# Local Government Energy Audit:
## Energy Audit Report


***Building #51 (Unified Science Center 1)***

101 Vera King Farris Drive

Galloway, New Jersey 08205

Stockton University

July 15, 2019

Draft Report by:

**TRC Energy Services**

# Disclaimer

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information about financial incentives that may be available. Most energy conservation measures have received preliminary analysis of feasibility that identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to establish a basis for further discussion and to help prioritize energy measures.

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

TRC bases estimated installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. We encourage the owner of the facility to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual 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. Please review all available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

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# 1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Building #51-Unified Science Center 1 (Building #51).

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 universities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

## 1.1 Facility Summary

Building #51 is a 60,622 square foot facility comprised of various space types within a single building. The building is three floors and includes classrooms, laboratories, offices, restrooms, storage, conference space, and a mechanical spaces in the fourth-floor attic.

Interior lighting at Building #51 primarily consists of linear T8 fluorescent lighting as well as some compact fluorescent lamps (CFL). Exterior lighting consists mostly of CFL and metal halide fixtures. Heating is provided primarily by a groundwater-source heat pump which generates hot water to be used in air-handlers and reheat coils. Condensing hot water boilers are used to supplement heating in the facility. Cooling is provided by a water-cooled chiller which provides chilled water to air-handlers throughout the facility. A thorough description of the facility and our observations are located in Section 2.

## 1.2 Your Cost Reduction Opportunities

### Energy Conservation Measures

TRC evaluated and recommends four measures which together represent an opportunity for Building #51 to reduce annual energy costs by $15,246 and annual greenhouse gas emissions by 127,834 lbs $CO_2e$. We estimate that if all measures were implemented as recommended, the project would pay for itself in 2.9 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 Building #51's annual energy use by 3%.

*Figure 1 – Previous 12 Month Utility Costs*

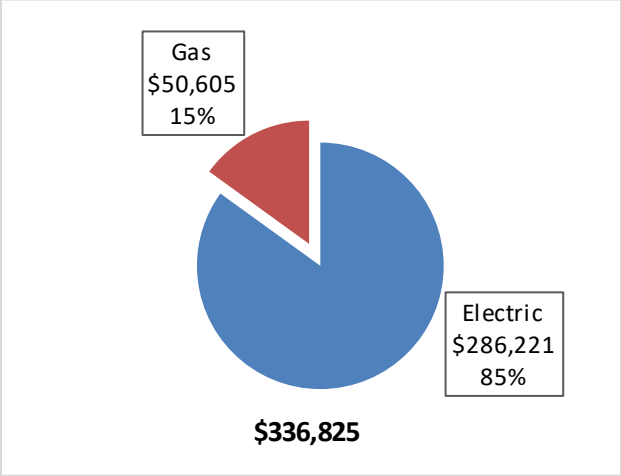
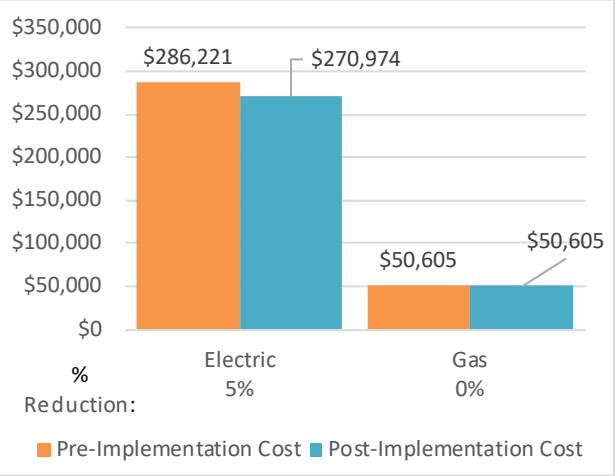



*Figure 2 – Potential Post-Implementation Costs*




A detailed description of Building #51'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 | | | 126,019 | 22.9 | 0.0 | $15,134.84 | $54,850.76 | $11,820.00 | $43,030.76 | 2.8 | 126,900 |
| ECM 1 | Install LED Fixtures | Yes | 17,458 | 2.6 | 0.0 | $2,096.68 | $18,902.35 | $1,950.00 | $16,952.35 | 8.1 | 17,580 |
| ECM 2 | Retrofit Fixtures with LED Lamps | Yes | 108,561 | 20.3 | 0.0 | $13,038.16 | $35,948.41 | $9,870.00 | $26,078.41 | 2.0 | 109,320 |
| Lighting Control Measures | | | 928 | 0.1 | 0.0 | $111.47 | $1,140.00 | $70.00 | $1,070.00 | 9.6 | 935 |
| ECM 3 | Install Occupancy Sensor Lighting Controls | Yes | 498 | 0.1 | 0.0 | $59.77 | $540.00 | $70.00 | $470.00 | 7.9 | 501 |
| ECM 4 | Install High/Low Lighitng Controls | Yes | 430 | 0.0 | 0.0 | $51.70 | $600.00 | $0.00 | $600.00 | 11.6 | 433 |
| TOTALS FOR HIGH PRIORITY MEASURES | | | 126,947 | 23.0 | 0.0 | $15,246.31 | $55,990.76 | $11,890.00 | $44,100.76 | 2.9 | 127,834 |
| TOTALS FOR ALL EVALUATED MEASURES | | | 126,947 | 23.0 | 0.0 | $15,246.31 | $55,990.76 | $11,890.00 | $44,100.76 | 2.9 | 127,834 |

* - 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.

## Energy Efficient Practices

TRC also identified seven 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 Building #51 include:

- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Perform Routine Motor Maintenance
- Clean Evaporator/Condenser Coils on AC Systems
- Perform Proper Boiler Maintenance
- 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 Building #51. 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 | 215 | kW DC STC |
| Electric Generation | 256,145 | kWh/yr |
| Displaced Cost | $22,280 | /yr |
| Installed Cost | $726,700 | |

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 (SRP)
- Energy Savings Improvement Program (ESIP)

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

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 located in Section 8 or: www.njcleanenergy.com/ci.

# 2 FACILITY INFORMATION AND EXISTING CONDITIONS

## 2.1 Project Contacts

*Figure 5 – Project Contacts*

| Name | Role | E-Mail | Phone # |
|---|---|---|---|
| Customer | | | |
| Charles (Skip) West , AIA | Director, Office of Facilities Planning & Construction | Charles.West@stockton.edu | (609) 626-5522 |
| Designated Representative | | | |
| Michael J. Ferraro II | Energy Systems Specialist | Michael.Ferraro@stockton.edu | (609) 652-4884 |
| TRC Energy Services | | | |
| Vish Nimbalkar, P.E. | Auditor | VNaikNimbalkar@trcsolutions.com | (732) 855-0033 |

## 2.2 General Site Information

On October 17, 2018, TRC performed an energy audit at Building #51 located in Galloway, New Jersey. TRC's team met with Michael J. Ferraro II to review facility operations and help focus our investigation on specific energy-using systems.

Built in 2013, Building #51 is a 60,622 square foot facility comprised of various space types within a single building. The building has three floors and includes classrooms, laboratories, offices, restrooms, storage, conference space, and mechanical spaces.

