Local Government Energy Audit Report

Tenafly High School

October 14, 2022

Prepared for:
Tenafly Public Schools
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Disclaimer

The goal of this audit report is to identify potential energy efficiency opportunities and help prioritize specific measures for implementation. 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 reviewed the energy conservation measures and estimates of energy savings 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 material and labor costs primarily on RS Means cost manuals as well as on our experience at similar facilities. This approach is based on standard cost estimating manuals and is vendor neutral. Cost estimates include material and labor pricing associated with one for one equipment replacements. Cost estimates do not include demolition or removal of hazardous waste. The actual implementation costs for energy savings projects are anticipated to be significantly higher based on the specific conditions at your site(s). We strongly recommend that you work with your design engineer or contractor to develop actual project costs for your specific scope of work for the installation of high efficiency equipment. We encourage you to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on selected products and installers. TRC and NJBPU do not guarantee cost estimates and shall in no event be held liable should actual installed costs vary from these material and labor estimates.

Incentive values provided in this report are estimated based of previously run state efficiency programs. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. Please review all available utility 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.

Table of Contents

ENERGY EFFICIENCY INCENTIVE & REBATE TRANSITION

For the purposes of your LGEA, estimated incentives and rebates are included as placeholders for planning purposes. New Jersey utilities are rolling out their own energy efficiency programs, which your project may be eligible for depending on individual measures, quantities, and size of the building.

In 2018, Governor Murphy signed into law the landmark legislation known as the Clean Energy Act. The law called for a significant overhaul of New Jersey's clean energy systems by building sustainable infrastructure in order to fight climate change and reduce carbon emissions, which will in turn create well-paying local jobs, grow the state's economy, and improve public health while ensuring a cleaner environment for current and future residents.

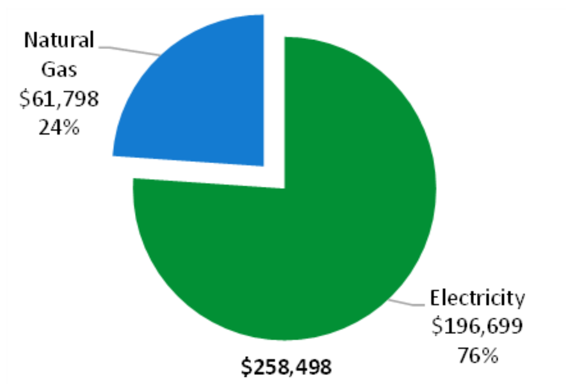
These next generation energy efficiency programs feature new ways of managing and delivering programs historically administered by New Jersey's Clean Energy Program™ (NJCEP). All of the investor-owned gas and electric utility companies will now also offer complementary energy efficiency programs and incentives directly to customers like you. NJCEP will still offer programs for new construction, renewable energy, the Energy Savings Improvement Program (ESIP), and large energy users.

New utility programs are under development. Keep up to date with developments by visiting the NJCEP website.

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Tenafly High School. This report provides you with information about your facility's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in your facility. TRC conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and to help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $258,498 Electricity: 1,876,139 kWh Natural Gas: 90,083 Therms	
ENERGY STAR® Benchmarking Score	71 *(1-100 scale)*	Congratulations, your building performs better than the national average. This report has suggestions about how to keep your building running efficiently, further improve performance, and lower your energy bills even more.

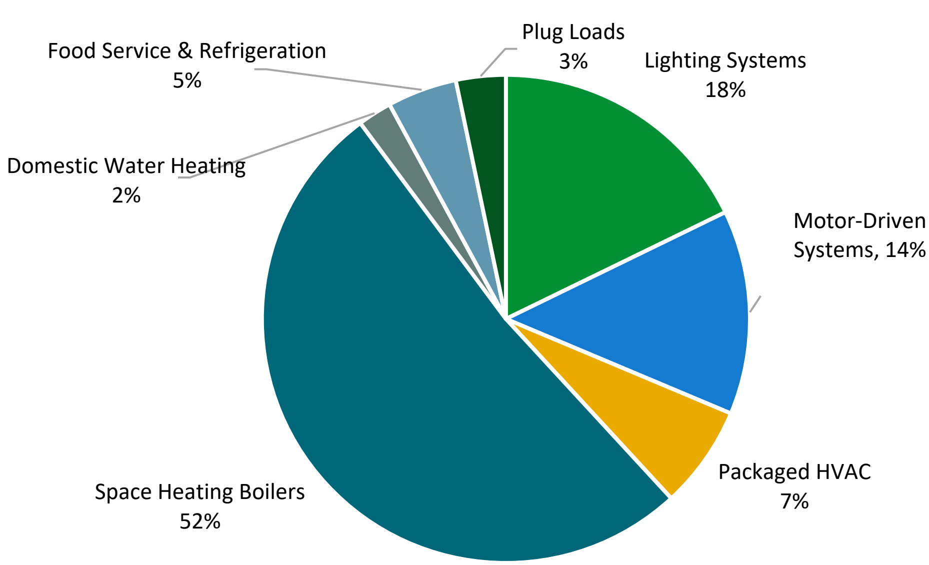


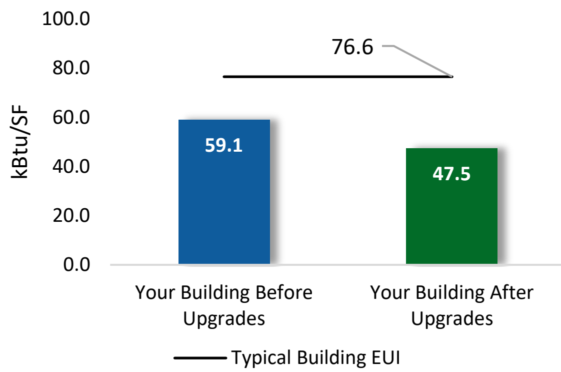
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

This energy audit considered a range of potential energy improvements in your building. Costs and savings will vary between improvements. Presented below are two potential scopes of work for your consideration.

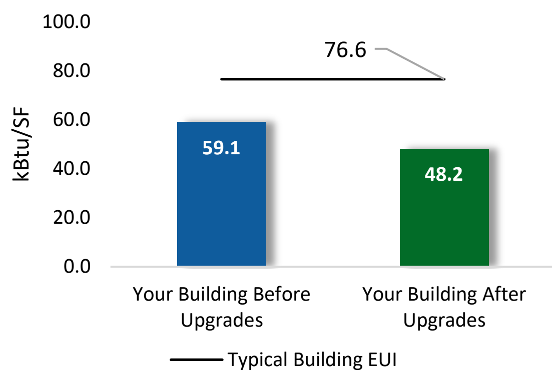
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$693,168
Potential Rebates & Incentives[1]	$85,788
Annual Cost Savings	$92,418
Annual Energy Savings	Electricity: 879,541 kWh Natural Gas: 298 Therms
Greenhouse Gas Emission Savings	445 Tons
Simple Payback	6.6 Years
Site Energy Savings (All Utilities)	20%



Scenario 2: Cost Effective Package[2]

Installation Cost	$396,899
Potential Rebates & Incentives	$66,526
Annual Cost Savings	$87,518
Annual Energy Savings	Electricity: 835,555 kWh Natural Gas: -122 Therms
Greenhouse Gas Emission Savings	420 Tons
Simple Payback	3.8 Years
Site Energy Savings (all utilities)	18%



On-site Generation Potential

Photovoltaic	High
Combined Heat and Power	None

[1] Incentives are based on previously run state rebate programs. Contact your utility provider for current program incentives that may apply.

[2] A cost-effective measure is defined as one where the simple payback does not exceed two-thirds of the expected proposed equipment useful life. Simple payback is based on the net measure cost after potential incentives.

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**474,851**	**78.6**	**-97**	**$49,120**	**$137,636**	**$27,115**	**$110,521**	**2.3**	**466,826**
ECM 1	Install LED Fixtures	Yes	102,971	14.1	-21	$10,655	$31,027	$3,250	$27,777	2.6	101,289
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	35,523	5.1	-7	$3,673	$10,746	$1,481	$9,265	2.5	34,902
ECM 3	Retrofit Fixtures with LED Lamps	Yes	336,357	59.4	-69	$34,791	$95,864	$22,384	$73,480	2.1	330,635
Lighting Control Measures			**121,226**	**20.6**	**-25**	**$12,536**	**$85,567**	**$20,040**	**$65,527**	**5.2**	**119,105**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	101,662	17.8	-21	$10,513	$72,742	$9,540	$63,202	6.0	99,884
ECM 5	Install High/Low Lighting Controls	Yes	19,563	2.8	-4	$2,023	$12,825	$10,500	$2,325	1.1	19,221
Variable Frequency Drive (VFD) Measures			**236,264**	**34.6**	**78**	**$25,307**	**$172,177**	**$18,975**	**$153,202**	**6.1**	**247,073**
ECM 6	Install VFD on Variable Air Volume (VAV) Fans	Yes	7,501	1.9	0	$786	$7,768	$400	$7,368	9.4	7,553
ECM 7	Install VFDs on Constant Volume (CV) Fans	Yes	75,589	19.7	0	$7,925	$86,965	$5,575	$81,390	10.3	76,118
ECM 8	Install VFDs on Chilled Water Pumps	Yes	22,777	4.1	0	$2,388	$11,843	$1,400	$10,443	4.4	22,936
ECM 9	Install VFDs on Heating Water Pumps	Yes	33,136	3.8	0	$3,474	$18,885	$3,500	$15,385	4.4	33,367
ECM 10	Install VFDs on Kitchen Hood Fan Motors	Yes	27,711	0.2	78	$3,442	$11,844	$1,300	$10,544	3.1	37,061
ECM 11	Install VFDs on Water Supply Pump	Yes	69,550	4.9	0	$7,292	$34,872	$6,800	$28,072	3.8	70,037
Unitary HVAC Measures			**12,016**	**6.1**	**0**	**$1,260**	**$68,064**	**$2,387**	**$65,677**	**52.1**	**12,100**
ECM 12	Install High Efficiency Air Conditioning Units	No	10,505	5.3	0	$1,101	$57,679	$2,387	$55,292	50.2	10,579
ECM 13	Install High Efficiency Heat Pumps	No	1,510	0.9	0	$158	$10,385	$0	$10,385	65.6	1,521
Electric Chiller Replacement			**31,360**	**14.7**	**0**	**$3,288**	**$202,039**	**$14,800**	**$187,239**	**56.9**	**31,579**
ECM 14	Install High Efficiency Chillers	No	31,360	14.7	0	$3,288	$202,039	$14,800	$187,239	56.9	31,579
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**42**	**$289**	**$24,493**	**$2,000**	**$22,493**	**77.9**	**4,925**
ECM 15	Install High Efficiency Furnaces	No	0	0.0	42	$289	$24,493	$2,000	$22,493	77.9	4,925
HVAC System Improvements			**0**	**0.0**	**5**	**$33**	**$43**	**$12**	**$31**	**1.0**	**557**
ECM 16	Install Pipe Insulation	Yes	0	0.0	5	$33	$43	$12	$31	1.0	557
Domestic Water Heating Upgrade			**0**	**0.0**	**27**	**$186**	**$409**	**$204**	**$204**	**1.1**	**3,167**
ECM 17	Install Low-Flow DHW Devices	Yes	0	0.0	27	$186	$409	$204	$204	1.1	3,167
Food Service & Refrigeration Measures			**3,824**	**0.4**	**0**	**$401**	**$2,741**	**$255**	**$2,486**	**6.2**	**3,851**
ECM 18	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	393	0.0	0	$41	$607	$80	$527	12.8	396
ECM 19	Refrigeration Controls	No	610	0.0	0	$64	$1,674	$75	$1,599	25.0	615
ECM 20	Vending Machine Control	Yes	2,821	0.3	0	$296	$460	$100	$360	1.2	2,840
TOTALS (COST EFFECTIVE MEASURES)			**835,555**	**134.1**	**-12**	**$87,518**	**$396,899**	**$66,526**	**$330,372**	**3.8**	**839,963**
TOTALS (ALL MEASURES)			**879,541**	**155.0**	**30**	**$92,418**	**$693,168**	**$85,788**	**$607,380**	**6.6**	**889,182**

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 2 – Evaluated Energy Improvements

For more detail on each evaluated energy improvement and a break out of cost-effective improvements, see **Section 4: Energy Conservation Measures.**

1.1 Planning Your Project

Careful planning makes for a successful energy project. When considering this scope of work, you will have some decisions to make, such as:

- How will the project be funded and/or financed?
- Is it best to pursue individual ECMs, groups of ECMs, or use a comprehensive approach where all ECMs are installed together?
- Are there other facility improvements that should happen at the same time?

Pick Your Installation Approach

Utility-run energy efficiency programs, such as New Jersey's Clean Energy Programs, give you the flexibility to do a little or a lot. Rebates, incentives, and financing are available to help reduce both your installation costs and your energy bills. If you are planning to take advantage of these programs, make sure to review incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives *before* purchasing materials or starting installation.

For details on these programs please visit New Jersey's Clean Energy Program website or contact your utility provider.

Options from Around the State

Financing and Planning Support with the Energy Savings Improvement Program (ESIP)

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the 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. You have already taken the first step as an LGEA customer, because this report is required to participate in ESIP.

Resiliency with Return on Investment through Combined Heat and Power (CHP)

The CHP program provides incentives for combined heat and power (i.e., cogeneration) and waste heat to power projects. Combined heat and power systems generate power on-site and recover heat from the generation system to meet on-site thermal loads. Waste heat to power systems use waste heat to generate power. You will work with a qualified developer who will design a system that meets your building's heating and cooling needs.

Successor Solar Incentive Program (SuSI)

New Jersey is committed to supporting solar energy. Solar projects help the state reach the renewable goals outlined in the state's Energy Master Plan. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available, but certified solar projects are able to earn one SREC II (Solar Renewable Energy Certificates II) for each megawatt-hour of solar electricity produced from a qualifying solar facility.

