | $65.00 | 8.19 |
| CR212 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR212 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.09 | 376 | 0.0 | $51.30 | $485.40 | $65.00 | 8.19 |
| CR201 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR201 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.09 | 376 | 0.0 | $51.30 | $485.40 | $65.00 | 8.19 |
| CR213 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR213 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.09 | 376 | 0.0 | $51.30 | $485.40 | $65.00 | 8.19 |
| CR202 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR202 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.09 | 376 | 0.0 | $51.30 | $485.40 | $65.00 | 8.19 |
| CR203 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR203 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.09 | 376 | 0.0 | $51.30 | $485.40 | $65.00 | 8.19 |
| CR214 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR214 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.09 | 376 | 0.0 | $51.30 | $485.40 | $65.00 | 8.19 |
| CR204 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR204 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.09 | 376 | 0.0 | $51.30 | $485.40 | $65.00 | 8.19 |
| CR215 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR215 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.09 | 376 | 0.0 | $51.30 | $485.40 | $65.00 | 8.19 |
| Girls' restroom | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.14 | 598 | 0.0 | $81.59 | $562.50 | $85.00 | 5.85 |
| Boys' restroom | 5 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 2,496 | None | Yes | 5 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Occupancy Sensor | 33 | 1,747 | 0.03 | 142 | 0.0 | $19.37 | $116.00 | $0.00 | 5.99 |
| Faculty restroom | 1 | Linear Fluorescent - T8: 2' T8 (17W) - 1L | Wall Switch | 22 | 2,496 | Relamp | Yes | 1 | LED - Linear Tubes: (1) 2' Lamp | Occupancy Sensor | 9 | 1,747 | 0.01 | 46 | 0.0 | $6.28 | $147.90 | $5.00 | 22.75 |

| | 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 |
| Closet | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 52 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 52 | 0.02 | 2 | 0.0 | $0.27 | $58.50 | $10.00 | 180.27 |
| Hallway | 15 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 15 | LED - Linear Tubes: (2) U-Lamp | High/Low Control | 33 | 1,747 | 0.56 | 2,450 | 0.0 | $334.00 | $2,748.00 | $0.00 | 8.23 |
| Generator room | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | No | 4 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 2,496 | 0.09 | 379 | 0.0 | $51.66 | $234.00 | $40.00 | 3.76 |
| Hallway | 9 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 9 | LED - Linear Tubes: (2) U-Lamp | High/Low Control | 33 | 1,747 | 0.34 | 1,470 | 0.0 | $200.40 | $1,368.80 | $0.00 | 6.83 |
| CR404 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.33 | 1,436 | 0.0 | $195.82 | $972.00 | $155.00 | 4.17 |
| CR404 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.07 | 314 | 0.0 | $42.75 | $449.50 | $60.00 | 9.11 |
| CR403 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.33 | 1,436 | 0.0 | $195.82 | $972.00 | $155.00 | 4.17 |
| CR403 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.07 | 314 | 0.0 | $42.75 | $449.50 | $60.00 | 9.11 |
| CR402 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR402 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.09 | 376 | 0.0 | $51.30 | $485.40 | $65.00 | 8.19 |
| CR401 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR401 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.09 | 376 | 0.0 | $51.30 | $485.40 | $65.00 | 8.19 |
| CR 404 restroom | 1 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 2,496 | Relamp | Yes | 1 | LED - Linear Tubes: (2) 2' Lamps | Occupancy Sensor | 17 | 1,747 | 0.01 | 61 | 0.0 | $8.26 | $164.20 | $10.00 | 18.68 |
| CR 403 restroom | 1 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 2,496 | Relamp | Yes | 1 | LED - Linear Tubes: (2) 2' Lamps | Occupancy Sensor | 17 | 1,747 | 0.01 | 61 | 0.0 | $8.26 | $164.20 | $10.00 | 18.68 |
| Nurse's office | 5 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | No | 5 | LED - Linear Tubes: (2) U-Lamp | Wall Switch | 33 | 2,496 | 0.10 | 416 | 0.0 | $56.74 | $316.00 | $0.00 | 5.57 |
| Nurse's office restroom | 1 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 2,496 | Relamp | Yes | 1 | LED - Linear Tubes: (2) 2' Lamps | Occupancy Sensor | 17 | 1,747 | 0.01 | 61 | 0.0 | $8.26 | $164.20 | $10.00 | 18.68 |
| Hallway | 7 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 7 | LED - Linear Tubes: (2) U-Lamp | High/Low Control | 33 | 1,747 | 0.26 | 1,143 | 0.0 | $155.87 | $642.40 | $0.00 | 4.12 |
| Main office | 6 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | No | 6 | LED - Linear Tubes: (2) U-Lamp | Wall Switch | 33 | 2,496 | 0.18 | 809 | 0.0 | $110.35 | $379.20 | $0.00 | 3.44 |
| Principal office | 2 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 2 | LED - Linear Tubes: (2) U-Lamp | Occupancy Sensor | 33 | 1,747 | 0.07 | 327 | 0.0 | $44.53 | $242.40 | $20.00 | 4.99 |
| Principal office restroom | 1 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 1 | LED - Linear Tubes: (2) U-Lamp | Occupancy Sensor | 33 | 1,747 | 0.04 | 163 | 0.0 | $22.27 | $179.20 | $0.00 | 8.05 |
| Copy room | 3 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 3 | LED - Linear Tubes: (2) U-Lamp | Occupancy Sensor | 33 | 1,747 | 0.11 | 490 | 0.0 | $66.80 | $305.60 | $20.00 | 4.28 |
| Entrance | 13 | Incandescent: 1 Lamp | Wall Switch | 40 | 2,496 | Relamp | No | 13 | LED Screw-In Lamps: 1 Lamp | Wall Switch | 6 | 2,496 | 0.29 | 1,269 | 0.0 | $172.97 | $698.79 | $65.00 | 3.66 |
| Display light focus | 3 | Incandescent: 1 Lamp | Wall Switch | 100 | 2,496 | Relamp | No | 3 | LED Screw-In Lamps: 1 Lamp | Wall Switch | 15 | 2,496 | 0.17 | 732 | 0.0 | $99.79 | $161.26 | $15.00 | 1.47 |
| Hallway | 7 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 7 | LED - Linear Tubes: (2) U-Lamp | High/Low Control | 33 | 1,747 | 0.26 | 1,143 | 0.0 | $155.87 | $642.40 | $0.00 | 4.12 |
| Office | 12 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 12 | LED - Linear Tubes: (2) U-Lamp | Occupancy Sensor | 33 | 1,747 | 0.45 | 1,960 | 0.0 | $267.20 | $874.40 | $20.00 | 3.20 |