Interior lighting primarily consists of linear T8 fluorescent lighting as well as some compact fluorescent lamps (CFL). Exterior lighting consists mostly of CFL and metal halide fixtures. Heating is provided primarily by a groundwater-source heat pump which generates hot water to be used in air-handlers and reheat coils. Condensing hot water boilers are used to supplement heating. Cooling is provided by a water-cooled chiller which provides chilled water to air-handlers throughout the facility.

## 2.3 Building Occupancy

The building is open to students and staff every day. The typical schedule is presented in the table below. The entire facility is used year-round by the campus and runs throughout the summer. During a typical day, the facility is occupied by approximately 1,100 staff and students.

*Figure 6 - Building Schedule*

| Building Name | Weekday/Weekend | Operating Schedule |
|---|---|---|
| Building 51 (Unified Science Center 1) | Weekday | 8:00 AM to 10:00 PM |
| Building 51 (Unified Science Center 1) | Weekend | 8:00 AM to 6:00 PM |

## 2.4 Building Envelope

The building is constructed of stone blocks and structural steel. The building has a flat roof covered with a membrane that is in good condition. The building has double pane windows which are in good condition and show little sign of excessive infiltration. The exterior doors are constructed of aluminum and in good condition, some with large glass panes.

*Figure 7 - Building Envelope*

## 2.5 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 compact fluorescent lamps (CFL). Most of the linear fluorescent fixtures are 2-lamp, 4-foot long troffers with diffusers.

Lighting control in most spaces is provided by occupancy sensors. The occupancy sensors are either wall or ceiling mounted depending on the space layout. Some stairwells, storage areas, mechanical spaces, and hallways do not contain any occupancy sensors and are controlled by wall switches.

The building's exterior lighting consists primarily of CFL and metal halide fixtures.

*Figure 8 – Lighting Technologies*

## Chilled Water System

The facility is served by a 600-ton York water-cooled centrifugal chiller (CH1). The chiller is configured in a primary distribution loop with two variable flow pumps (P1 & 1A). Each pump has a 60 hp motor, with one pump always in standby. Chilled water is distributed to the facility at 44°F.

The chiller provides chilled water to air handlers (AHU-1 & 2), heat recovery units (HRU-1 to 4), and fan coil units. The chiller is original equipment to the facility and has been well maintained.

The condenser water system consists of a closed-loop system, used by both the chiller and heat pump, which transfers heat through a heat exchanger to a groundwater loop. Water is circulated through both the chiller and heat pump by two variable flow pumps (P-4 & 4A), one always in standby. Each pump has a 60 hp motor.

The condenser water temperature is supplied at 70°F to the chiller and heat pump.

*Figure 9 – Chilled Water Equipment*



## Heating Hot Water Heating System

The heating hot water system consists of two Aerco Benchmark 2.0 1,860 kBtu/hr output condensing boilers (BR1 & 2). The boilers have a nominal combustion efficiency of 93%. The boilers are configured in a variable flow distribution with two hot water pumps (P-6 & 7). Each boiler pump has a 20 hp motor. Hot water is supplied at 180°F. The boilers supplement hot water to air handlers (AHU-1 & 2), heat recovery units (HRU-1 to 4), fan coil units, unit heaters and various reheat coils throughout the facility.

The boilers operate in a lead/lag configuration. Both boilers may be required during cold weather when heat pump generated hot water is insufficient. The boilers are in good condition and well maintained.

*Figure 10 – Hot Water Heating Equipment*


## Heating, Ventilation, and Air-Conditioning (HVAC)

There are two air handling units (AHU-1 & 2) and four heat recovery units (HRU-1 to 4) that serve the entire facility. Each AHU draws air from its own return air shaft and supplies air to its own air shaft. HRUs are 100% outside air units and supply air to their own air shafts.

AHUs and HRUs are located on the roof in a mechanical penthouse. The AHUs each have a 25 hp supply fan and a 15 hp return fan. The HRUs each have a different supply fan motor sizes, at 20 hp, 25 hp, 30 hp, and 40 hp. All of the fans are controlled by VFDs and the system flow is controlled by changing speed of the supply and return fans. The AHU supply fans maintain a constant duct static pressure of about 1.5 inch W.G. and the HRU supply fans maintain a duct static pressure of about one inch water W.G. The AHUs have outside air economizers to utilize free cooling when the outside air temperature is lower than the return air temperature. HRUs recover heat from exhaust air to precondition incoming outside air.

Three 50 hp exhaust fans provide ventilation for laboratory spaces.

There is also a 6-ton air-source heat pump which provides air-conditioning to a telecommunications room.

AHUs and HRUs operate to maintain a 70°F space temperature in most zones throughout the facility.

*Figure 11 – HVAC Equipment*



## Water Source Heat Pump (WSHP)

A Carrier water-cooled chiller is used as a heat pump hot water generator (HP-1) with an output heating capacity of approximately 5,000 kBtu/hr. The heat pump is configured in a primary distribution loop with two variable flow pumps (P-2 & 2A), one always in standby. Each pump has a 25 hp motor. Hot water is distributed to the facility at 120°F. The heat pump provides hot water to air handlers (AHU-1 & 2), heat recovery units (HRU-1 to 4), fan coil units, unit heaters and various reheat coils throughout the facility. The heat pump is original to the building and is in good condition.

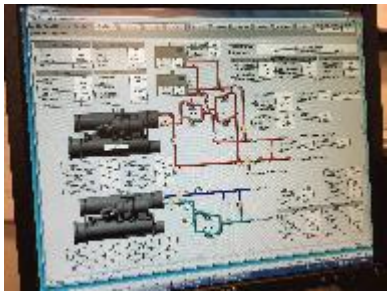
The heat pump utilizes the same closed-loop condenser water system used by the chiller which transfers heat through a heat exchanger to a groundwater loop. Again, groundwater is circulated through both the heat pump and chiller by two variable flow pumps (P-4 & 4A), one always in standby. Each pump has a 60 hp motor.

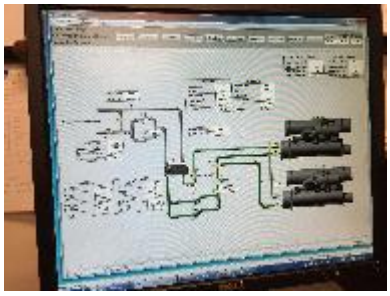
*Figure 12 – WSHP Equipment*

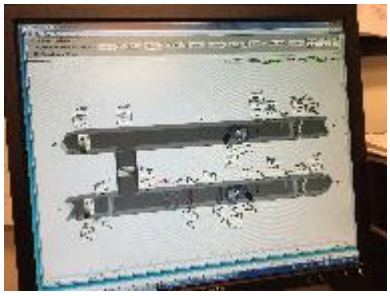
## Building Energy Management System (BEMS)

The facility is controlled with a Schneider Electric Continuum building energy management system (BEMS). The BEMS aggregates the DDC points from throughout the building. The system is capable of providing trends for individual DDC points as well as historical data.

*Figure 13 – BEMS Screenshots*







## Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of two PVI, gas-fired condensing hot water heaters one with an input rating of 399 kBtu/hr and the other with an input rating of 199 kBtu/hr each with a nominal efficiency of 94%. The larger water heater has a 250-gallon storage tank and the other has an 80-gallon storage tank.

*Figure 14 – Domestic Hot Water Equipment*


## Food Service Equipment

There are three low-temperature under counter dishwashers throughout the facility.