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces 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. By enabling commercial facilities to reduce electric demand 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 demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

Large Energy User Program (LEUP)

LEUP designed to promote self-investment in energy efficiency and combined heat and power or fuel cell projects. It incentivizes owners/users of buildings to upgrade or install energy conserving measures in existing buildings to help offset the capital costs associated with the project. The efficiency upgrades are customized to meet the requirements of the customers' existing facilities, while advancing the State's energy efficiency, conservation, and greenhouse gas reduction goals.

2 Existing Conditions

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Tenafly High School. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs.

TRC conducted this study as part of a comprehensive effort to assist New Jersey educational and local government facilities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

2.1 Site Overview

On June 14, 2022, TRC performed an energy audit at Tenafly High School located in Tenafly, New Jersey. TRC met with Mario Cofini to review the facility operations and help focus our investigation on specific energy-using systems.

Tenafly High School is a two-story, 260,715 square foot building built in 1972. Spaces include classrooms, offices, conference rooms, lounges, gymnasiums, locker rooms, auditorium, kitchen, cafeteria, library, corridors, stairwells, restrooms, storage rooms, electrical and mechanical space.

Lighting for the facility is provided mainly by linear fluorescent T8 fixtures. One chiller and four boilers provide cooling and heating to most spaces. There is one passenger elevator located in the facility. The building has a diesel generator to provide emergency backup electricity.

2.2 Building Occupancy

The facility is occupied year-round, with the school year ending for students in July and restarting in September. The building has limited use on the weekends, and the facility closes at 11:00 PM on weekdays. During a typical day, the facility is occupied by 169 staff and 1237 students.

Building Name	Weekday/Weekend	Operating Schedule
Tenafly High School - General Operating Hours	Weekday	5:30 AM - 11:00 PM
	Weekend	Varies
Tenafly High School - Classes Hours	Weekday	8:10 AM - 3:11 PM
	Weekend	Closed

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel with a brick facade. The roof is flat, and partially covered with pebbles over a gray membrane. The roof is in good condition.

The windows are single glazed and have aluminum frames with thermal breaks. The glass-to-frame seals are in fair condition. The operable window weather seals are in fair condition, showing little evidence of excessive wear. Exterior doors have aluminum frames and are in fair condition with worn door seals. Degraded window and door seals increase drafts and outside air infiltration. Overall, the building envelope appears in fair condition.

Building Walls

Building Window

Building Windows

Entrance Doors

Exit Doors

Roof

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt fluorescent T8 lamps. Fixture types include 1-lamp, 2-lamp, 3-lamp, and 4-lamp, 2-foot and 4-foot long recessed, surface mounted, and pendent fixtures with linear tube lamps. Fluorescent T5 and T12 lamps were observed in some areas as well. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts.

Additionally, compact fluorescent lamps (CFL), halogen, incandescent, metal halide (MH) and LED lamps are used in some spaces. Typically, CFLs at this site use between 14-Watts to 32-Watts, halogen lamps draw 32-Watts to 50-Watts, and incandescent "A" lamps are rated at 60-Watts. Main gymnasium fixtures are equipped with a mix of manually controlled high-bay 400-Watt MH and LED lamps. Auditorium fixtures have manually controlled CFLs, halogen, and incandescent lamps. Exit signs use LED sources.

Interior light fixtures are primarily controlled by manual wall switches, with some area equipped with occupancy sensors. All light fixtures are in good condition. Interior lighting levels were generally sufficient.

Exterior fixtures use a mix of CFLs, incandescent, MH, mercury vapor (MV), and LED lamps and are photocell controlled.

Fluorescent T8 Fixture

Fluorescent T8 Fixture

Gymnasium High-Bay Fixture

Gymnasium High-Bay Fixture

Exterior CFL Fixture

MH Fixture

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators (UV) provide heating, cooling and ventilation to classroom areas. These UVs are equipped with hot water heating coils and chilled water-cooling coils. These units are also equipped with supply fan motors and pneumatically controlled outside air dampers. Some of the units can be monitored through the onsite building energy management system (EMS).

Unit Ventilator

Unit Ventilator

Unitary Electric HVAC Equipment

Some areas of the building are conditioned using 14 split air conditioning (AC) units, three mini-split AC units, and one window AC unit. These cooling-only units' range in cooling capacity from 1.2 tons to 5.0 tons, with efficiencies ranging from 10 EER to 16 EER.

Two mini-split heat pump (HP) units serve additional building areas. These units each have a 1.0-ton cooling capacity at a 13 EER efficiency rating and a heating capacity of 11.5 MBh with an efficiency rating of 7.7 HSPF.

The units are in fair to good condition; the older units are recommended for replacement.

Split AC System

Mini-split HP Unit

Science classrooms 236 through 239 are heated by a total of four, gas-fired forced air furnaces, MAU 1-4. The units each have an estimated heating capacity of 120 MBh. The units are in fair condition and are controlled and monitored by the onsite EMS.


Forced Air Furnace

Packaged Rooftop Units (RTUs)

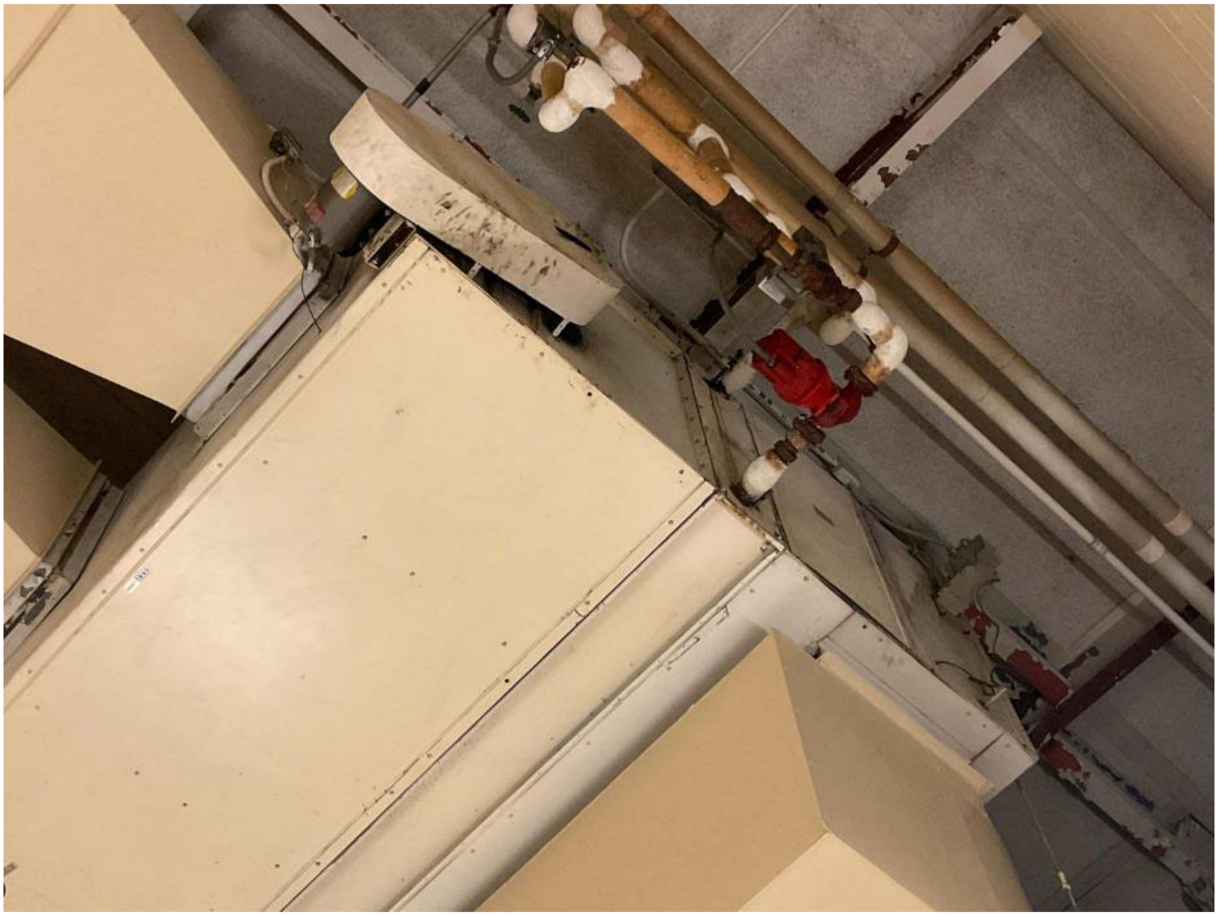
Areas of the building are served by four packaged rooftop units (RTUs) equipped with heating coils and direct expansion cooling. The units provide heating and cooling to spaces as noted below. Supply fans are driven by constant speed motors. The units are controlled and monitored by the onsite EMS. Refer to Appendix A for detailed information about each unit.

Units	Area Served	Heating System	Cooling Capacity (tons)	Supply Fan (hp)
RTU-1	1st Floor VAVs	Boilers	8.5	3.0
RTU-2	1st Floor VAVs	Boilers	8.5	3.0
RTU-3	Classroom 103	Boilers	4.0	1.5
ERU-1	Classroom 127	Boilers	8.0	3.0

Packaged Rooftop Unit

Air Handling Units (AHUs)

The gymnasiums are heated and ventilated using air handling units (AHUs). The AHUs are each equipped with hot water heating coils, chilled water-cooling coils, an estimated 1 hp constant speed heating hot water booster pump, and an estimated 2 hp constant speed supply fan. The units are in fair condition and are controlled and monitored by the onsite EMS.



Air Handling Unit

2.6 Heating Hot Water Systems

The building's heating system consists of four Aerco gas-fired condensing hot water boilers each with an output capacity of 4,700 MBh. The boilers have fully modulating burners with a nominal efficiency rating of 94%. Each boiler is equipped with a combustion air fan. The boilers are configured in a lead-lag control scheme operating with two boilers that are changed manually and are monitored by the facility's energy management system (EMS). Multiple boilers are required under high load conditions. Installed in 2018, they are in good condition. There is a service contract in place.

The building's hydronic distribution system provides heating and cooling, with the boilers serving the heating component of the dual temperature distribution system.

The boilers serve a primary distribution with two, 10 hp constant speed hot water pumps (HWP-1 and HWP-2) operating with a lead-lag control scheme serving the new wing, eight constant speed dual temperature pumps ranging from 2.0 hp to 7.5 hp each serving different areas of the building, and a 20 hp constant speed hot water pump (HWP-9) serving additional areas.

Note that the dual temperature pumps serve a dual use function in that they circulate heated and chilled water seasonally in the same loop. Hot water from the boilers and chilled water from the chillers mix for the dual temp supply. The boilers provide hot water to unit ventilators and air handling units throughout the building. The boiler's schedules and temperatures are controlled and monitored using the onsite EMS.

Hot Water Boilers

Heating Hot Water Pump


Dual Temperature Pumps

2.7 Chilled Water Systems

The chiller plant consists of a 400-ton, water-cooled Trane screw chiller. The chiller is configured in a primary distribution loop. There is a 15 hp BAC roof mounted variable speed cooling tower fan and a 20 hp constant flow condenser water pump in the boiler room.

As noted in Section 2.6, the dual temperature loop is circulated by the eight constant speed dual temperature pumps that range from 2.0 to 7.5 hp. An additional 2 hp constant speed chilled water pump serves some areas of the building. The chiller supplies chilled water to unit ventilators and air handling units throughout the building. The chilled water temperatures and chiller operating schedules are controlled by the onsite EMS. Installed in 2002, the chiller is in fair condition.

Water-cooled Chiller

2.8 Building Energy Management Systems (EMS)

A Johnson Controls Metasys EMS and an Automated Logic WebCTRL EMS are used to control the HVAC equipment, the boilers, the chiller, the air handlers, the package units, and some unit ventilators.

The control systems provide equipment scheduling control and monitor and control space temperatures, supply air temperatures, humidity, heating water loop temperatures and chilled water loop temperatures.

The site staff expressed an interest in expanding the level of control provided by the EMS, as well as changing the systems controlled by the Automated Logic EMS over to the Johnson Controls Metasys EMS.

Building Energy Management System for Tenafly High School

2.9 Domestic Hot Water

Hot water is produced by a 250 MBh, 100-gallon gas-fired Rheem storage water heater. Installed in 2017, the unit is in good condition. The domestic hot water pipes are partially insulated, and the insulation is in good condition.

Water Heater

2.10 Food Service Equipment

The kitchen has a mix of gas and electric equipment that is used to prepare meals for students and staff. Most cooking is done using convection gas-fired ovens. Bulk prepared foods are held in several electric holding cabinets. The convection gas-fired ovens are high efficiency with the remaining equipment being standard efficiency, and all are in good condition.

Visit https://www.energystar.gov/products/commercial_food_service_equipment for the latest information on high efficiency food service equipment.

Gas-fired Oven

Electric Holding Cabinet

2.11 Refrigeration

The facility has two stand-up refrigerators and four stand-up freezers with a mix of solid and glass doors. There is one commercial grade ice maker located in the cafeteria. Equipment is standard efficiency, and all are in good condition.

The walk-in refrigerator has an estimated 0.75-ton compressor and a two-fan evaporator.

Visit https://www.energystar.gov/products/commercial_food_service_equipment for the latest information on high efficiency food service equipment.

Stand-up Refrigerator

Walk-in Refrigerator

2.12 Plug Load and Vending Machines

The location is doing a great job managing their electrical plug loads. This report makes additional suggestions for ECMs in this area as well as energy efficient best practices.

Plug loads throughout the building include general cafe and office equipment. There are classroom typical loads such as smart boards and projectors, and typical office loads such as computers, copiers, printers, microwaves, coffee machines, and mini fridges.