| | 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 |
| Office 341 | 2 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 2 | LED - Linear Tubes: (2) U-Lamp | Occupancy Sensor | 33 | 1,747 | 0.07 | 327 | 0.0 | $44.53 | $242.40 | $20.00 | 4.99 |
| Women's restroom | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 3 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.08 | 359 | 0.0 | $48.96 | $445.50 | $65.00 | 7.77 |
| Men's restroom | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 3 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.08 | 359 | 0.0 | $48.96 | $445.50 | $65.00 | 7.77 |
| Custodial closet | 1 | Incandescent: 1 Lamp | Wall Switch | 60 | 2,496 | Relamp | Yes | 1 | LED Screw-In Lamps: 1 Lamp | Occupancy Sensor | 9 | 1,747 | 0.04 | 154 | 0.0 | $21.01 | $169.75 | $5.00 | 7.84 |
| Hallway | 7 | U-Bend Fluorescent - T8: U T8 (32W) - 2L | Wall Switch | 80 | 2,496 | Relamp | Yes | 7 | LED - Linear Tubes: (2) U-Lamp | High/Low Control | 33 | 1,747 | 0.26 | 1,143 | 0.0 | $155.87 | $642.40 | $0.00 | 4.12 |
| CR 304 | 8 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 8 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.22 | 958 | 0.0 | $130.55 | $738.00 | $115.00 | 4.77 |
| CR 304 | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 5 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.14 | 598 | 0.0 | $81.59 | $562.50 | $85.00 | 5.85 |
| CR 302 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.33 | 1,436 | 0.0 | $195.82 | $972.00 | $155.00 | 4.17 |
| CR 302 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.16 | 718 | 0.0 | $97.91 | $621.00 | $95.00 | 5.37 |
| CR 301 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.33 | 1,436 | 0.0 | $195.82 | $972.00 | $155.00 | 4.17 |
| CR 301 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 6 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.16 | 718 | 0.0 | $97.91 | $621.00 | $95.00 | 5.37 |
| CR 303 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| CR 303 | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.11 | 479 | 0.0 | $65.27 | $504.00 | $75.00 | 6.57 |
| CR 303 restroom | 1 | Linear Fluorescent - T8: 2' T8 (17W) - 2L | Wall Switch | 33 | 2,496 | Relamp | Yes | 1 | LED - Linear Tubes: (2) 2' Lamps | Occupancy Sensor | 17 | 1,747 | 0.01 | 61 | 0.0 | $8.26 | $164.20 | $10.00 | 18.68 |
| Trailer 1 | 13 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 13 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.36 | 1,556 | 0.0 | $212.14 | $1,030.50 | $165.00 | 4.08 |
| Trailer 2 | 13 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 13 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.36 | 1,556 | 0.0 | $212.14 | $1,030.50 | $165.00 | 4.08 |
| Trailer 3 | 13 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 13 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.36 | 1,556 | 0.0 | $212.14 | $1,030.50 | $165.00 | 4.08 |
| Trailer 5 | 13 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 13 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.36 | 1,556 | 0.0 | $212.14 | $1,030.50 | $165.00 | 4.08 |
| Trailer 1 | 1 | Incandescent: 2 Lamps | Wall Switch | 80 | 2,496 | Relamp | Yes | 1 | LED Screw-In Lamps: 2 Lamps | Occupancy Sensor | 12 | 1,747 | 0.05 | 206 | 0.0 | $28.02 | $223.51 | $10.00 | 7.62 |
| Trailer 2 | 1 | Incandescent: 2 Lamps | Wall Switch | 80 | 2,496 | Relamp | Yes | 1 | LED Screw-In Lamps: 2 Lamps | Occupancy Sensor | 12 | 1,747 | 0.05 | 206 | 0.0 | $28.02 | $223.51 | $10.00 | 7.62 |
| Trailer 3 | 1 | Incandescent: 2 Lamps | Wall Switch | 80 | 2,496 | Relamp | Yes | 1 | LED Screw-In Lamps: 2 Lamps | Occupancy Sensor | 12 | 1,747 | 0.05 | 206 | 0.0 | $28.02 | $223.51 | $10.00 | 7.62 |
| Trailer 5 | 1 | Incandescent: 2 Lamps | Wall Switch | 80 | 2,496 | Relamp | Yes | 1 | LED Screw-In Lamps: 2 Lamps | Occupancy Sensor | 12 | 1,747 | 0.05 | 206 | 0.0 | $28.02 | $223.51 | $10.00 | 7.62 |
| Trailer 4 | 1 | High-Pressure Sodium: (1) 70W Lamp | Wall Switch | 95 | 2,496 | Fixture Replacement | No | 1 | LED - Fixtures: Outdoor Wall-Mounted Area Fixture | Wall Switch | 36 | 2,496 | 0.04 | 169 | 0.0 | $23.09 | $390.68 | $100.00 | 12.59 |
| Trailer 4 classroom | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| Trailer 4 corridor | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 2,496 | 0.04 | 189 | 0.0 | $25.83 | $117.00 | $20.00 | 3.76 |