## Refrigeration

The facility has three different cold storage areas. The walk-in coolers are maintained at a constant temperature between 5°C (41°F) and 25°C (77°F). Each cooler has a 2.25-ton compressor connected to evaporators serving the cooler section.

*Figure 15 – Refrigeration Equipment*



## Building Plug Load

There is various laboratory equipment and other process equipment throughout the facility. In addition to the laboratory related appliances, there are other appliances including refrigerators, printers, projectors, microwaves, and televisions.

*Figure 16 – Plug Load Appliances*

# 3 SITE ENERGY USE AND COSTS

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

## 3.1 Total Cost of Energy

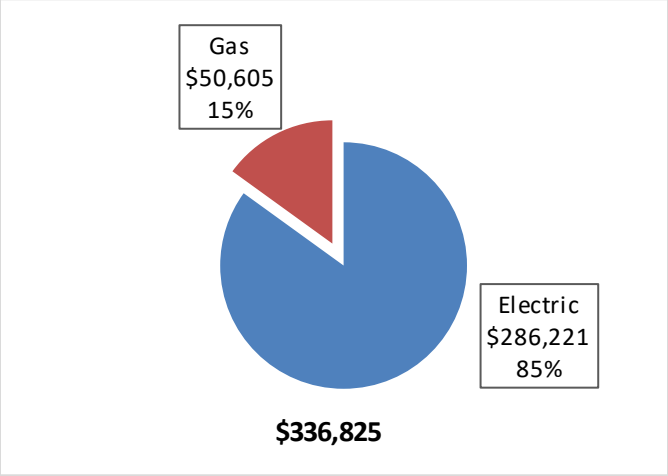
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

*Figure 17 - Utility Summary*

| Utility Summary for Building 51 (Unified Science Center 1) | | |
|---|---|---|
| Fuel | Usage | Cost |
| Electricity | 2,383,185 kWh | $286,221 |
| Natural Gas | 50,075 Therms | $50,605 |
| Total | | $336,825 |

The current annual energy cost for this facility is $336,825 as shown in the chart below.

*Figure 18 - Energy Cost Breakdown*



## 3.2 Electricity Usage

Electricity is provided by Atlantic City Electric. The average electric cost over the past 12 months was $0.120/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. Demand use and energy consumption is greatest in September due to the increased cooling load satisfied by electric air-conditioning equipment. The monthly electricity consumption and peak demand are shown in the chart below.

*Figure 19 - Electric Usage & Demand*

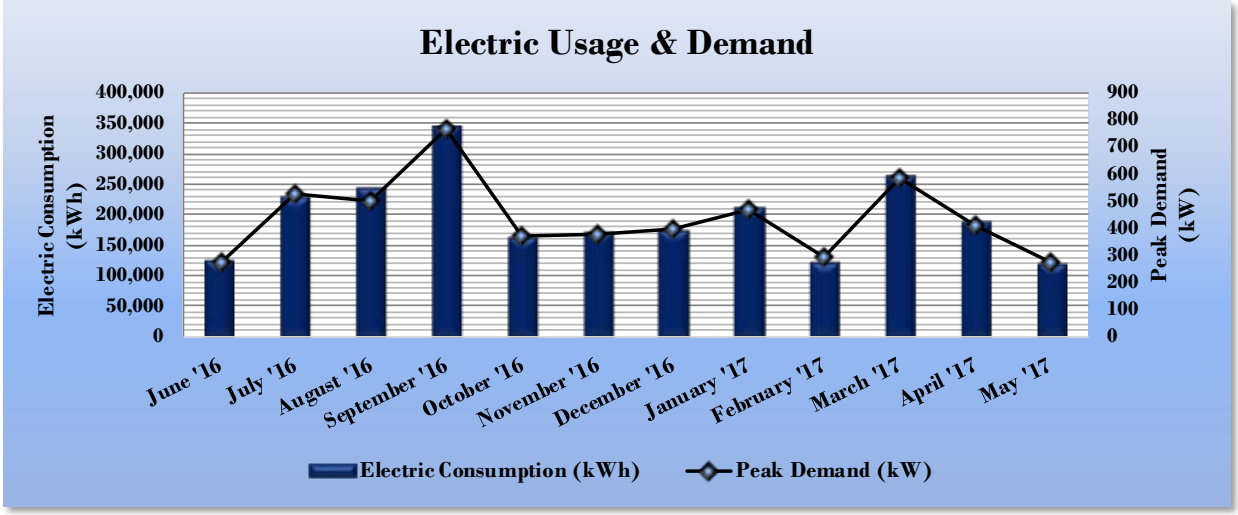



*Figure 20 - Electric Usage & Demand*

| Electric Billing Data for Building 51 (Unified Science Center 1) | | | | | | |
|---|---|---|---|---|---|---|
| Period Ending | Days in Period | Electric Usage (kWh) | Demand (kW) | Demand Cost | Total Electric Cost | TRC Estimated Usage? |
| 6/30/16 | 30 | 127,988 | 273 | | $15,371 | Yes |
| 7/31/16 | 31 | 232,048 | 525 | | $27,869 | Yes |
| 8/31/16 | 31 | 246,632 | 502 | | $29,621 | Yes |
| 9/30/16 | 30 | 345,672 | 763 | | $41,515 | Yes |
| 10/31/16 | 31 | 165,948 | 372 | | $19,930 | Yes |
| 11/30/16 | 30 | 174,080 | 375 | | $20,907 | Yes |
| 12/31/16 | 31 | 175,881 | 396 | | $21,123 | Yes |
| 1/31/17 | 31 | 213,853 | 465 | | $25,684 | Yes |
| 2/28/17 | 28 | 124,076 | 292 | | $14,902 | Yes |
| 3/31/17 | 31 | 265,525 | 587 | | $31,890 | Yes |
| 4/30/17 | 30 | 189,708 | 412 | | $22,784 | Yes |
| 5/31/17 | 31 | 121,774 | 272 | | $14,625 | Yes |
| Totals | 365 | 2,383,185 | 763 | $0 | $286,221 | |
| Annual | 365 | 2,383,185 | 763 | $0 | $286,221 | |

## 3.3 Natural Gas Usage

Natural gas is provided by South Jersey Gas. The average gas cost for the past 12 months is $1.011/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