There are six residential-style refrigerators that are used to store food and drinks. These vary in condition and efficiency.

There are two refrigerated beverage vending machines and one non-refrigerated vending machine. Vending machines are not equipped with occupancy-based controls.

Vending Machine

Residential-style Refrigerator

2.13 Water-Using Systems

There are 24 restrooms and locker rooms with toilets, urinals, showers, and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm) or higher.

Typical Restroom Sinks

2.14 On-Site Generation

Tenafly High School has a 647-kW rooftop photovoltaic (PV) array with approximately 1,925 panels. The install date was not provided by the applicant. This system provides approximately 28% of the electricity used at this facility. Some electricity generated by the panels is sold back to the grid.

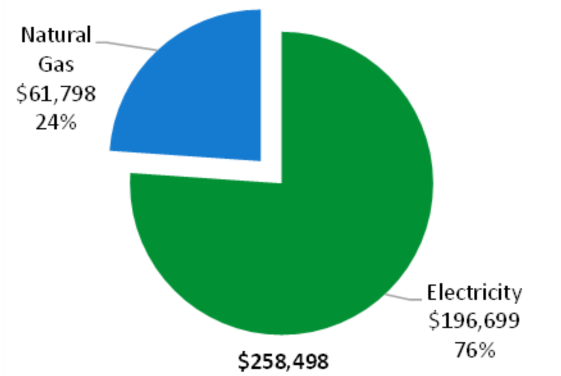
Tenafly High School has an emergency diesel generator that, in the event of a power outage, serves critical services and is only used for emergency needs.

Rooftop Solar Panels

3 ENERGY USE AND COSTS

Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

Utility Summary		
Fuel	**Usage**	**Cost**
Electricity	1,876,139 kWh	$196,699
Natural Gas	90,083 Therms	$61,798
Total		**$258,498**



An energy balance identifies and quantifies energy use in your various building systems. This can highlight areas with the most potential for improvement. This energy balance was developed using calculated energy use for each of the end uses noted in the figure.

The energy auditor collects information regarding equipment operating hours, capacity, efficiency, and other operational parameters from facility staff, drawings, and on-site observations. This information is used as the inputs to calculate the existing conditions energy use for the site. The calculated energy use is then compared to the historical energy use and the initial inputs are revised, as necessary, to balance the calculated energy use to the historical energy use.

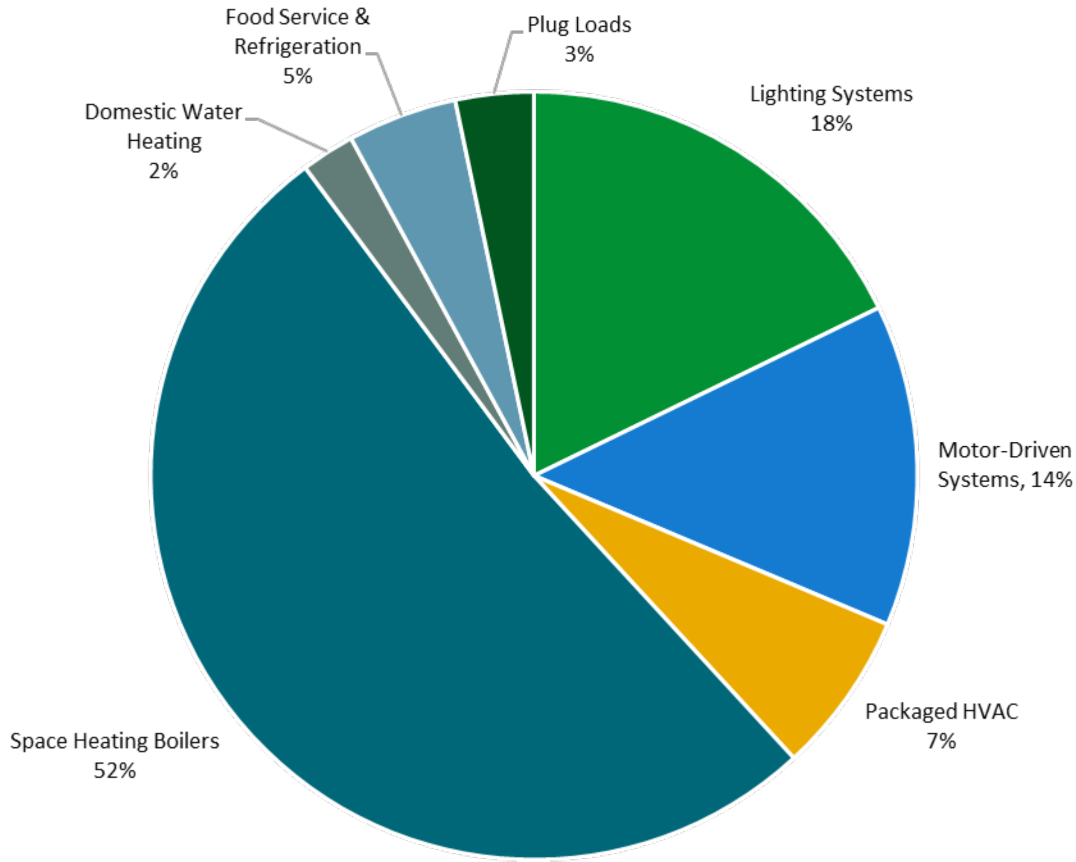
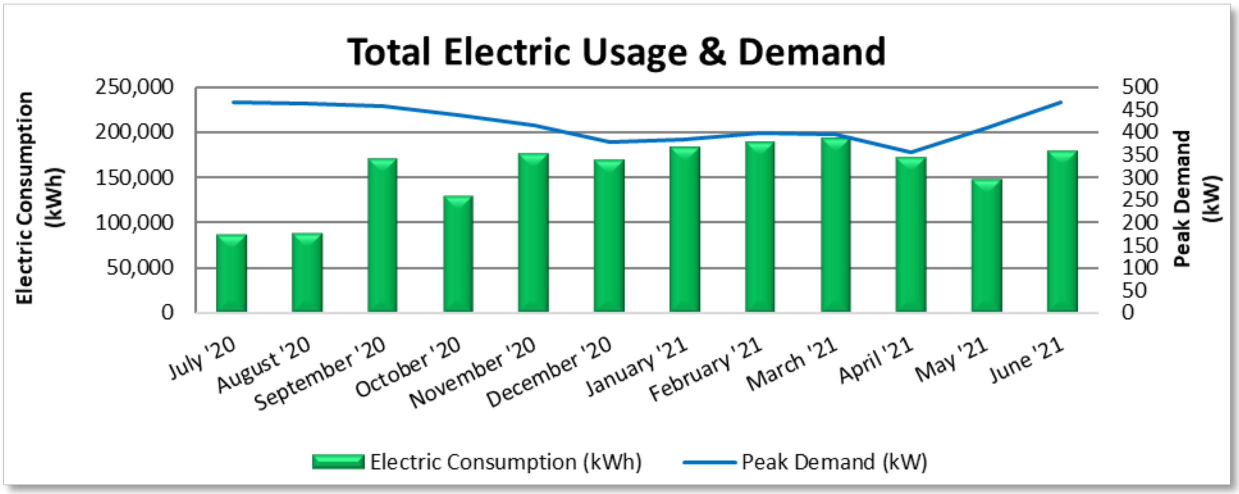
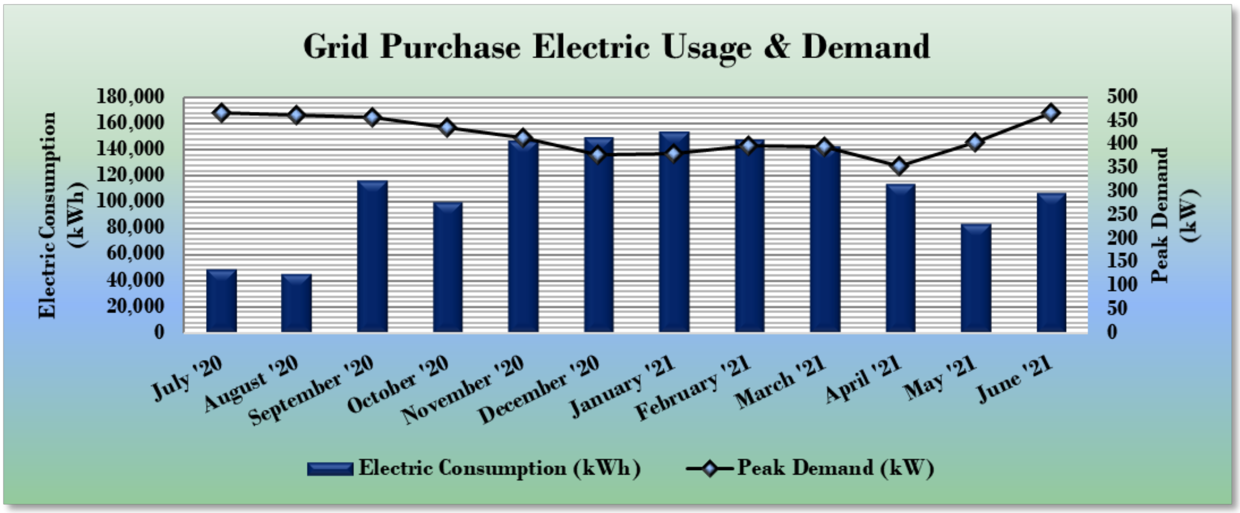


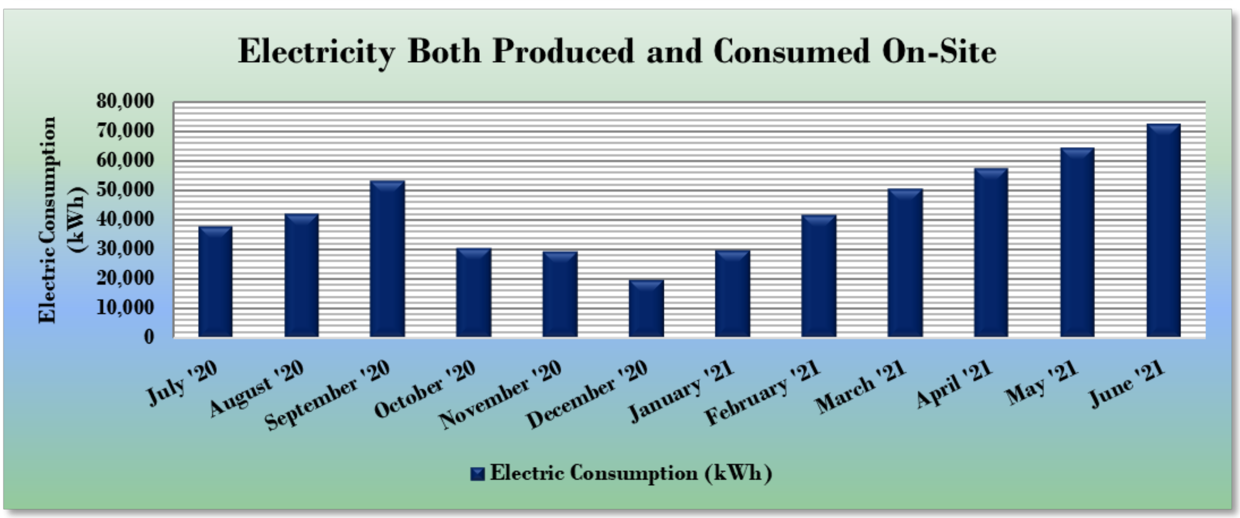
Figure 4 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class Large Power & Lighting Secondary (LPLS), with electric production provided by Constellation Energy, a third-party supplier.





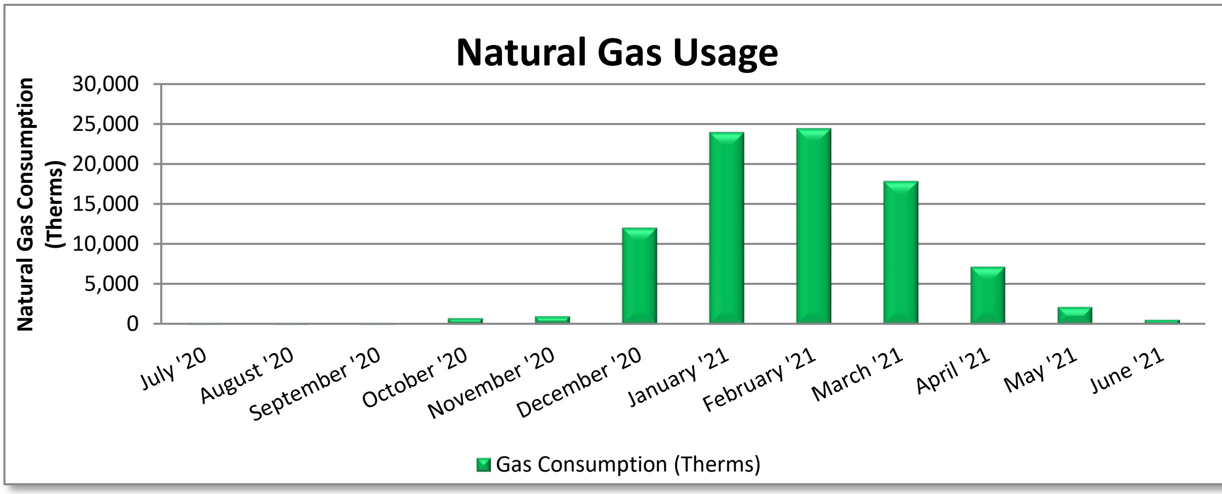


Notes:

- Peak demand of 468 kW occurred in June 2021.
- Average demand over the past 12 months was 419 kW.
- The average electric cost over the past 12 months was $0.105/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.
- On-site generation is through a PPA, and the site purchases the generated electricity from Heliovaas. Some of the electricity generated on-site is used on-site and the remainder is exported to the grid.
- The first graph shows combined electricity consumption, the second graph shows energy consumed from the grid, and the third graph reflects energy produced by the solar panels and consumed on site.
- The solar meter does not capture kW load and is therefore not displayed on the third graph.