| | 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 |
| Trailer 4 restroom (Girls) | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 1 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.01 | 63 | 0.0 | $8.55 | $151.90 | $5.00 | 17.18 |
| Trailer 4 restroom (Boys) | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,496 | Relamp | Yes | 1 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 1,747 | 0.01 | 63 | 0.0 | $8.55 | $151.90 | $5.00 | 17.18 |
| Trailer 4 classroom | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,496 | Relamp | Yes | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,747 | 0.27 | 1,197 | 0.0 | $163.18 | $855.00 | $135.00 | 4.41 |
| Exit Signs | 27 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 27 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Exterior - Pole with two fixtures | 19 | High-Pressure Sodium: (1) 400W Lamp | Daylight Dimming | 465 | 4,380 | Fixture Replacement | No | 19 | LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture | Daylight Dimming | 120 | 4,380 | 4.30 | 33,018 | 0.0 | $4,501.35 | $37,106.87 | $1,900.00 | 7.82 |
| Exterior Canopy recessed fixtures under doorways | 9 | Compact Fluorescent: 1 Lamp | Daylight Dimming | 42 | 4,380 | Relamp | No | 9 | LED Screw-In Lamps: 1 Lamp | Daylight Dimming | 29 | 4,380 | 0.07 | 571 | 0.0 | $77.87 | $483.78 | $0.00 | 6.21 |
| Exterior - Wall mounted fixtures | 11 | Compact Fluorescent: 1 Lamp | Daylight Dimming | 42 | 4,380 | Relamp | No | 11 | LED Screw-In Lamps: 1 Lamp | Daylight Dimming | 29 | 4,380 | 0.09 | 698 | 0.0 | $95.18 | $591.28 | $0.00 | 6.21 |
| Exterior - Wall pack fixtures | 5 | Metal Halide: (1) 150W Lamp | Daylight Dimming | 190 | 4,380 | Fixture Replacement | No | 5 | LED - Fixtures: Outdoor Wall-Mounted Area Fixture | Daylight Dimming | 45 | 4,380 | 0.48 | 3,652 | 0.0 | $497.86 | $1,953.39 | $500.00 | 2.92 |