*Figure 21 - Natural Gas Usage*

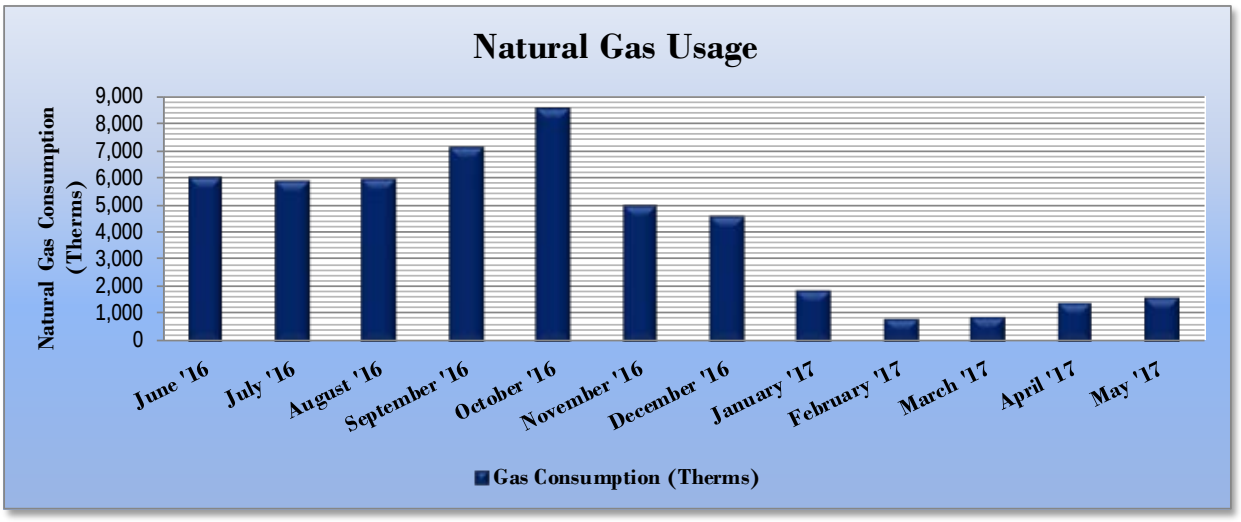



*Figure 22 - Natural Gas Usage*

| Gas Billing Data for Building 51 (Unified Science Center 1) | | | | |
|---|---|---|---|---|
| Period Ending | Days in Period | Natural Gas Usage (Therms) | Natural Gas Cost | TRC Estimated Usage? |
| 6/30/16 | 30 | 6,056 | $6,120 | Yes |
| 7/31/16 | 31 | 5,940 | $6,003 | Yes |
| 8/31/16 | 31 | 5,997 | $6,061 | Yes |
| 9/30/16 | 30 | 7,141 | $7,217 | Yes |
| 10/31/16 | 31 | 8,543 | $8,633 | Yes |
| 11/30/16 | 30 | 5,003 | $5,056 | Yes |
| 12/31/16 | 31 | 4,640 | $4,689 | Yes |
| 1/31/17 | 31 | 1,867 | $1,887 | Yes |
| 2/28/17 | 28 | 853 | $862 | Yes |
| 3/31/17 | 31 | 917 | $926 | Yes |
| 4/30/17 | 30 | 1,469 | $1,485 | Yes |
| 5/31/17 | 31 | 1,649 | $1,666 | Yes |
| Totals | 365 | 50,075 | $50,605 | 12 |
| Annual | 365 | 50,075 | $50,605 | |

## 3.4 Benchmarking

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

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

*Figure 23 - Energy Use Intensity Comparison – Existing Conditions*

| Energy Use Intensity Comparison - Existing Conditions | | |
|---|---|---|
| | Building 51 (Unified Science Center 1) | National Median Building Type: Higher Education - Public |
| Source Energy Use Intensity (kBtu/ft$^2$) | 507.9 | 262.6 |
| Site Energy Use Intensity (kBtu/ft$^2$) | 216.7 | 130.7 |

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

*Figure 24 - Energy Use Intensity Comparison – Following Installation of Recommended Measures*

| Energy Use Intensity Comparison - Following Installation of Recommended Measures | | |
|---|---|---|
| | Building 51 (Unified Science Center 1) | National Median Building Type: Higher Education - Public |
| Source Energy Use Intensity (kBtu/ft$^2$) | 485.5 | 262.6 |
| Site Energy Use Intensity (kBtu/ft$^2$) | 209.6 | 130.7 |

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 building is not eligible to receive a score**.

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

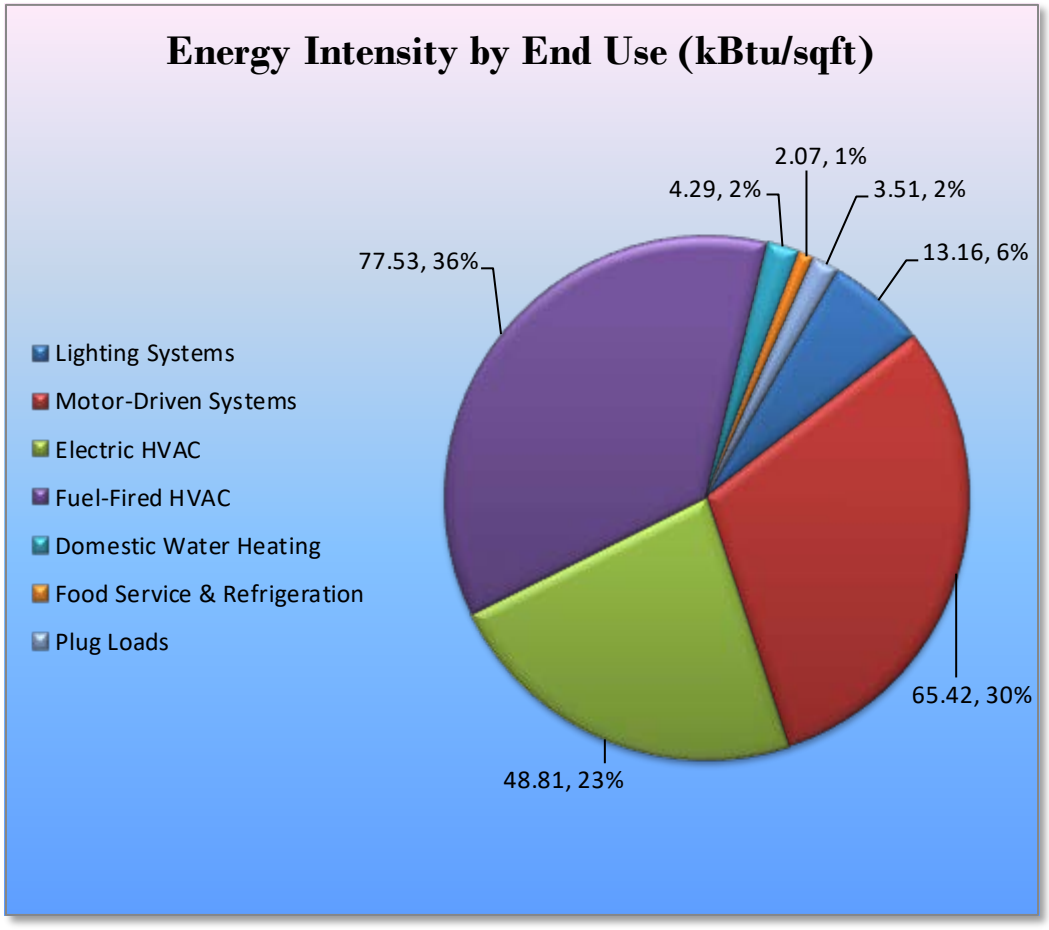
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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