3.2 Natural Gas

PSE&G delivers natural gas under rate class Large Volume Gas (LVG), with natural gas supply provided by UGI Energy, a third-party supplier.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
7/17/20	30	10	$149
8/18/20	32	10	$153
9/17/20	30	42	$169
10/16/20	29	815	$622
11/16/20	31	1,033	$3,292
12/16/20	30	12,030	$9,688
1/20/21	35	23,912	$16,548
2/17/21	28	24,394	$14,358
3/19/21	30	17,828	$10,563
4/19/21	31	7,209	$4,362
5/19/21	30	2,203	$1,439
6/17/21	29	597	$455
Totals	**365**	**90,083**	**$61,798**
Annual	**365**	**90,083**	**$61,798**

Notes:

- The average gas cost for the past 12 months is $0.686/therm, which is the blended rate used throughout the analysis.
- Summer gas usage can be attributed to domestic hot water and cooking equipment usage.

3.3 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's (EPA) *Portfolio Manager®* software. Benchmarking compares your building's energy use to that of similar buildings across the country, while neutralizing variations due to location, occupancy, and operating hours. Some building types can be scored with a 1-100 ranking of a building's energy performance relative to the national building market. A score of 50 represents the national average and a score of 100 is best.

This ENERGY STAR® benchmarking score provides a comprehensive snapshot of your building's energy performance. It assesses the building's physical assets, operations, and occupant behavior, which is compiled into a quick and easy-to-understand score.

Benchmarking Score	71

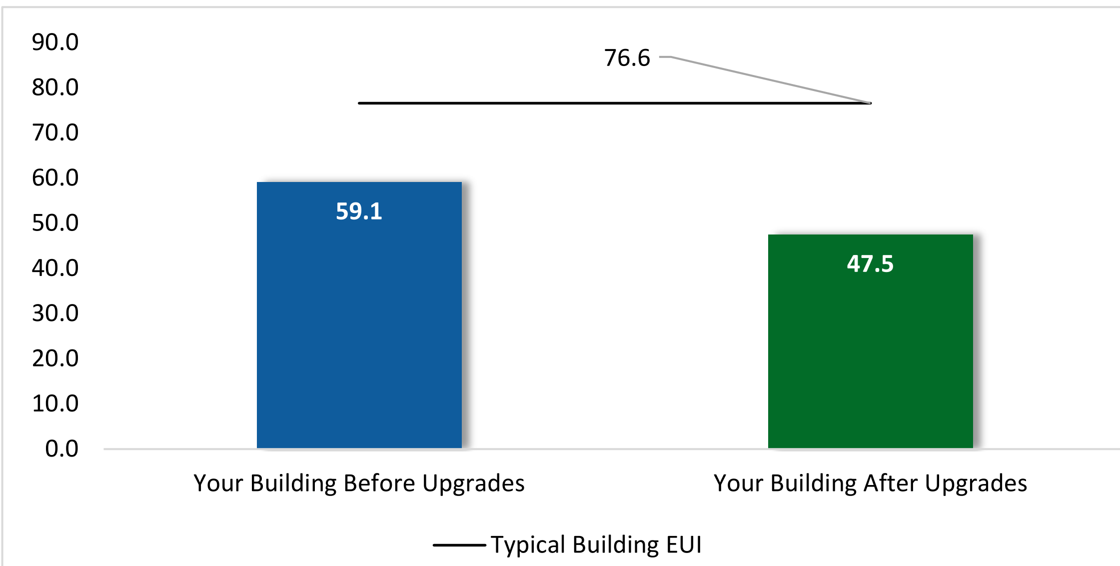


Figure 5 - Energy Use Intensity Comparison[3]

Congratulations, your building performs better than the national average. This report has suggestions about how to keep your building running efficiently, further improve performance, and lower your energy bills even more.

Energy use intensity (EUI) measures energy consumption per square foot and is the standard metric for comparing buildings' energy performance. A lower EUI means better performance and less energy consumed. Several factors can cause a building to vary from typical energy usage. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and occupant behavior all contribute to a building's energy use and the benchmarking score.

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

Keeping track of your energy use on a monthly basis is one of the best ways to keep energy costs in check. Update your utility information in Portfolio Manager® regularly, so that you can keep track of your building's performance.

We have created a Portfolio Manager® account for your facility, and we have already entered the monthly utility data shown above for you. Account login information for your account will be sent via email.

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.

For more information on ENERGY STAR® and Portfolio Manager®, visit their website.

4 ENERGY CONSERVATION MEASURES

The goal of this audit report is to identify and evaluate potential energy efficiency improvements and provide information about the cost effectiveness of those improvements. Most energy conservation measures have received preliminary analysis of feasibility, which identifies expected ranges of savings. This level of analysis is typically sufficient to demonstrate project cost-effectiveness and help prioritize energy measures.

Calculations of energy use and savings are based on the current version of the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the NJBPU. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances.

Operation and maintenance costs for the proposed new equipment will generally be lower than the current costs for the existing equipment—especially if the existing equipment is at or past its normal useful life. We have conservatively assumed there to be no impact on overall maintenance costs over the life of the equipment.

Financial incentives are based on previously run state rebate programs. New utility programs are expected to start rolling out in the spring and summer of 2021. Keep up to date with developments by visiting the NJCEP website. Some measures and proposed upgrades may be eligible for higher incentives than those shown below.

For a detailed list of the locations and recommended energy conservation measures for all inventoried equipment, see **Appendix A: Equipment Inventory & Recommendations.**

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**474,851**	**78.6**	**-97**	**$49,120**	**$137,636**	**$27,115**	**$110,521**	**2.3**	**466,826**
ECM 1	Install LED Fixtures	Yes	102,971	14.1	-21	$10,655	$31,027	$3,250	$27,777	2.6	101,289
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	35,523	5.1	-7	$3,673	$10,746	$1,481	$9,265	2.5	34,902
ECM 3	Retrofit Fixtures with LED Lamps	Yes	336,357	59.4	-69	$34,791	$95,864	$22,384	$73,480	2.1	330,635
Lighting Control Measures			**121,226**	**20.6**	**-25**	**$12,536**	**$85,567**	**$20,040**	**$65,527**	**5.2**	**119,105**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	101,662	17.8	-21	$10,513	$72,742	$9,540	$63,202	6.0	99,884
ECM 5	Install High/Low Lighting Controls	Yes	19,563	2.8	-4	$2,023	$12,825	$10,500	$2,325	1.1	19,221
Variable Frequency Drive (VFD) Measures			**236,264**	**34.6**	**78**	**$25,307**	**$172,177**	**$18,975**	**$153,202**	**6.1**	**247,073**
ECM 6	Install VFD on Variable Air Volume (VAV) Fans	Yes	7,501	1.9	0	$786	$7,768	$400	$7,368	9.4	7,553
ECM 7	Install VFDs on Constant Volume (CV) Fans	Yes	75,589	19.7	0	$7,925	$86,965	$5,575	$81,390	10.3	76,118
ECM 8	Install VFDs on Chilled Water Pumps	Yes	22,777	4.1	0	$2,388	$11,843	$1,400	$10,443	4.4	22,936
ECM 9	Install VFDs on Heating Water Pumps	Yes	33,136	3.8	0	$3,474	$18,885	$3,500	$15,385	4.4	33,367
ECM 10	Install VFDs on Kitchen Hood Fan Motors	Yes	27,711	0.2	78	$3,442	$11,844	$1,300	$10,544	3.1	37,061
ECM 11	Install VFDs on Water Supply Pump	Yes	69,550	4.9	0	$7,292	$34,872	$6,800	$28,072	3.8	70,037
Unitary HVAC Measures			**12,016**	**6.1**	**0**	**$1,260**	**$68,064**	**$2,387**	**$65,677**	**52.1**	**12,100**
ECM 12	Install High Efficiency Air Conditioning Units	No	10,505	5.3	0	$1,101	$57,679	$2,387	$55,292	50.2	10,579
ECM 13	Install High Efficiency Heat Pumps	No	1,510	0.9	0	$158	$10,385	$0	$10,385	65.6	1,521
Electric Chiller Replacement			**31,360**	**14.7**	**0**	**$3,288**	**$202,039**	**$14,800**	**$187,239**	**56.9**	**31,579**
ECM 14	Install High Efficiency Chillers	No	31,360	14.7	0	$3,288	$202,039	$14,800	$187,239	56.9	31,579
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**42**	**$289**	**$24,493**	**$2,000**	**$22,493**	**77.9**	**4,925**
ECM 15	Install High Efficiency Furnaces	No	0	0.0	42	$289	$24,493	$2,000	$22,493	77.9	4,925
HVAC System Improvements			**0**	**0.0**	**5**	**$33**	**$43**	**$12**	**$31**	**1.0**	**557**
ECM 16	Install Pipe Insulation	Yes	0	0.0	5	$33	$43	$12	$31	1.0	557
Domestic Water Heating Upgrade			**0**	**0.0**	**27**	**$186**	**$409**	**$204**	**$204**	**1.1**	**3,167**
ECM 17	Install Low-Flow DHW Devices	Yes	0	0.0	27	$186	$409	$204	$204	1.1	3,167
Food Service & Refrigeration Measures			**3,824**	**0.4**	**0**	**$401**	**$2,741**	**$255**	**$2,486**	**6.2**	**3,851**
ECM 18	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	393	0.0	0	$41	$607	$80	$527	12.8	396
ECM 19	Refrigeration Controls	No	610	0.0	0	$64	$1,674	$75	$1,599	25.0	615
ECM 20	Vending Machine Control	Yes	2,821	0.3	0	$296	$460	$100	$360	1.2	2,840
TOTALS			**879,541**	**155.0**	**30**	**$92,418**	**$693,168**	**$85,788**	**$607,380**	**6.6**	**889,182**

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 6 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**474,851**	**78.6**	**-97**	**$49,120**	**$137,636**	**$27,115**	**$110,521**	**2.3**	**466,826**
ECM 1	Install LED Fixtures	102,971	14.1	-21	$10,655	$31,027	$3,250	$27,777	2.6	101,289
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	35,523	5.1	-7	$3,673	$10,746	$1,481	$9,265	2.5	34,902
ECM 3	Retrofit Fixtures with LED Lamps	336,357	59.4	-69	$34,791	$95,864	$22,384	$73,480	2.1	330,635
Lighting Control Measures		**121,226**	**20.6**	**-25**	**$12,536**	**$85,567**	**$20,040**	**$65,527**	**5.2**	**119,105**
ECM 4	Install Occupancy Sensor Lighting Controls	101,662	17.8	-21	$10,513	$72,742	$9,540	$63,202	6.0	99,884
ECM 5	Install High/Low Lighting Controls	19,563	2.8	-4	$2,023	$12,825	$10,500	$2,325	1.1	19,221
Variable Frequency Drive (VFD) Measures		**236,264**	**34.6**	**78**	**$25,307**	**$172,177**	**$18,975**	**$153,202**	**6.1**	**247,073**
ECM 6	Install VFD on Variable Air Volume (VAV) Fans	7,501	1.9	0	$786	$7,768	$400	$7,368	9.4	7,553
ECM 7	Install VFDs on Constant Volume (CV) Fans	75,589	19.7	0	$7,925	$86,965	$5,575	$81,390	10.3	76,118
ECM 8	Install VFDs on Chilled Water Pumps	22,777	4.1	0	$2,388	$11,843	$1,400	$10,443	4.4	22,936
ECM 9	Install VFDs on Heating Water Pumps	33,136	3.8	0	$3,474	$18,885	$3,500	$15,385	4.4	33,367
ECM 10	Install VFDs on Kitchen Hood Fan Motors	27,711	0.2	78	$3,442	$11,844	$1,300	$10,544	3.1	37,061
ECM 11	Install VFDs on Water Supply Pump	69,550	4.9	0	$7,292	$34,872	$6,800	$28,072	3.8	70,037
HVAC System Improvements		**0**	**0.0**	**5**	**$33**	**$43**	**$12**	**$31**	**1.0**	**557**
ECM 16	Install Pipe Insulation	0	0.0	5	$33	$43	$12	$31	1.0	557
Domestic Water Heating Upgrade		**0**	**0.0**	**27**	**$186**	**$409**	**$204**	**$204**	**1.1**	**3,167**
ECM 17	Install Low-Flow DHW Devices	0	0.0	27	$186	$409	$204	$204	1.1	3,167
Food Service & Refrigeration Measures		**3,214**	**0.4**	**0**	**$337**	**$1,067**	**$180**	**$887**	**2.6**	**3,236**
ECM 18	Refrigerator/Freezer Case Electrically Commutated Motors	393	0.0	0	$41	$607	$80	$527	12.8	396
ECM 20	Vending Machine Control	2,821	0.3	0	$296	$460	$100	$360	1.2	2,840
TOTALS		**835,555**	**134.1**	**-12**	**$87,518**	**$396,899**	**$66,526**	**$330,372**	**3.8**	**839,963**

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 7 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**474,851**	**78.6**	**-97**	**$49,120**	**$137,636**	**$27,115**	**$110,521**	**2.3**	**466,826**
ECM 1	Install LED Fixtures	102,971	14.1	-21	$10,655	$31,027	$3,250	$27,777	2.6	101,289
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	35,523	5.1	-7	$3,673	$10,746	$1,481	$9,265	2.5	34,902
ECM 3	Retrofit Fixtures with LED Lamps	336,357	59.4	-69	$34,791	$95,864	$22,384	$73,480	2.1	330,635

When considering lighting upgrades, we suggest using a comprehensive design approach that simultaneously upgrades lighting fixtures and controls to maximize energy savings and improve occupant lighting. Comprehensive design will also consider appropriate lighting levels for different space types to make sure that the right amount of light is delivered where needed. If conversion to LED light sources is proposed, we suggest converting all of a specific lighting type (e.g., linear fluorescent) to LED lamps to minimize the number of lamp types in use at the facility, which should help reduce future maintenance costs.