## 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 |
| Head custodians office | Head custodians office | 1 | 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 |
| Roof | Unknown | 1 | Supply Fan | 1.0 | 85.5% | No | 2,745 | No | 85.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Unknown | 1 | 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 |
| Computer room | Computer room | 1 | Supply Fan | 1.0 | 85.5% | No | 2,745 | No | 85.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Mechanical room | All school | 2 | Water-Source Heat Pump Circulation Pump | 5.0 | 89.5% | No | 2,745 | No | 89.5% | Yes | 2 | 1.26 | 9,953 | 0.0 | $1,356.89 | $6,551.70 | $0.00 | 4.83 |
| Roof | ERV | 12 | Other | 1.5 | 86.5% | No | 2,745 | No | 86.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | ERV | 2 | Other | 0.5 | 60.0% | No | 2,745 | No | 60.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Gym | 2 | Supply Fan | 5.0 | 89.5% | No | 3,000 | No | 89.5% | Yes | 2 | 1.35 | 4,501 | 0.0 | $613.63 | $6,551.70 | $800.00 | 9.37 |
| Roof | Gym | 2 | Exhaust Fan | 1.5 | 86.5% | No | 3,000 | No | 86.5% | Yes | 2 | 0.42 | 1,397 | 0.0 | $190.47 | $5,264.92 | $240.00 | 26.38 |
| Head custodians office | Head custodians office | 1 | 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 |
| Computer room | Computer room, Library, Multi purpose room | 5 | Supply Fan | 1.0 | 85.5% | No | 2,745 | No | 85.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Classrooms | Classrooms | 30 | Supply Fan | 0.5 | 60.0% | No | 2,745 | No | 60.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Mech room | New addition | 1 | Other | 0.5 | 60.0% | No | 2,745 | No | 60.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | All school | 10 | Exhaust 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 |

## 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 |
| Head custodians office | Head custodians office | 1 | Water Source HP | 7.00 | 77.00 | Yes | 1 | Water Source HP | 7.00 | 77.00 | 14.00 | 4.50 | No | 5.27 | 10,130 | 0.0 | $1,381.00 | $8,649.32 | $567.00 | 5.85 |
| Roof | Unknown | 1 | Packaged AC | 5.00 | | Yes | 1 | Packaged AC | 5.00 | | 14.00 | | No | 1.30 | 2,199 | 0.0 | $299.85 | $11,344.80 | $460.00 | 36.30 |
| Roof | Unknown | 1 | Packaged AC | 6.50 | | Yes | 1 | Packaged AC | 6.50 | | 14.00 | | No | 0.70 | 1,188 | 0.0 | $161.93 | $11,583.69 | $474.50 | 68.60 |
| Computer room | Computer room, Library, Multi purpose room | 5 | Water Source HP | 6.00 | 66.00 | Yes | 1 | Water Source HP | 6.00 | 66.00 | 14.00 | 4.50 | No | 9.45 | 40,622 | 0.0 | $5,538.04 | $7,413.70 | $486.00 | 1.25 |
| Computer room office | Computer room office | 1 | Ductless Mini-Split HP | 0.75 | 9.00 | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Trailers | Trailers 1,2,3,5 | 4 | Packaged AC | 3.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Trailers 1,2,3,5 | Trailers 1,2,3,5 | 4 | Electric Resistance Heat | | 38.40 | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Trailer 4 | Trailer 4 | 1 | Packaged AC | 5.00 | | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Trailer 4 | Trailer 4 | 1 | Electric Resistance Heat | | 38.40 | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Small stoage spaces and closets | Small stoage spaces and closets | 21 | Electric Resistance Heat | | 10.23 | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Classrooms | Classrooms | 30 | Water Source HP | 2.50 | 19.00 | Yes | 30 | Water Source HP | 2.50 | 19.00 | 18.50 | 4.80 | No | 5.75 | 16,294 | 0.0 | $2,221.38 | $208,471.50 | $6,075.00 | 91.11 |
| Roof | Gym | 2 | Water Source HP | 26.00 | 266.00 | No | | | | | | | 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 |
| Mech room | New addition | 1 | Storage Tank Water Heater (> 50 Gal) | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Closet | Bathrooms | 1 | Storage Tank Water Heater (> 50 Gal) | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Closet | Bathrooms | 1 | Storage Tank Water Heater (> 50 Gal) | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Closet | Bathrooms | 1 | Storage Tank Water Heater (> 50 Gal) | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Closet | Faculty restrooms | 1 | Storage Tank Water Heater (≤ 50 Gal) | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## 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 |
| Coach's office RR, teachers' lounge RR, CR401-405, Nurse's office, Principal's office, Trailer 1,2,3,5 | 14 | Faucet Aerator (Lavatory) | 2.50 | 1.00 | 0.00 | 6,992 | 0.0 | $953.25 | $100.38 | $0.00 | 0.11 |
| CR 101,102,103,104,105,111, 112,113,114, Fac lounge,CR 201-215, CR 401-405, Nurse's office | 25 | Faucet Aerator (Kitchen) | 2.50 | 2.20 | 0.00 | 2,497 | 0.0 | $340.45 | $179.25 | $0.00 | 0.53 |