## 3.5 Energy End-Use Breakdown

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

*Figure 25 - Energy Balance (% and kBtu/SF)*



# 4 ENERGY CONSERVATION MEASURES

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Building #51 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 26 – 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 | | 126,019 | 22.9 | 0.0 | $15,134.84 | $54,850.76 | $11,820.00 | $43,030.76 | 2.8 | 126,900 |
| ECM 1 | Install LED Fixtures | 17,458 | 2.6 | 0.0 | $2,096.68 | $18,902.35 | $1,950.00 | $16,952.35 | 8.1 | 17,580 |
| ECM 2 | Retrofit Fixtures with LED Lamps | 108,561 | 20.3 | 0.0 | $13,038.16 | $35,948.41 | $9,870.00 | $26,078.41 | 2.0 | 109,320 |
| Lighting Control Measures | | 928 | 0.1 | 0.0 | $111.47 | $1,140.00 | $70.00 | $1,070.00 | 9.6 | 935 |
| ECM 3 | Install Occupancy Sensor Lighting Controls | 498 | 0.1 | 0.0 | $59.77 | $540.00 | $70.00 | $470.00 | 7.9 | 501 |
| ECM 4 | Install High/Low Lighitng Controls | 430 | 0.0 | 0.0 | $51.70 | $600.00 | $0.00 | $600.00 | 11.6 | 433 |
| TOTALS | | 126,947 | 23.0 | 0.0 | $15,246.31 | $55,990.76 | $11,890.00 | $44,100.76 | 2.9 | 127,834 |

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

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

### 4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 27 below.

***Figure 27 – 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 | | 126,019 | 22.9 | 0.0 | $15,134.84 | $54,850.76 | $11,820.00 | $43,030.76 | 2.8 | 126,900 |
| ECM 1 | Install LED Fixtures | 17,458 | 2.6 | 0.0 | $2,096.68 | $18,902.35 | $1,950.00 | $16,952.35 | 8.1 | 17,580 |
| ECM 2 | Retrofit Fixtures with LED Lamps | 108,561 | 20.3 | 0.0 | $13,038.16 | $35,948.41 | $9,870.00 | $26,078.41 | 2.0 | 109,320 |

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

#### ECM 1: Install LED Fixtures

*Summary of Measure Economics*

| Interior/ Exterior | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| Interior | 0 | 0.0 | 0.0 | $0.00 | $0.00 | $0.00 | $0.00 | 0.0 | 0 |
| Exterior | 17,458 | 2.6 | 0.0 | $2,096.68 | $18,902.35 | $1,950.00 | $16,952.35 | 8.1 | 17,580 |

*Measure Description*

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

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of existing sources.

## 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 | 107,598 | 20.1 | 0.0 | $12,922.53 | $35,546.04 | $9,755.00 | $25,791.04 | 2.0 | 108,350 |
| Exterior | 963 | 0.2 | 0.0 | $115.62 | $402.37 | $115.00 | $287.37 | 2.5 | 969 |

*Measure Description*

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

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

## 4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 28 below.

***Figure 28 – 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 | | 928 | 0.1 | 0.0 | $111.47 | $1,140.00 | $70.00 | $1,070.00 | 9.6 | 935 |
| ECM 3 | Install Occupancy Sensor Lighting Controls | 498 | 0.1 | 0.0 | $59.77 | $540.00 | $70.00 | $470.00 | 7.9 | 501 |
| ECM 4 | Install High/Low Lighitng Controls | 430 | 0.0 | 0.0 | $51.70 | $600.00 | $0.00 | $600.00 | 11.6 | 433 |

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) |
|---|---|---|---|---|---|---|---|---|
| 498 | 0.1 | 0.0 | $59.77 | $540.00 | $70.00 | $470.00 | 7.9 | 501 |

*Measure Description*

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in the controls room and classroom 300. 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) |
|---|---|---|---|---|---|---|---|---|
| 430 | 0.0 | 0.0 | $51.70 | $600.00 | $0.00 | $600.00 | 11.6 | 433 |

*Measure Description*

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

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. Energy savings results from only providing full lighting levels when it is required.

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.

# 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.

## Perform Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20% - 60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6 – 12 months.

## Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

## Perform Routine Motor Maintenance

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

## Clean Evaporator/Condenser Coils on AC Systems

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

## Perform 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 gallons per minute (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 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

# 6 On-Site Generation Measures

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

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

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

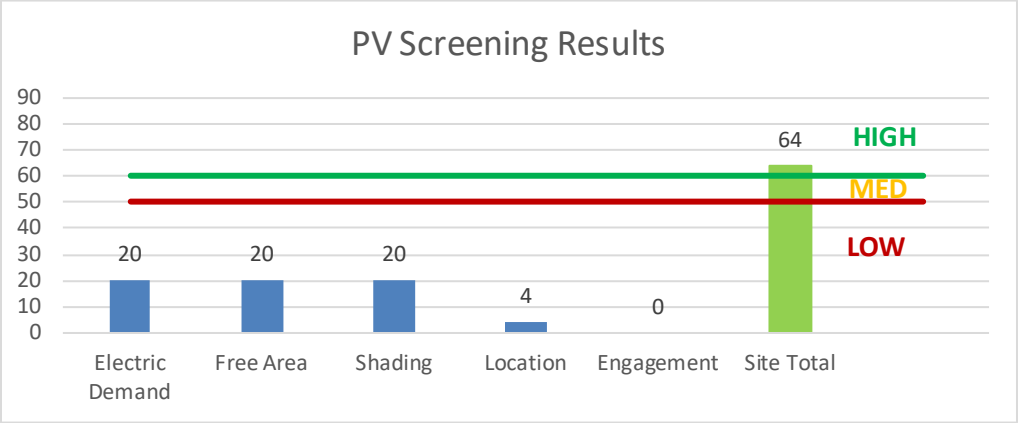
## 6.1 Photovoltaic

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

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a **High** potential for 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 over the main parking lot may be feasible. If Building #51 is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

*Figure 29 - 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 8.3 for additional information.

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

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

## 6.2 Combined Heat and Power

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

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

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

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

# 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.

All Stockton University buildings participate in electricity demand response since 2012. Curtailment service provider is awarded by bid. The Program meets or exceeds goal every year.

# 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 30 for a list of the eligible programs identified for each recommended ECM.

*Figure 30 - ECM Incentive Program Eligibility*

| Energy Conservation Measure | | SmartStart Prescriptive | SmartStart Custom | Direct Install | Pay For Performance Existing Buildings | Large Energy Users Program | Combined Heat & Power and Fuel Cell |
|---|---|---|---|---|---|---|---|
| ECM 1 | Install LED Fixtures | X | | | | | |
| ECM 2 | Retrofit Fixtures with LED Lamps | X | | | | | |
| ECM 3 | Install Occupancy Sensor Lighting Controls | X | | | | | |
| ECM 4 | Install High/Low Lighitng Controls | | | | | | |