ECM 1: Install LED Fixtures

Replace existing fixtures containing high-intensity discharge (HID) lamps with new LED light fixtures. This measure saves energy by installing LEDs, which use less power than other technologies with a comparable light output.

In some cases, HID fixtures can be retrofit with screw-based LED lamps. Replacing an existing HID fixture with a new LED fixture will generally provide better overall lighting optics; however, replacing the HID lamp with a LED screw-in lamp is typically a less expensive retrofit. We recommend you work with your lighting contractor to determine which retrofit solution is best suited to your needs and will be compatible with the existing fixtures.

Maintenance savings may also be achieved since LED lamps last longer than other light sources and therefore do not need to be replaced as often.

Affected Building Areas: gymnasium and exterior fixtures using MH and MV lamps.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Retrofit fluorescent fixtures by removing the fluorescent tubes and ballasts and replacing them with LED tubes and LED drivers (if necessary), which are designed to be used in retrofitted fluorescent fixtures.

The measure uses the existing fixture housing but replaces the electric components with more efficient lighting technology, which use less power than other lighting technologies but provides equivalent lighting output. Maintenance savings may also be achieved since LED tubes last longer than fluorescent tubes and, therefore, do not need to be replaced as often.

Affected Building Areas: all areas with fluorescent fixtures with T12 tubes.

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent, CFL, and incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies. Be sure to specify replacement lamps that are compatible with existing dimming controls, where applicable. In some circumstances, you may need to upgrade your dimming system for optimum performance.

This measure saves energy by installing LEDs, which use less power than other lighting technologies yet provide equivalent lighting output for the space. Maintenance savings may also be available, as longer-lasting LEDs lamps will not need to be replaced as often as the existing lamps.

Affected Building Areas: all areas with CFL or incandescent lamps, and fluorescent fixtures with T5 or T8 tubes.

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**121,226**	**20.6**	**-25**	**$12,536**	**$85,567**	**$20,040**	**$65,527**	**5.2**	**119,105**
ECM 4	Install Occupancy Sensor Lighting Controls	101,662	17.8	-21	$10,513	$72,742	$9,540	$63,202	6.0	99,884
ECM 5	Install High/Low Lighting Controls	19,563	2.8	-4	$2,023	$12,825	$10,500	$2,325	1.1	19,221

ECM 4: Install Occupancy Sensor Lighting Controls

Install occupancy sensors to control lighting fixtures in areas that are frequently unoccupied, even for short periods. For most spaces, we recommend that lighting controls use dual technology sensors, which reduce the possibility of lights turning off unexpectedly.

Occupancy sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Most occupancy sensor lighting controls allow users to manually turn fixtures on/off, as needed. Some controls can also provide dimming options.

Occupancy sensors can be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are best suited to single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in large spaces, locations without local switching, and where wall switches are not in the line-of-sight of the main work area.

This measure provides energy savings by reducing the lighting operating hours.

Affected Building Areas: classrooms, offices, lounges, library, cafeteria, kitchen, auditorium, gymnasiums, locker rooms, restrooms, and storage rooms.

ECM 5: Install High/Low Lighting Controls

Install 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.

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety code requirements for egress. Sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Fixtures automatically switch back to low level after a predefined period of vacancy. In parking lots and parking garages with significant ambient lighting, this control can sometimes be combined with photocell controls to turn the lights off when there is sufficient daylight.

The controller lowers the light level by dimming the fixture output. Therefore, the controlled fixtures need to have a dimmable ballast or driver. This will need to be considered when selecting retrofit lamps and bulbs for the areas proposed for high/low control.

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

This measure provides energy savings by reducing the light fixture power draw when reduced light output is appropriate.

Affected Building Areas: hallways, lobbies, and stairwells.

4.3 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**236,264**	**34.6**	**78**	**$25,307**	**$172,177**	**$18,975**	**$153,202**	**6.1**	**247,073**
ECM 6	Install VFD on Variable Air Volume (VAV) Fans	7,501	1.9	0	$786	$7,768	$400	$7,368	9.4	7,553
ECM 7	Install VFDs on Constant Volume (CV) Fans	75,589	19.7	0	$7,925	$86,965	$5,575	$81,390	10.3	76,118
ECM 8	Install VFDs on Chilled Water Pumps	22,777	4.1	0	$2,388	$11,843	$1,400	$10,443	4.4	22,936
ECM 9	Install VFDs on Heating Water Pumps	33,136	3.8	0	$3,474	$18,885	$3,500	$15,385	4.4	33,367
ECM 10	Install VFDs on Kitchen Hood Fan Motors	27,711	0.2	78	$3,442	$11,844	$1,300	$10,544	3.1	37,061
ECM 11	Install VFDs on Water Supply Pump	69,550	4.9	0	$7,292	$34,872	$6,800	$28,072	3.8	70,037

Variable frequency drives control motors for fans, pumps, and process equipment based on the actual output required of the driven equipment. Energy savings result from more efficient control of motor energy usage when equipment operates at partial load. The magnitude of energy savings depends on the estimated amount of time that the motor would operate at partial load. For equipment with proposed VFDs, we have included replacing the controlled motor with a new inverter duty rated motor to conservatively account for the cost of an inverter duty rated motor.

ECM 6: Install VFD on Variable Air Volume (VAV) Fans

Replace existing air volume control devices on variable volume fans, such as inlet vanes and variable pitch fan blades, with VFDs. Inlet guide vanes and variable pitch fan blades are an inefficient means of controlling the air volume compared to VFDs. The existing volume control device will be removed or permanently disabled, and the control signal will be redirected to the VFD to determine proper fan motor speed.

Energy savings result from using a more efficient control device to regulate the air flow provided by the fan. Additional maintenance savings may result from this measure. VFDs are solid state electronic devices, which generally requires less maintenance than mechanical air volume control devices.

Affected Air Handlers: RTU-1 and RTU-2 supply fans.

ECM 7: Install VFDs on Constant Volume (CV) Fans

Install VFDs to control constant volume fan motor speeds. This converts a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor if the air handler has one.

Zone thermostats signal the VFD to adjust fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature.

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

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing must be determined during the final project design. The control system programming should maintain the minimum air flow whenever the compressor is operating. Prior to implementation, verify minimum fan speed in cooling mode with the manufacturer. Note that savings will vary depending on the operating characteristics of each AHU.

Energy savings result from reducing the fan speed (and power) when conditions allow for reduced air flow.

Affected Air Handlers: supply fans for MAUs 1-4, ERU-1, RTU-3, and larger exhaust fans.

ECM 8: Install VFDs on Chilled Water Pumps

Install VFDs to control chilled water pumps. Two-way valves must serve the chilled water coils being served and the chilled water loop must have a differential pressure sensor installed. If three-way valves or a bypass leg are used in the chilled water distribution, they will need to be modified when this measure is implemented. As the chilled water valves close, the differential pressure increases, and the VFD modulates the pump speed to maintain a differential pressure setpoint.

This measure includes a recommendation to assess potential for VFD control of the condensing water pump. Chillers need a minimum flow of condenser water or else the chiller will cycle off. A lesser-known concern is that reducing condenser water flow can cause areas of the cooling tower fill material to dry up. Testing should be done to determine the minimum condenser water volume needed to keep fill material wet. This can vary depending on outdoor weather conditions so consider testing in shoulder months and under different wet bulb conditions.

For systems with variable chilled water flow through the chiller, the minimum flow to prevent the chiller from tripping off will need to be determined during the final project design. The control system should be programmed to maintain the minimum flow through the chiller and to prevent pump cavitation.

Energy savings result from reducing the pump motor speed (and power) as chilled water valves close. The magnitude of energy savings is based on the estimated amount of time that the system operates at reduced loads.

Affected Pumps: CHW pumps.

ECM 9: Install VFDs on Heating Water Pumps

Install variable frequency drives (VFD) to control heating water pumps. Two-way valves must serve the hot water coils, and the hot water loop must have a differential pressure sensor installed. If three-way valves or a bypass leg are used in the hot water distribution, they will need to be modified when this measure is implemented. As the hot water valves close, the differential pressure increases and the VFD modulates the pump speed to maintain a differential pressure setpoint.

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

Affected Pumps: HWP-1 and HWP-2; HWP-9.

ECM 10: Install VFDs on Kitchen Hood Fan Motors

Install VFDs and sensors to control the kitchen hood fan motors. The air flow of the hood is varied based on two key inputs: temperature and smoke/cooking fumes. The VFD controls the amount of exhaust (and kitchen make-up air) based on temperature—the lower the temperature the lower the flow. If the optic sensor is triggered by smoke or cooking fumes, the speed of the fan ramps up to 100%.

Energy savings result from reducing the hood fan speed (and power) when conditions allow for reduced air flow.

ECM 11: Install VFDs on Dual Temperature Water Supply Pumps

Install VFDs to control dual temperature loop water pumps. Two-way valves must serve the coils being served and the loop must have a differential pressure sensor installed. If three-way valves or a bypass leg are used in the distribution, they will need to be modified when this measure is implemented. As the valves close, the differential pressure increases, and the VFD modulates the pump speed to maintain a differential pressure setpoint.

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

Affected Pumps: dual temperature pumps.

4.4 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**12,016**	**6.1**	**0**	**$1,260**	**$68,064**	**$2,387**	**$65,677**	**52.1**	**12,100**
ECM 12	Install High Efficiency Air Conditioning Units	10,505	5.3	0	$1,101	$57,679	$2,387	$55,292	50.2	10,579
ECM 13	Install High Efficiency Heat Pumps	1,510	0.9	0	$158	$10,385	$0	$10,385	65.6	1,521

Replacing the unitary HVAC units has a long payback period and may not be justifiable based simply on energy considerations. However, most of the units are nearing or have reached the end of their normal useful life. Typically, the marginal cost of purchasing a high efficiency unit can be justified by the marginal savings from the improved efficiency. When the mini-split AC units, mini-split HP units, window AC units, and package units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 12: Install High Efficiency Air Conditioning Units

We evaluated replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling and heating load, and the estimated annual operating hours. Note that VFD control has been recommended for some of these units in a separate measure. Prioritize system replacement over VFD control if replacement is anticipated on a short-term horizon. Most new units are equipped with VFD control mechanisms.

Affected Units: RTUs 1-3, ERU-1, the window AC unit serving office 124, and the mini-split AC units.

ECM 13: Install High Efficiency Heat Pumps

We evaluated replacing standard efficiency heat pumps with high efficiency heat pumps. A higher EER or SEER rating indicates a more efficient cooling system, and a higher HSPF rating indicates more efficient heating mode. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average heating and cooling loads, and the estimated annual operating hours.

Affected Units: DSCU-1 and DSCU-2.

4.5 Electric Chillers

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Chiller Replacement		**31,360**	**14.7**	**0**	**$3,288**	**$202,039**	**$14,800**	**$187,239**	**56.9**	**31,579**
ECM 14	Install High Efficiency Chillers	31,360	14.7	0	$3,288	$202,039	$14,800	$187,239	56.9	31,579

ECM 14: Install High Efficiency Chillers

We evaluated replacing the older inefficient electric chiller with a new high efficiency chiller. The type of chiller to be installed depends on the magnitude of the cooling load and variability of the cooling load profile, for example:

- Positive displacement chillers are usually under 600 tons of cooling capacity, and centrifugal chillers generally start at 150 tons of cooling capacity.
- Constant speed chillers should be used to meet cooling loads with little or no variation, while variable speed chillers are more efficient for variable cooling load profiles.
- Water cooled chillers are more efficient than air cooled chillers but require cooling towers and additional pumps to circulate the cooling water.
- In any given size range, variable speed chillers tend to have better partial load efficiency, but worse full load efficiency, than constant speed chillers.

Energy savings result from the improvement in chiller efficiency and matching the right type of chiller to the cooling load. The energy savings are calculated based on the cooling capacity of the new chiller, the improvement in efficiency compared with the base case equipment, the cooling load profile, and the estimated annual operating hours of the chiller before and after the upgrade.

For the purposes of this analysis, we evaluated the replacement of chillers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your design team to select chillers that are sized appropriately for the cooling load. In some cases, the plant energy use can be reduced by selecting multiple chillers that match the facility load profile, rather than one or two large chillers. This can also improve the chiller plant reliability through increased redundancy. Energy savings are maximized by proper selection of new equipment based on the cooling load profile.

Replacing the chiller has a long payback based on energy savings and may not be justifiable based simply on energy considerations. However, the chiller is nearing the end of its normal useful life. Typically, the marginal cost of purchasing a high-efficiency chiller can be justified by the marginal savings from the improved efficiency. When the chiller is eventually replaced, consider purchasing equipment that exceed the minimum efficiency required by building codes.

4.6 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**42**	**$289**	**$24,493**	**$2,000**	**$22,493**	**77.9**	**4,925**
ECM 15	Install High Efficiency Furnaces	0	0.0	42	$289	$24,493	$2,000	$22,493	77.9	4,925

ECM 15: Install High Efficiency Furnaces

We evaluated replacing standard efficiency furnaces with condensing furnaces. Improved combustion technology and heat exchanger design optimize heat recovery from the combustion gases, which can significantly improve furnace efficiency. Savings result from improved system efficiency.

Note: these units produce acidic condensate that require proper drainage. Also, note that VFD control has been recommended for these units in a separate measure. Prioritize system replacement over VFD control if replacement is anticipated on a short-term horizon. Most new units are equipped with VFD control mechanisms.

Affected Units: MAUs 1-4.