## 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 | 2 | 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 | 1 | Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.) | Yes | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Kitchen | 2 | Refrigerator Chest | Yes | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Kitchen | 2 | Freezer Chest | 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 | Electric 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 (1/2 Size) | 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? |
| Lucy N Holman ES | 18 | Computer | 150.0 | Yes |
| Lucy N Holman ES | 7 | Laptop | 45.0 | Yes |
| Lucy N Holman ES | 6 | Printer - small | 20.0 | Yes |
| Lucy N Holman ES | 3 | Printer - medium | 60.0 | Yes |
| Lucy N Holman ES | 3 | Printer - big | 200.0 | Yes |
| Lucy N Holman ES | 26 | Projector | 200.0 | Yes |
| Lucy N Holman ES | 4 | Microwave | 1,000.0 | Yes |
| Lucy N Holman ES | 1 | Refrigerator - medium | 60.0 | Yes |
| Lucy N Holman ES | 3 | Refrigerator - large | 216.0 | Yes |
| Lucy N Holman ES | 1 | Toaster | 850.0 | Yes |
| Lucy N Holman ES | 2 | Toaster oven | 1,200.0 | Yes |
| Lucy N Holman ES | 31 | Smart board | 5.0 | Yes |
| Lucy N Holman ES | 7 | Hand dryer | 1,500.0 | No |

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

## ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

**39**

ENERGY STAR® Score[1]

### Lucy N. Holman Elementary School

**Primary Property Type:** K-12 School
**Gross Floor Area (ft²):** 56,280
**Built:** 1970

**For Year Ending:** December 31, 2016
**Date Generated:** March 28, 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 |
|---|---|---|
| Lucy N. Holman Elementary School<br>125 Manhattan Street<br>Jackson, New Jersey 08527 | Jackson Township BOE<br>151 Don Connor Boulevard<br>Jackson, NJ 08527<br>(732) 833-4600 | Michelle Richardson<br>151 Don Connor Boulevard<br>Jackson, NJ 08527<br>(732) 833-4600<br>sstewart@trcsolutions.com |

**Property ID:** 2552310

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

**Site EUI**
48.6 kBtu/ft²

**Source EUI**
152.6 kBtu/ft²

**Annual Energy by Fuel**

| | | |
|---|---|---|
| Electric - Grid (kBtu) | 2,734,377 | (100%) |

**National Median Comparison**

| | |
|---|---|
| National Median Site EUI (kBtu/ft²) | 44.2 |
| National Median Source EUI (kBtu/ft²) | 138.8 |
| % Diff from National Median Source EUI | 10% |

**Annual Emissions**

| | |
|---|---|
| Greenhouse Gas Emissions (Metric Tons CO2e/year) | 303 |

### 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)**