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

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

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

## 8.1 SmartStart

**Overview**

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

**Equipment with Prescriptive Incentives Currently Available:**

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

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

**Incentives**

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

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

**How to Participate**

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

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

## 8.2 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 |
| 4th Floor Mechanical | 15 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,000 | Relamp | No | 15 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 2,000 | 0.32 | 990 | 0.0 | $118.90 | $547.73 | $150.00 | 3.35 |
| 4th Floor Mechanical | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Storage | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,000 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 2,000 | 0.39 | 1,214 | 0.0 | $145.85 | $584.24 | $160.00 | 2.91 |
| Hall | 5 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 5 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.12 | 664 | 0.0 | $79.76 | $182.58 | $50.00 | 1.66 |
| Stairwell | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 5,000 | Relamp | No | 10 | LED - Linear Tubes: (1) 4' Lamp | Wall Switch | 15 | 5,000 | 0.13 | 1,006 | 0.0 | $120.85 | $182.58 | $50.00 | 1.10 |
| 1st Floor Mechanical | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 2,000 | Relamp | No | 6 | LED - Linear Tubes: (1) 4' Lamp | Wall Switch | 15 | 2,000 | 0.08 | 242 | 0.0 | $29.00 | $109.55 | $30.00 | 2.74 |
| Controls Room | 7 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 5,000 | Relamp | Yes | 7 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.21 | 1,678 | 0.0 | $201.58 | $525.61 | $105.00 | 2.09 |
| Room 155 | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 3 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.07 | 398 | 0.0 | $47.86 | $109.55 | $30.00 | 1.66 |
| Room 156 | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.02 | 133 | 0.0 | $15.95 | $36.52 | $10.00 | 1.66 |
| Room 135 | 9 | Linear Fluorescent - T8: 4' T8 (32W) - 3L | Occupancy Sensor | 93 | 3,500 | Relamp | No | 9 | LED - Linear Tubes: (3) 4' Lamps | Occupancy Sensor | 44 | 3,500 | 0.33 | 1,793 | 0.0 | $215.36 | $492.95 | $135.00 | 1.66 |
| Room 135 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |
| Lab 133 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |
| Lab 151 | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.39 | 2,125 | 0.0 | $255.24 | $584.24 | $160.00 | 1.66 |
| Lab 151 | 4 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 4 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Lab 252 Prep Room | 17 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 17 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.41 | 2,258 | 0.0 | $271.19 | $620.76 | $170.00 | 1.66 |
| Lab 253 | 24 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 24 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.58 | 3,188 | 0.0 | $382.85 | $876.36 | $240.00 | 1.66 |
| Lab 256 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |
| Hall | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Chemical Storage 257 | 11 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 2,000 | Relamp | No | 11 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,000 | 0.27 | 835 | 0.0 | $100.27 | $401.67 | $110.00 | 2.91 |
| Chemical Storage 259 | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 2,000 | Relamp | No | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,000 | 0.10 | 304 | 0.0 | $36.46 | $146.06 | $40.00 | 2.91 |
| Hall | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Instruction Lab 355 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.24 | 1,328 | 0.0 | $159.52 | $365.15 | $100.00 | 1.66 |
| Lab 356 | 8 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 8 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.19 | 1,063 | 0.0 | $127.62 | $292.12 | $80.00 | 1.66 |
| Lab 337 | 32 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 32 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.78 | 4,250 | 0.0 | $510.47 | $1,168.48 | $320.00 | 1.66 |
| Chemical Storage 359 | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 2,000 | Relamp | No | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 2,000 | 0.10 | 304 | 0.0 | $36.46 | $146.06 | $40.00 | 2.91 |

| | 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 |
| Lab 353 | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.39 | 2,125 | 0.0 | $255.24 | $584.24 | $160.00 | 1.66 |
| Lab 354 | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.39 | 2,125 | 0.0 | $255.24 | $584.24 | $160.00 | 1.66 |
| Hall | 4 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 4 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Instruction Room 334 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |
| Hall | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Prep Lab 352 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |
| Lab 351 | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.39 | 2,125 | 0.0 | $255.24 | $584.24 | $160.00 | 1.66 |
| Hall | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| CR 345 | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.39 | 2,125 | 0.0 | $255.24 | $584.24 | $160.00 | 1.66 |
| Electrical | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,000 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,000 | 0.05 | 76 | 0.0 | $9.12 | $73.03 | $20.00 | 5.82 |
| Office 321 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 320 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 319 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 318 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 317 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 316 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 315 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 314 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Instruction Lab 334 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |
| Office 313 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 312 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 331 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |
| Conference Room 311 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| CR 300 | 8 | Compact Fluorescent: One Screw-in Lamp | Wall Switch | 23 | 5,000 | Relamp | Yes | 8 | LED Screw-In Lamps: One Screw-in Lamp | Occupancy Sensor | 16 | 3,500 | 0.07 | 540 | 0.0 | $64.80 | $407.80 | $75.00 | 5.14 |
| Stairwell | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 5,000 | Relamp | No | 6 | LED - Linear Tubes: (1) 4' Lamp | Wall Switch | 15 | 5,000 | 0.08 | 604 | 0.0 | $72.51 | $109.55 | $30.00 | 1.10 |

| | 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 | Occupancy Sensor | 62 | 1,000 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,000 | 0.02 | 38 | 0.0 | $4.56 | $36.52 | $10.00 | 5.82 |
| Mens Restroom | 7 | Compact Fluorescent: One Screw-in Lamp | Occupancy Sensor | 23 | 3,500 | Relamp | No | 7 | LED Screw-In Lamps: One Screw-in Lamp | Occupancy Sensor | 16 | 3,500 | 0.04 | 194 | 0.0 | $23.35 | $120.58 | $35.00 | 3.67 |
| Mens Restroom | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Occupancy Sensor | 32 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 3,500 | 0.03 | 141 | 0.0 | $16.92 | $36.52 | $10.00 | 1.57 |
| Womens Restroom | 7 | Compact Fluorescent: One Screw-in Lamp | Occupancy Sensor | 23 | 3,500 | Relamp | No | 7 | LED Screw-In Lamps: One Screw-in Lamp | Occupancy Sensor | 16 | 3,500 | 0.04 | 194 | 0.0 | $23.35 | $120.58 | $35.00 | 3.67 |
| Womens Restroom | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Occupancy Sensor | 32 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 3,500 | 0.03 | 141 | 0.0 | $16.92 | $36.52 | $10.00 | 1.57 |
| 3rd Floor Hallway | 88 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 88 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 2.14 | 11,689 | 0.0 | $1,403.80 | $3,213.32 | $880.00 | 1.66 |
| 3rd Floor Hallway | 22 | Compact Fluorescent: One Screw-in Lamp | Occupancy Sensor | 23 | 3,500 | Relamp | No | 22 | LED Screw-In Lamps: One Screw-in Lamp | Occupancy Sensor | 16 | 3,500 | 0.11 | 611 | 0.0 | $73.38 | $378.95 | $110.00 | 3.67 |
| 3rd Floor Hallway | 8 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 8 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Mens Restroom | 5 | Compact Fluorescent: One Screw-in Lamp | Occupancy Sensor | 23 | 3,500 | Relamp | No | 5 | LED Screw-In Lamps: One Screw-in Lamp | Occupancy Sensor | 16 | 3,500 | 0.03 | 139 | 0.0 | $16.68 | $86.13 | $25.00 | 3.67 |
| Mens Restroom | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Occupancy Sensor | 32 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 3,500 | 0.03 | 141 | 0.0 | $16.92 | $36.52 | $10.00 | 1.57 |
| Womens Restroom | 5 | Compact Fluorescent: One Screw-in Lamp | Occupancy Sensor | 23 | 3,500 | Relamp | No | 5 | LED Screw-In Lamps: One Screw-in Lamp | Occupancy Sensor | 16 | 3,500 | 0.03 | 139 | 0.0 | $16.68 | $86.13 | $25.00 | 3.67 |
| Womens Restroom | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Occupancy Sensor | 32 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (1) 4' Lamp | Occupancy Sensor | 15 | 3,500 | 0.03 | 141 | 0.0 | $16.92 | $36.52 | $10.00 | 1.57 |
| CR 360 | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.39 | 2,125 | 0.0 | $255.24 | $584.24 | $160.00 | 1.66 |
| Hall | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| CR 346 | 15 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 15 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.36 | 1,992 | 0.0 | $239.28 | $547.73 | $150.00 | 1.66 |
| CR 260 | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.39 | 2,125 | 0.0 | $255.24 | $584.24 | $160.00 | 1.66 |
| CR 246 | 15 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 15 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.36 | 1,992 | 0.0 | $239.28 | $547.73 | $150.00 | 1.66 |
| CR 245 | 17 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 17 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.41 | 2,258 | 0.0 | $271.19 | $620.76 | $170.00 | 1.66 |
| Lab 251 | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.39 | 2,125 | 0.0 | $255.24 | $584.24 | $160.00 | 1.66 |
| Office 211 | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.10 | 531 | 0.0 | $63.81 | $146.06 | $40.00 | 1.66 |
| Lab 231 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |
| Office 213 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 212 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 214 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Lab 233 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |

| | Existing Conditions | | | | | Proposed Conditions | | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Fixture Recommendation | Add Controls? | Fixture Quantity | Fixture Description | Control System | Watts per Fixture | Annual Operating Hours | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Office 216 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 217 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 234 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |
| Office 218 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 219 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Lab 235 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |
| Office 220 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 221 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Closet 2E1 | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,000 | Relamp | No | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,000 | 0.02 | 38 | 0.0 | $4.56 | $36.52 | $10.00 | 5.82 |
| Closet 2E2 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,000 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,000 | 0.05 | 76 | 0.0 | $9.12 | $73.03 | $20.00 | 5.82 |
| Mailroom 242 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Mailroom 242 | 1 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 1 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Admin 240 | 10 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 10 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.24 | 1,328 | 0.0 | $159.52 | $365.15 | $100.00 | 1.66 |
| Admin Conference Room | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.10 | 531 | 0.0 | $63.81 | $146.06 | $40.00 | 1.66 |
| Hall | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | None | No | 2 | Exit Signs: LED - 2 W Lamp | None | 6 | 8,760 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Admin 241 | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 6 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.15 | 797 | 0.0 | $95.71 | $219.09 | $60.00 | 1.66 |
| Admin 239 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Admin 238 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| File Room | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,000 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,000 | 0.05 | 76 | 0.0 | $9.12 | $73.03 | $20.00 | 5.82 |
| Display Case | 18 | Compact Fluorescent: One Screw-in Lamp | None | 13 | 8,760 | Relamp | Yes | 18 | LED Screw-In Lamps: One Screw-in Lamp | High/Low Control | 9 | 6,132 | 0.09 | 1,202 | 0.0 | $144.39 | $910.05 | $90.00 | 5.68 |
| 1st Floor Hallway | 88 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 88 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 2.14 | 11,689 | 0.0 | $1,403.80 | $3,213.32 | $880.00 | 1.66 |
| 2nd Floor Hallway | 88 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 88 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 2.14 | 11,689 | 0.0 | $1,403.80 | $3,213.32 | $880.00 | 1.66 |
| CR 145 | 17 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 17 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.41 | 2,258 | 0.0 | $271.19 | $620.76 | $170.00 | 1.66 |
| CR 160 | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.39 | 2,125 | 0.0 | $255.24 | $584.24 | $160.00 | 1.66 |
| Electric Room | 6 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 1,000 | Relamp | No | 6 | LED - Linear Tubes: (2) 4' Lamps | Wall Switch | 29 | 1,000 | 0.15 | 228 | 0.0 | $27.35 | $219.09 | $60.00 | 5.82 |

| | 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 143 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Instruction Lab | 16 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 16 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.39 | 2,125 | 0.0 | $255.24 | $584.24 | $160.00 | 1.66 |
| Office 121 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 120 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 119 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 118 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Lab 134 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |
| Office 117 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 116 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 115 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 114 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Lab 132 | 12 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 12 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.29 | 1,594 | 0.0 | $191.43 | $438.18 | $120.00 | 1.66 |
| Office 113 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Office 112 | 2 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 2 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.05 | 266 | 0.0 | $31.90 | $73.03 | $20.00 | 1.66 |
| Conference Room 111 | 4 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 3,500 | Relamp | No | 4 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 3,500 | 0.10 | 531 | 0.0 | $63.81 | $146.06 | $40.00 | 1.66 |
| Poles | 18 | Metal Halide: (1) 250W Lamp | None | 295 | 4,380 | Fixture Replacement | No | 18 | LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture | None | 89 | 4,380 | 2.74 | 18,723 | 0.0 | $2,248.58 | $16,750.15 | $1,800.00 | 6.65 |
| Cans | 5 | Compact Fluorescent: One Screw-in Lamp | None | 23 | 4,380 | Relamp | No | 5 | LED Screw-In Lamps: One Screw-in Lamp | None | 16 | 4,380 | 0.03 | 174 | 0.0 | $20.87 | $86.13 | $25.00 | 2.93 |
| Sprinkler Room | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Occupancy Sensor | 62 | 1,000 | Relamp | No | 3 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,000 | 0.07 | 114 | 0.0 | $13.67 | $109.55 | $30.00 | 5.82 |
| Bollards | 1 | Incandescent: One Lamp Screw-in | None | 100 | 4,380 | Relamp | No | 1 | LED Screw-In Lamps: One Screw-in Lamp | None | 15 | 4,380 | 0.06 | 428 | 0.0 | $51.42 | $17.23 | $5.00 | 0.24 |
| Bollards | 3 | Metal Halide: (1) 100W Lamp | None | 128 | 4,380 | Fixture Replacement | No | 3 | LED - Fixtures: Bollard Fixture | None | 38 | 4,380 | 0.20 | 1,354 | 0.0 | $162.61 | $2,152.20 | $150.00 | 12.31 |
| Bollards | 9 | Compact Fluorescent: One Screw-in Lamp | None | 23 | 4,380 | Relamp | No | 9 | LED Screw-In Lamps: One Screw-in Lamp | None | 16 | 4,380 | 0.05 | 313 | 0.0 | $37.57 | $155.03 | $45.00 | 2.93 |
| Cans | 1 | Compact Fluorescent: Two Screw-in Lamp | None | 52 | 4,380 | Relamp | No | 1 | LED Screw-In Lamps: Two Screw-in Lamps | None | 36 | 4,380 | 0.01 | 79 | 0.0 | $9.44 | $34.45 | $10.00 | 2.59 |