4.7 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**0**	**0.0**	**5**	**$33**	**$43**	**$12**	**$31**	**1.0**	**557**
ECM 16	Install Pipe Insulation	0	0.0	5	$33	$43	$12	$31	1.0	557

ECM 16: Install Pipe Insulation

Install insulation on domestic hot water system piping. Distribution system losses are dependent on system fluid temperature, the size of the distribution system, and the level of insulation of the piping. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is exposed to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Affected Systems: domestic hot water piping around the water heater.

4.8 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**27**	**$186**	**$409**	**$204**	**$204**	**1.1**	**3,167**
ECM 17	Install Low-Flow DHW Devices	0	0.0	27	$186	$409	$204	$204	1.1	3,167

ECM 17: Install Low-Flow DHW Devices

Install low-flow devices to reduce overall hot water demand. The following low-flow devices are recommended to reduce hot water usage:

Device	Flow Rate
Faucet aerators (lavatory)	0.5 gpm
Faucet aerator (kitchen)	1.5 gpm
Showerhead	2.0 gpm
Pre-rinse spray valve (kitchen)	1.28 gpm

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. Additional cost savings may result from reduced water usage.

4.9 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**3,824**	**0.4**	**0**	**$401**	**$2,741**	**$255**	**$2,486**	**6.2**	**3,851**
ECM 18	Refrigerator/Freezer Case Electrically Commutated Motors	393	0.0	0	$41	$607	$80	$527	12.8	396
ECM 19	Refrigeration Controls	610	0.0	0	$64	$1,674	$75	$1,599	25.0	615
ECM 20	Vending Machine Control	2,821	0.3	0	$296	$460	$100	$360	1.2	2,840

ECM 18: Refrigerator/Freezer Case Electrically Commutated Motors

Replace shaded pole or permanent split capacitor (PSC) motors with electronically commutated (EC) motors in walk-in coolers. Fractional horsepower EC motors are significantly more efficient than mechanically commutated, brushed motors, particularly at low speeds or partial load. By using variable-speed technology, EC motors can optimize fan usage. Because these motors are brushless and use DC power, losses due to friction and phase shifting are eliminated.

Savings for this measure consider both the increased efficiency of the motor as well as the reduction in refrigeration load due to motor heat loss.

ECM 19: Refrigeration Controls

We evaluated installing additional controls to optimize the operation of walk-in coolers and freezers.

Defrost controllers can be used to override defrost of evaporator fans when the defrost operation is not necessary, which reduces annual energy consumption. This measure is applicable to existing evaporator fans with a traditional electric de-frost mechanism.

Many walk-in coolers and freezers have evaporator fans that run continuously. The measure adds a control system feature to automatically shut off evaporator fans when not needed.

Energy savings for each of the control measures account for reduction in compressor and fan operating hours as well as reduction in the refrigeration heat load as appropriate.

ECM 20: Vending Machine Control

Vending machines operate continuously, even during unoccupied hours. Install occupancy sensor controls to reduce energy use. These controls power down vending machines when the vending machine area has been vacant for some time, and they power up the machines at necessary regular intervals or when the surrounding area is occupied. Energy savings are dependent on the vending machine and activity level in the area surrounding the machines.

4.10 Measures for Future Consideration

There are additional opportunities for improvement that Tenafly Public Schools may wish to consider. These potential upgrades typically require further analysis, involve substantial capital investment, and/or include significant system reconfiguration. These measures are therefore beyond the scope of this energy audit. These measures are described here to support a whole building approach to energy efficiency and sustainability.

Tenafly Public Schools may wish to consider the Energy Savings Improvement Program (ESIP) or other whole building approach. With interest in implementing comprehensive, largescale and/or complex system wide projects, these measures may be pursued during development of a future energy savings plan. We recommend that you work with your energy service company (ESCO) and/or design team to:

- Evaluate these measures further.
- Develop firm costs.
- Determine measure savings.
- Prepare detailed implementation plans.

Other modernization or capital improvement funds may be leveraged for these types of refurbishments. As you plan for capital upgrades, be sure to consider the energy impact of the building systems and controls being specified.

Upgrade/Replace Energy Management System

Based on our site survey and on conversations with facility staff, it appears that the existing energy management system (EMS) is substantially limited in its capabilities, means of control, monitoring/ reporting function, or condition relative to new systems available in the marketplace. A substantial upgrade to your site's EMS could increase the efficiency of your building HVAC system operation.

The current generation EMS typically provides building systems with a network of temperature and pressure sensors that obtain feedback about field conditions and provide signals to control systems to adjust system operation for optimal functioning. Thirty years ago, most control systems were pneumatic systems driven by compressed air, with pneumatic thermostats and air driven actuators for valves and dampers. Pneumatics controls have largely been replaced by direct digital control (DDC) systems, but many pneumatic systems remain. Contemporary DDC systems afford tighter controls and enhanced monitoring and trending capabilities as compared to the older systems.

A controls upgrade would enable automated equipment start and stop times, temperature setpoints, and lockouts and deadbands to be programmed remotely using a graphic interface. Controls can be configured to optimize ventilation and outside air intake by adjusting economizer position, damper function, and fan speed. Existing chilled and hot water distribution system controls are typically tied in, including associated pumps and valves. Coordinated control of HVAC systems is dependent on a network of sensors and status points. A comprehensive building control system provides monitoring and control for all HVAC systems, so operators can adjust system programming for optimal comfort and energy savings.

It is recommended that an HVAC engineer or contractor who specializes in EMS be contacted for a detailed evaluation and implementation costs. A controls expert will be able to tell you to what extent an existing system can be refurbished or expanded, what sensors should be replaced, what additional HVAC systems could be controlled, and what monitoring and graphic capabilities can be added. For the purposes of this report, the potential energy savings and measure costs were estimated based on industry standards and previous project experience. Further analysis should be conducted for the feasibility of this measure. This is not an investment grade analysis, nor should be used as a basis for design and construction.

Window Replacements

Energy efficient windows are an important consideration when improving the building envelope. The heat transfer through the glass panes are responsible for a significant portion of the facility's heating and cooling energy consumption. We recommend replacing single-pane windows with double-pane windows, and we recommend models that are gas-filled with low-e coatings to reduce heat loss. Windows should be selected with low U-factors to maximize energy savings. The U-factor is the rate at which the window conducts non-solar heat flow and is a key indicator of performance. The lower the U-factor, the higher the efficiency of the window. Window frames and sashes should be efficient as well. If metal frames are specified or required by code, the frame extrusions should have a thermal break to reduce conduction through the frame. As part of the installation, the window frames should be properly sealed with caulk materials to ensure the mitigation of air infiltration. Building envelopes that limit air infiltration and that have adequate fenestrations play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort. Window system replacement is an expensive upgrade that generally involves architectural elements. We recommend this as a measure for further study.

5 ENERGY EFFICIENT BEST PRACTICES

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs.

Operation and maintenance (O&M) plans enhance the operational efficiency of HVAC and other energy intensive systems and could save 5% –20% of the energy usage in your building without substantial capital investment. A successful plan includes your records of energy usage trends and costs, building equipment lists, current maintenance practices, and planned capital upgrades, and it incorporates your ideas for improved building operation. Your plan will address goals for energy-efficient operation, provide detail on how to reach the goals, and outline procedures for measuring and reporting whether goals have been achieved.

You may already be doing some of these things—see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

Energy Tracking with ENERGY STAR® Portfolio Manager®

You've heard it before—you cannot manage what you do not measure. ENERGY STAR® Portfolio Manager® is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions[4] . Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Weatherization

Caulk or weather strip leaky doors and windows to reduce drafts and loss of heated or cooled air. Sealing cracks and openings can reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. Materials used may include caulk, polyurethane foam, and other weather-stripping materials. There is an energy savings opportunity by reducing the uncontrolled air exchange between the outside and inside of the building. Blower door assisted comprehensive building air sealing will reduce the amount of air exchange, which will in turn reduce the load on the buildings heating and cooling equipment, providing energy savings and increased occupant comfort.

Doors and Windows

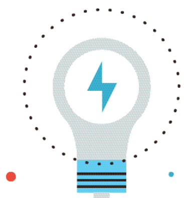
Close exterior doors and windows in heated and cooled areas. Leaving doors and windows open leads to a loss of heat during the winter and chilled air during the summer. Reducing air changes per hour can lead to increased occupant comfort as well as heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

[4] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager.

Window Treatments/Coverings

Use high-reflectivity films or cover windows with shades or shutters to reduce solar heat gain and reduce the load on cooling and heating systems. Older, single-pane windows and east- or west-facing windows are especially prone to solar heat gain. In addition, use shades or shutters at night during cold weather to reduce heat loss.

Lighting Maintenance



Clean lamps, reflectors and lenses of dirt, dust, oil, and smoke buildup every six to twelve months. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust. Together, this can reduce total light output by up to 60% while still drawing full power.

In addition to routine cleaning, developing a maintenance schedule can ensure that maintenance is performed regularly, and it can reduce the overall cost of fixture re-lamping and re-ballasting. Group re-lamping and re-ballasting maintains lighting levels and minimizes the number of site visits by a lighting technician or contractor, decreasing the overall cost of maintenance.

Lighting Controls

As part of a lighting maintenance schedule, test lighting controls to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight and photocell sensors, maintenance involves cleaning sensor lenses and confirming that setpoints and sensitivity are configured properly. Adjust exterior lighting time clock controls seasonally as needed to match your lighting requirements.

Motor Controls

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Whenever possible, use automatic devices such as twist timers or occupancy sensors to turn off motors when they are not needed.

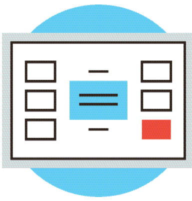
Motor Maintenance

Motors have many moving parts. As these parts degrade over time, the efficiency of the motor is reduced. Routine maintenance prevents damage to motor components. Routine maintenance should include 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.

Fans to Reduce Cooling Load

Install ceiling fans to supplement your cooling system. Thermostat settings can typically be increased by 4°F with no change in overall occupant comfort due to the wind chill effect of moving air.

Thermostat Schedules and Temperature Resets



Use thermostat setback temperatures and schedules to reduce heating and cooling energy use during periods of low or no occupancy. Thermostats should be programmed for a setback of 5°F-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Economizer Maintenance

Economizers can significantly reduce cooling system load. A malfunctioning economizer can increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air. Common economizer malfunctions include broken outdoor thermostat or enthalpy control or dampers that are stuck or improperly adjusted.

Periodic inspection and maintenance will keep economizers working in sync with the heating and cooling system. This maintenance should be part of annual system maintenance, and it should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position.

Chiller Maintenance

Service chillers regularly to keep them operating properly. Chillers are responsible for a substantial portion of a commercial building's overall energy usage, and when they do not work well, there is usually a noticeable increase in energy bills and increased occupant complaints. Regular diagnostics and service can save 5% to 10% of the cost of operating your chiller. If you already have a maintenance contract in place, your existing service company should be able to provide these services.

AC System Evaporator/Condenser Coil Cleaning

Dirty evaporator and condenser coils restrict air flow and restrict heat transfer. This increases the loads on the evaporator and condenser fan and decreases overall cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

HVAC Filter Cleaning and Replacement

Air filters should be checked regularly (often monthly) and cleaned or replaced when appropriate. Air filters reduce indoor air pollution, increase occupant comfort, and help keep equipment operating efficiently. If the building has a building management system, consider installing a differential pressure switch across filters to send an alarm about premature fouling or overdue filter replacement. Over time, filters become less and less effective as particulate buildup increases. Dirty filters also restrict air flow through the air conditioning or heat pump system, which increases the load on the distribution fans.

Ductwork Maintenance

Duct maintenance has two primary goals: keep the ducts clean to avoid air quality problems and seal leaks to save energy. Check for cleanliness, obstructions that block airflow, water damage, and leaks. Ducts should be inspected at least every two years.

The biggest symptoms of clogged air ducts are differing temperatures throughout the building and areas with limited airflow from supply registers. If a particular air duct is clogged, then air flow will only be cut off to some rooms in the building—not all of them. The reduced airflow will make it more difficult for those areas to reach the temperature setpoint, which will cause the HVAC system to run longer to cool or heat that area properly. If you suspect clogged air ducts, ensure that all areas in front of supply registers are clear of items that may block or restrict air flow, and you should check for fire dampers or balancing dampers that have failed closed.

Duct leakage in commercial buildings can account for 5%–25% of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building wasting conditioned air. Check ductwork for leakage. Eliminating duct leaks can improve ventilation system performance and reduce heating and cooling system operation.

Distribution system losses are dependent on-air system temperature, the size of the distribution system, and the level of insulation of the ductwork. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is missing or worn, the system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely and efficiently. Boilers should be cleaned according to the manufacturer's instructions to remove soot and scale from the boiler tubes to improve heat transfer.

Furnace Maintenance

Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should check for gas / carbon monoxide leaks; change the air and fuel filters; check components for cracks, corrosion, dirt, or debris build-up; ensure the ignition system is working properly; test and adjust operation and safety controls; inspect electrical connections; and lubricate motors and bearings.

Label HVAC Equipment

For improved coordination in maintenance practices, we recommend labeling or re-labeling the site HVAC equipment. Maintain continuity in labeling by following labeling conventions as indicated in the facility drawings or EMS building equipment list. Use weatherproof or heatproof labeling or stickers for permanence, but do not cover over original equipment nameplates, which should be kept clean and readable whenever possible. Besides equipment, label piping for service and direction of flow when possible. Ideally, maintain a log of HVAC equipment, including nameplate information, asset tag designation, areas served, installation year, service dates, and other pertinent information.

This investment in your equipment will enhance collaboration and communication between your staff and your contracted service providers and may help you with regulatory compliance.