## 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 |
| Roof | AHU 1 | 1 | Supply Fan | 25.0 | 93.6% | Yes | 4,067 | No | 93.6% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | AHU 1 | 1 | Return Fan | 15.0 | 93.0% | Yes | 3,391 | No | 93.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | AHU 2 | 1 | Supply Fan | 25.0 | 93.6% | Yes | 4,067 | No | 93.6% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | AHU 2 | 1 | Return Fan | 15.0 | 93.0% | Yes | 3,391 | No | 93.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | HRU 1 | 1 | Supply Fan | 25.0 | 93.6% | Yes | 4,067 | No | 93.6% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | HRU 2 | 1 | Supply Fan | 40.0 | 94.1% | Yes | 4,067 | No | 94.1% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | HRU 3 | 1 | Supply Fan | 30.0 | 94.1% | Yes | 4,067 | No | 94.1% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | HRU 4 | 1 | Supply Fan | 20.0 | 93.0% | Yes | 3,391 | No | 93.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 4th Floor Mech | Chilled Water P-1 | 1 | Chilled Water Pump | 60.0 | 95.0% | Yes | 5,329 | No | 95.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 4th Floor Mech | Heating Water P-2 | 1 | Heating Hot Water Pump | 25.0 | 93.6% | Yes | 4,067 | No | 93.6% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 4th Floor Mech | Heating Water Standby P-2A | 1 | Heating Hot Water Pump | 25.0 | 93.6% | Yes | 0 | No | 93.6% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 4th Floor Mech | Chilled Water Stand by P-1A | 1 | Chilled Water Pump | 60.0 | 95.0% | Yes | 0 | No | 95.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 1st Floor Mech | Condenser Water P-4 | 1 | Condenser Water Pump | 60.0 | 95.0% | Yes | 5,329 | No | 95.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 1st Floor Mech | Boiler Circulator P-6 | 1 | Heating Hot Water Pump | 20.0 | 93.0% | Yes | 3,391 | No | 93.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 1st Floor Mech | Boiler Circulator P-7 | 1 | Heating Hot Water Pump | 20.0 | 93.0% | Yes | 2,000 | No | 93.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | HRUs P-8 | 1 | Process Pump | 10.0 | 89.5% | No | 3,391 | No | 89.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | HRUs P-9 | 1 | Process Pump | 10.0 | 89.5% | No | 2,000 | No | 89.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 1st Floor Mech | Condenser Water Stand by P-4A | 1 | Condenser Water Pump | 60.0 | 95.0% | Yes | 0 | No | 95.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 1st Floor Mech | Geothermal Water P-3 | 1 | Water-Source Heat Pump Circulation Pump | 40.0 | 94.1% | Yes | 4,067 | No | 94.1% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 1st Floor Mech | Geothermal Water Stand by P-3A | 1 | Water-Source Heat Pump Circulation Pump | 40.0 | 94.1% | Yes | 0 | No | 94.1% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

| | | Existing Conditions | | | | | | Proposed Conditions | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Area(s)/System(s) Served | 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 |
| Roof | Lab Exhaust | 2 | Exhaust Fan | 50.0 | 94.1% | Yes | 4,067 | No | 94.1% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 4th Floor Mech | Medical Air Machines | 2 | Other | 15.0 | 90.2% | No | 3,391 | No | 90.2% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 4th Floor Mech | Distilled Water circulation pumps | 2 | Water Supply Pump | 5.0 | 88.5% | No | 2,745 | No | 88.5% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Lab Exhaust | 1 | Exhaust Fan | 50.0 | 94.1% | Yes | 0 | No | 94.1% | 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 |
| 4th Floor Mechanical | Heat Pump Hot Water Generator | 1 | Water Source HP | 0.00 | 5,000.00 | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Roof | Telecom room | 1 | Split-System Air-Source HP | 6.00 | 80.00 | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Electric Chiller Inventory & Recommendations

| | | Existing Conditions | | | Proposed Conditions | | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Area(s)/System(s) Served | Chiller Quantity | System Type | Cooling Capacity per Unit (Tons) | Install High Efficiency Chillers? | Chiller Quantity | System Type | Constant/ Variable Speed | Cooling Capacity (Tons) | Full Load Efficiency (kW/Ton) | IPLV Efficiency (kW/Ton) | 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 |
| 4th Floor Mechanical | Chilled Water System | 1 | Water-Cooled Centrifugal Chiller | 600.00 | No | | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Fuel Heating Inventory & Recommendations

| | | Existing Conditions | | | Proposed Conditions | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Area(s)/System(s) Served | System Quantity | System Type | Output Capacity per Unit (MBh) | Install High Efficiency System? | System Quantity | System Type | Output Capacity per Unit (MBh) | Heating Efficiency | Heating Efficiency Units | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| 4th Floor Mechanical | Heating Hot Water | 2 | Condensing Hot Water Boiler | 1,860.00 | 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 |
| 4th Floor Mechanical | Entire Facility | 1 | Storage Tank Water Heater (> 50 Gal) | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| 4th Floor Mechanical | Entire Facility | 1 | Storage Tank Water Heater (> 50 Gal) | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Walk-In Cooler/Freezer Inventory & Recommendations

| | Existing Conditions | | Proposed Conditions | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Cooler/ Freezer Quantity | Case Type/Temperature | Install EC Evaporator Fan Motors? | Install Electric Defrost Control? | Install Evaporator Fan Control? | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Lab | 3 | Cooler (35F to 55F) | No | No | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Dishwasher Inventory & Recommendations

| | Existing Conditions | | | | | Proposed Conditions | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Quantity | Dishwasher Type | Water Heater Fuel Type | Booster Heater Fuel Type | ENERGY STAR Qualified? | Install ENERGY STAR Equipment? | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Payback w/ Incentives in Years |
| Multiple Locations | 3 | Under Counter (Low Temp) | Natural Gas | None | 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? |
| Multiple Locations | 2 | Refrigerator | 600.0 | |
| Multiple Locations | 11 | Microwave | 1,000.0 | |
| Multiple Locations | 21 | Minifridge | 30.0 | |
| Multiple Locations | 12 | Lab Refrigerator | 600.0 | |
| Multiple Locations | 12 | OH Projector | 200.0 | |
| Multiple Locations | 20 | Small Printer | 20.0 | |
| Multiple Locations | 4 | Medium Printer | 250.0 | |
| Multiple Locations | 1 | Large Printer | 515.0 | |
| Multiple Locations | 3 | 50" TV | 150.0 | |
| Multiple Locations | 1 | Misc Process Equipment | 18,200.0 | |

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

## ENERGY STAR® Statement of Energy Performance

**N/A**

ENERGY STAR® Score[1]

### Building 51 - Unified Science Center 1

**Primary Property Type:** Laboratory
**Gross Floor Area (ft²):** 60,622
**Built:** 2013

**For Year Ending:** April 30, 2017
**Date Generated:** December 03, 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 |
|---|---|---|
| Building 51 - Unified Science Center 1<br>101 Vera King Farris Drive<br>Galloway, New Jersey 08205 | Stockton University<br>101 Vera King Farris Drive<br>Galloway, NJ 08205<br>(___)___-____ | Dan Cordle<br>101 Vera King Farris Drive<br>Galloway, NJ 08205<br>609-652-4221<br>Dan.Cordle@stockton.edu |

**Property ID:** 6626735

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

**Site EUI**
225.5 kBtu/ft²

**Source EUI**
483.2 kBtu/ft²

| Annual Energy by Fuel | |
|---|---|
| Electric - Grid (kBtu) | 8,535,719 (62%) |
| Natural Gas (kBtu) | 5,134,582 (38%) |

| National Median Comparison | |
|---|---|
| National Median Site EUI (kBtu/ft²) | 148.5 |
| National Median Source EUI (kBtu/ft²) | 318.2 |
| % Diff from National Median Source EUI | 52% |
| **Annual Emissions** | |
| Greenhouse Gas Emissions (Metric Tons CO2e/year) | 1,138 |

### 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)**