Optimize HVAC Equipment Schedules

Energy management systems (EMS) typically provide advanced controls for building HVAC systems, including chillers, boilers, air handling units, rooftop units and exhaust fans. The EMS monitors and reports operational status, schedules equipment start and stop times, locks out equipment operation based on outside air or space temperature, and often optimizes damper and valve operation based on complex algorithms. These EMS features, when in proper adjustment, can improve comfort for building occupants and save substantial energy.

Know your EMS scheduling capabilities. Regularly monitor HVAC equipment operating schedules and match them to building operating hours in order to eliminate unnecessary equipment operation and save energy. Monitoring should be performed often at sites with frequently changing usage patterns – daily in some cases. We recommend using the *optimal start* feature of the EMS (if available) to optimize the building warmup sequence. Most EMS scheduling programs provide for holiday schedules, which can be used during reduced use or shutdown periods. Finally, many systems are equipped with a one-time override function, which can be used to provide additional space conditioning due to a one-time, special event. When available this override feature should be used rather than changing the base operating schedule.

Water Heater Maintenance

The lower the supply water temperature that is used for hand washing sinks, the less energy is needed to heat the water. Reducing the temperature results in energy savings and the change is often unnoticeable to users. Be sure to review the domestic water temperature requirements for sterilizers and dishwashers as you investigate reducing the supply water temperature.

Also, preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. At least once a year, follow manufacturer instructions to 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. Annual checks should include checks for:

- Leaks or heavy corrosion on the pipes and valves.
- 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 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 more than three years old, have a technician inspect the sacrificial anode annually.

Refrigeration Equipment Maintenance

Preventative maintenance keeps commercial refrigeration equipment running reliably and efficiently. Commercial refrigerators and freezers are mission-critical equipment that can cost a fortune when they go down. Even when they appear to be working properly, refrigeration units can be consuming too much energy. Have walk-in refrigeration and freezer and other commercial systems serviced at least annually. This practice will allow systems to perform to their highest capabilities and will help identify system issues if they exist.

Maintaining your commercial refrigeration equipment can save between 5% and 10% on energy costs. When condenser coils are dirty, your commercial refrigerators and freezers work harder to maintain the temperature inside. Worn gaskets, hinges, door handles or faulty seals cause cold air to leak from the unit, forcing the unit to run longer and use more electricity.

Regular cleaning and maintenance also help your commercial refrigeration equipment to last longer.

Water Conservation

Installing dual flush or low-flow toilets and low-flow/waterless urinals are ways to reduce water use. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and for flush valve toilets is 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

For more information regarding water conservation go to the EPA's WaterSense™ website[5] or download a copy of EPA's "WaterSense™ at Work: Best Management Practices for Commercial and Institutional Facilities"[6] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Water conservation devices that do not reduce hot water consumption will not provide energy savings at the site level, but they may significantly affect your water and sewer usage costs. 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.

If the facility has detached buildings with a master water meter for the entire campus, check for unnatural wet areas in the lawn or water seeping in the foundation at water pipe penetrations through the foundation. Periodically check overnight meter readings when the facility is unoccupied, and there is no other scheduled water usage.

Manage irrigation systems to use water more effectively outside the building. Adjust spray patterns so that water lands on intended lawns and plantings and not on pavement and walls. Consider installing an evapotranspiration irrigation controller that will prevent over-watering.

[5] https://www.epa.gov/watersense.

[6] https://www.epa.gov/watersense/watersense-work-0.

Procurement Strategies

Purchasing efficient products reduces energy costs without compromising quality. Consider modifying your procurement policies and language to require ENERGY STAR® or WaterSense™ products where available.

6 On-site Generation

You don't have to look far in New Jersey to see one of the thousands of solar electric systems providing clean power to homes, businesses, schools, and government buildings. On-site generation includes both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) technologies that generate power to meet all or a portion of the facility's electric energy needs. Also referred to as distributed generation, these systems contribute to greenhouse gas (GHG) emission reductions, demand reductions, and reduced customer electricity purchases, which results in improved electric grid reliability through better use of transmission and distribution systems.

Preliminary screenings were performed to determine if an on-site generation measure could be a cost-effective solution for your facility. Before deciding to install an on-site generation system, we recommend conducting a feasibility study to analyze 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.

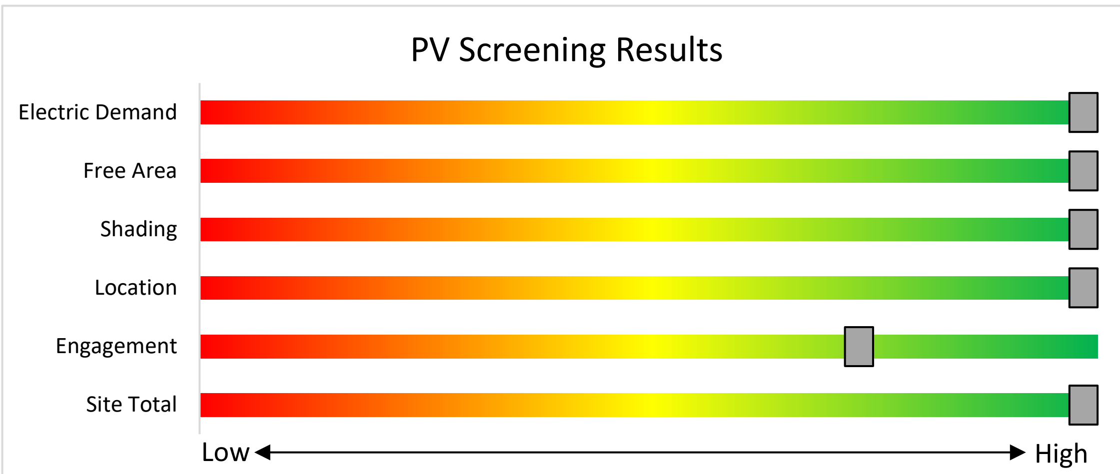
6.1 Solar Photovoltaic

Photovoltaic (PV) panels convert sunlight into electricity. Individual panels are combined into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is then connected to the building's electrical distribution system.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has high potential for installing an additional PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential. An additional PV array located on the roof may be feasible. If you are interested in pursuing the installation of PV, we recommend conducting a full feasibility study.

The graphic below displays the results of the PV potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.



Potential	High	
System Potential	322	kW DC STC
Electric Generation	383,621	kWh/yr
Displaced Cost	$40,220	/yr
Installed Cost	$837,200	

Figure 8 - Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available for solar projects. Solar projects may qualify to earn SREC- IIs (Solar Renewable Energy Certificates-II), however, the project owners *must* register their solar projects prior to the start of construction to establish the project's eligibility.

Get more information about solar power in New Jersey or find a qualified solar installer who can help you decide if solar is right for your building:

Successor Solar Incentive Program (SuSI): https://www.njcleanenergy.com/renewable-energy/programs/susi-program

- **Basic Info on Solar PV in NJ**: www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs.
- **Approved Solar Installers in the NJ Market**: 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) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for space cooling.

The key criteria used for screening is the amount of time that the CHP system would operate at full load and the facility's ability to use the recovered heat. Facilities with a continuous need 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 no potential for installing a cost-effective CHP system.

Based on a preliminary analysis, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation. The lack of gas service, low or infrequent thermal load, and lack of space for siting the equipment are the most significant factors contributing to the lack of CHP potential.

The graphic below displays the results of the CHP potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.

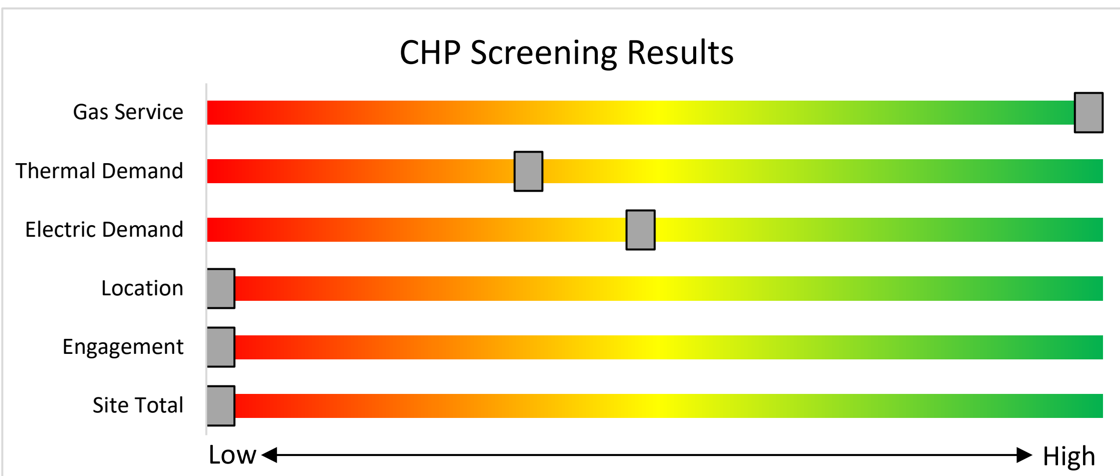


Figure 9 - Combined Heat and Power Screening

Find a qualified firm that specializes in commercial CHP cost assessment and installation: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

7 Project Funding and Incentives

Ready to improve your building's performance? Your utility provider may be able to help.

7.1 Utility Energy Efficiency Programs

The Clean Energy Act, signed into law by Governor Murphy in 2018, requires New Jersey's investor-owned gas and electric utilities to reduce their customers' use by set percentages over time. To help reach these targets the New Jersey Board of Public Utilities approved a comprehensive suite of energy efficiency programs to be run by the utility companies.

These new utility programs are rolling out in the spring and summer of 2021. Keep up to date with developments by visiting:

https://www.njcleanenergy.com/transition

8 New Jersey's Clean Energy Programs

New Jersey's Clean Energy Program will continue to offer some energy efficiency programs.

8.1 Large Energy Users

The Large Energy Users Program (LEUP) is designed to foster self-directed investment in energy projects. This program is offered to New Jersey's largest energy customers that annually contribute at least $200,000 to the NJCEP aggregate of all buildings/sites. This equates to roughly $5 million in energy costs in the prior fiscal year.

Incentives

Incentives are based on the specifications below. The maximum incentive per entity is the lesser of:

- $4 million
- 75% of the total project(s) cost
- 90% of total NJCEP fund contribution in previous year
- $0.33 per projected kWh saved; $3.75 per projected Therm saved annually

How to Participate

To participate in LEUP, you will first need submit an enrollment application. This program requires all qualified and approved applicants to submit an energy plan that outlines the proposed energy efficiency work for review and approval. Applicants may submit a Draft Energy Efficiency Plan (DEEP), or a Final Energy Efficiency Plan (FEEP). Once the FEEP is approved, the proposed work can begin.

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

8.2 Combined Heat and Power

The Combined Heat & Power (CHP) program provides incentives for eligible CHP or waste heat to power (WHP) projects. Eligible CHP or WHP projects must achieve an annual system efficiency of at least 65% (lower heating value, or LHV), based on total energy input and total utilized energy output. Mechanical energy may be included in the efficiency evaluation.

Incentives

Eligible Technologies	Size (Installed Rated Capacity)[1]	Incentive ($/kW)	% of Total Cost Cap per Project[3]	$ Cap per Project[3]
Powered by non-renewable or renewable fuel source[4]	≤500 kW	$2,000	30-40%[2]	$2 million
Gas Internal Combustion Engine	>500 kW - 1 MW	$1,000		
Gas Combustion Turbine	> 1 MW - 3 MW	$550	30%	$3 million
Microturbine	>3 MW	$350		
Fuel Cells with Heat Recovery				
Waste Heat to Power*	<1 MW	$1,000	30%	$2 million
	> 1MW	$500		$3 million

*Waste Heat to Power: Powered by non-renewable fuel source, heat recovery or other mechanical recovery from existing equipment utilizing new electric generation equipment (e.g. steam turbine).

Check the NJCEP website for details on program availability, current incentive levels, and requirements.

How to Participate

You will work with a qualified developer or consulting firm to complete the CHP application. Once the application is approved the project can be installed. Information about the CHP program can be found at www.njcleanenergy.com/CHP.

8.3 Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The program is used to register and certify solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects *must* register their projects prior to the start of construction to establish the project's eligibility to earn SREC-IIs (Solar Renewable Energy Certificates-II). SuSI consists of two sub-programs. The Administratively Determined Incentive (ADI) Program and the Competitive Solar Incentive (CSI) Program.

Administratively Determined Incentive (ADI) Program

The ADI Program provides administratively set incentives for net metered residential projects, net metered non-residential projects 5 MW or less, and all community solar projects.

After the registration is accepted, construction is complete, and a complete final as-built packet has been submitted, the project is issued a New Jersey certification number, which enables it to generate New Jersey SREC- IIs.

Market Segments	Size MW dc	Incentive Value ($/SREC II)	Public Entities Incentive Value - $20 Adder ($/SRECII)
Net Metered Residential	All types and sizes	$90	N/A
Small Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects smaller than 1 MW	$100	$120
Large Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects 1 MW to 5 MW	$90	$110
Small Net Metered Non-Residential Ground Mount	Projects smaller than 1 MW	$85	$105
Large Net Metered Non-Residential Ground Mount	Projects 1 MW to 5 MW	$80	$100
LMI Community Solar	Up to 5 MW	$90	N/A
Non-LMI Community Solar	Up to 5 MW	$70	N/A
Interim Subsection (t)	All types and sizes	$100	N/A

Eligible projects may generate SREC-IIs for 15 years following the commencement of commercial operations which is defined as permission to operate (PTO) from the Electric Distribution Company. After 15 years, projects may be eligible for a NJ Class I REC.

SREC-IIs will be purchased monthly by the SREC-II Program Administrator who will allocate the SREC-IIs to the Load Serving Entities (BGS Providers and Third-Party Suppliers) annually based on their market share of retail electricity sold during the relevant Energy Year.

The ADI Program online portal is now open to new registrations effective August 28, 2021.

Competitive Solar Incentive Program

The Competitive Solar Incentive (CSI) Program will provide competitively set incentives for grid supply projects and net metered non-residential projects greater than 5MW. The program is currently under development with the goal of holding the first solicitation by early-to-mid 2022. For updates, please continue to check the Solar Proceedings page on the New Jersey's Clean Energy Program website.

Solar projects help the State of New Jersey reach renewable energy goals outlined in the state's Energy Master Plan.

If you are considering installing solar photovoltaics on your building, visit the following link for more information: https://njcleanenergy.com/renewable-energy/programs/susi-program.

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. An ESIP is a type of performance contract, whereby school districts, counties, municipalities, housing authorities, and other public and state entities enter into contracts to help finance building energy upgrades. Annual payments are lower than the savings projected from the energy conservation measures (ECMs), ensuring that ESIP projects are cash flow positive for the life of the contract.

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 described above can also be used to help further reduce the total project cost of eligible measures.

How to Participate

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 used 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 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. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program descriptions and application can be found at www.njcleanenergy.com/ESIP.

ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you can use NJCEP incentive programs to help further reduce costs when developing the energy savings plan. Refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 Project Development

Energy conservation measures (ECMs) have been identified for your site, and their energy and economic analyses are provided within this LGEA report. Note that some of the identified projects may be mutually exclusive, such as replacing equipment versus upgrading motors or controls. The next steps with project development are to set goals and create a comprehensive project plan. The graphic below provides an overview of the process flow for a typical energy efficiency or renewable energy project. We recommend implementing as many ECMs as possible prior to undertaking a feasibility study for a renewable project. The cyclical nature of this process flow demonstrates the ongoing work required to continually improve building energy efficiency over time. If your building(s) scope of work is relatively simple to implement or small in scope, the measurement and verification (M&V) step may not be required. It should be noted through a typical project cycle, there will be changes in costs based on specific scopes of work, contractor selections, design considerations, construction, etc. The estimated costs provided throughout this LGEA report demonstrate the unburdened turn-key material and labor cost only. There will be contingencies and additional costs at the time of implementation. We recommend comprehensive project planning that includes the review of multiple bids for project work, incorporates potential operations and maintenance (O&M) cost savings, and maximizes your incentive potential.

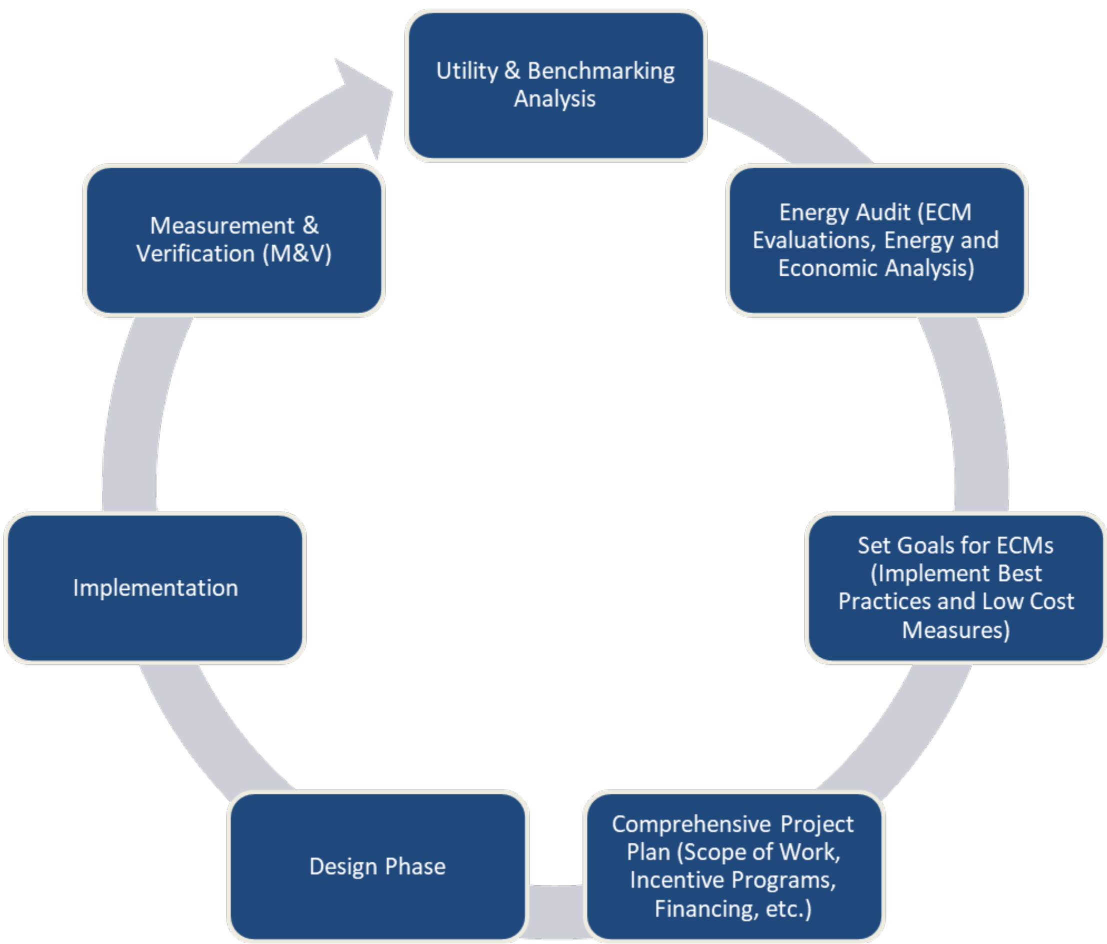


Figure 10 – Project Development Cycle

10 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

10.1 Retail Electric Supply Options

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. 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 already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party electric suppliers is available at the NJBPU website[7].

10.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market based and fluctuate monthly. The utility provides basic gas supply service 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 typically depends on whether a customer prefers 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 does not already purchase natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility already purchases natural gas from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party natural gas suppliers is available at the NJBPU website[8].

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[7] www.state.nj.us/bpu/commercial/shopping.html.

[8] 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	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Auditorium	6	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	6	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,140	0.1	484	0	$50	$345	$41	6.1
Auditorium	4	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	4	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,140	0.0	323	0	$33	$320	$39	8.4
Auditorium	9	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	4,550	3, 4	Relamp	Yes	9	LED Lamps: A19 Lamps	Occupancy Sensor	9	3,140	0.3	2,423	-1	$251	$425	$44	1.5
Auditorium	7	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Auditorium	6	Halogen Incandescent: (1) 40W PAR30 Screw-In Lamp	Wall Switch	S	40	4,550	3, 4	Relamp	Yes	6	LED Lamps: PAR30 Lamps	Occupancy Sensor	6	3,140	0.2	1,077	0	$111	$409	$53	3.2
Auditorium	39	Halogen Incandescent: (1) 40W PAR30 Screw-In Lamp	Wall Switch	S	40	4,550	3, 4	Relamp	Yes	39	LED Lamps: PAR30 Lamps	Occupancy Sensor	6	3,140	1.0	7,000	-1	$724	$1,716	$222	2.1
Auditorium	1	LED Lamps: (1) 12W A19 Screw-In Lamp	Wall Switch	S	12	4,550		None	No	1	LED Lamps: (1) 12W A19 Screw-In Lamp	Wall Switch	12	4,550	0.0	0	0	$0	$0	$0	0.0
Cafeteria	18	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	4,550	3, 4	Relamp	Yes	18	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	45	3,140	0.4	2,968	-1	$307	$990	$106	2.9
Cafeteria	1	Compact Fluorescent: (1) 23W Spiral Plug-In Lamp	Wall Switch	S	23	4,550	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	17	4,550	0.0	30	0	$3	$17	$1	5.2
Cafeteria	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Cafeteria	60	U-Bend Fluorescent - T12: U T12 (40W) - 2L	Wall Switch	S	88	4,550	3, 4	Relamp	Yes	60	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,140	2.8	19,589	-4	$2,026	$5,428	$740	2.3
Cafeteria	14	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	4,550	2, 4	Relamp & Reballast	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,140	0.7	4,764	-1	$493	$1,233	$175	2.1
Cafeteria	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,140	0.3	2,102	0	$217	$635	$135	2.3
Classroom - Band	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom - Band	50	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	3,413	3, 4	Relamp	Yes	50	LED - Linear Tubes: (2) 4' T5 (14.5W) Lamps	Occupancy Sensor	30	2,355	1.4	7,376	-2	$763	$3,934	$640	4.3
Classroom - Band	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,413	0.0	124	0	$13	$37	$10	2.1
Classroom - Band	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.3	1,419	0	$147	$599	$125	3.2
Classroom - Between Science Classes #1	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.2	946	0	$98	$489	$95	4.0
Classroom - Between Science Classes #2	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.3	1,419	0	$147	$599	$125	3.2
Classroom - Child Study 134	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.7	3,546	-1	$367	$1,092	$260	2.3
Classroom - Music 133	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom - Music 133	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.1	315	0	$33	$73	$20	1.6
Classroom - Music 133	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.3	1,419	0	$147	$599	$125	3.2
Classroom - Music 133	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.9	4,729	-1	$489	$1,635	$370	2.6
Classroom - Orchestra Room	15	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	3,413	3, 4	Relamp	Yes	15	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	2,355	0.3	1,490	0	$154	$645	$65	3.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom - Orchestra Room	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom - Orchestra Room	17	Linear Fluorescent - T5: 2' T5 (14W) - 2L	Wall Switch	S	34	3,413	3, 4	Relamp	Yes	17	LED - Linear Tubes: (2) 2' T5 (8W) Lamps	Occupancy Sensor	17	2,355	0.3	1,421	0	$147	$1,446	$172	8.7
Classroom 103	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,837	-1	$293	$927	$215	2.4
Classroom 104	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 104	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 105	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 105	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,522	-1	$261	$1,124	$230	3.4
Classroom 106	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 106	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 107	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.6	3,152	-1	$326	$1,270	$270	3.1
Classroom 108	22	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	22	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.7	3,468	-1	$359	$1,343	$290	2.9
Classroom 110	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 111	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.4	2,049	0	$212	$745	$165	2.7
Classroom 112	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.7	3,783	-1	$391	$1,416	$310	2.8
Classroom 113	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,837	-1	$293	$927	$215	2.4
Classroom 114	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,837	-1	$293	$927	$215	2.4
Classroom 115	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 116	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 118	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 119	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 120	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 122	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 123	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 125	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 129	27	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	3,413	3, 4	Relamp	Yes	27	LED Lamps: A19 Lamps	Occupancy Sensor	9	2,355	1.0	5,452	-1	$564	$1,005	$97	1.6

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 129	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.4	1,891	0	$196	$708	$155	2.8
Classroom 135 - Home Economics	4	Halogen Incandescent: (1) 50W PAR16 Screw-In Lamp	Wall Switch	S	50	3,413	3, 4	Relamp	Yes	4	LED Lamps: PAR16 Lamps	Occupancy Sensor	8	2,355	0.1	668	0	$69	$355	$43	4.5
Classroom 135 - Home Economics	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.8	4,098	-1	$424	$1,489	$330	2.7
Classroom 137	1	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	3,413	3	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	45	3,413	0.0	71	0	$7	$25	$2	3.1
Classroom 137	1	Compact Fluorescent: (2) 23W Spiral Plug-In Lamps	Wall Switch	S	46	3,413	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	33	3,413	0.0	49	0	$5	$34	$2	6.4
Classroom 137	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,837	-1	$293	$927	$215	2.4
Classroom 138 - Tiger Den	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 138 - Tiger Den	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	28	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.8	4,413	-1	$456	$1,562	$350	2.7
Classroom 139	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,837	-1	$293	$927	$215	2.4
Classroom 140	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,837	-1	$293	$927	$215	2.4
Classroom 141	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,837	-1	$293	$927	$215	2.4
Classroom 142	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,837	-1	$293	$927	$215	2.4
Classroom 143	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 143	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.8	4,256	-1	$440	$1,526	$340	2.7
Classroom 143a	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.2	1,182	0	$122	$544	$110	3.5
Classroom 144	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 144	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.9	4,729	-1	$489	$1,635	$370	2.6
Classroom 145	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 145	28	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	28	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	1.3	6,620	-1	$685	$2,074	$490	2.3
Classroom 146	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 146	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	19	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.9	4,492	-1	$465	$1,581	$355	2.6
Classroom 146a	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.1	473	0	$49	$226	$50	3.6
Classroom 146b	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,413	0.0	124	0	$13	$37	$10	2.1
Classroom 146b	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.1	709	0	$73	$434	$80	4.8
Classroom 147	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 147	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	19	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.9	4,492	-1	$465	$1,581	$355	2.6
Classroom 148	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 148	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	19	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.9	4,492	-1	$465	$1,581	$355	2.6
Classroom 148a	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.1	473	0	$49	$226	$50	3.6
Classroom 148b	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,413	0.0	124	0	$13	$37	$10	2.1
Classroom 148b	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.1	709	0	$73	$434	$80	4.8
Classroom 149	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 149	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	19	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.9	4,492	-1	$465	$1,581	$355	2.6
Classroom 149	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 149	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	19	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.9	4,492	-1	$465	$1,581	$355	2.6
Corridor - 1st Floor New Wing	38	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	4,550	3, 5	Relamp	Yes	38	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	45	3,140	0.9	6,267	-1	$648	$2,525	$1,406	1.7
Corridor - 1st Floor New Wing	9	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	9	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor - 1st Floor Old Wing	158	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	4,550	3, 5	Relamp	Yes	158	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	45	3,140	3.7	26,057	-5	$2,694	$10,025	$5,846	1.6
Corridor - 1st Floor Old Wing	15	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	15	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor - 1st Floor Old Wing	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,550	3, 5	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	3,140	0.1	946	0	$98	$389	$150	2.4
Corridor - Hall	1	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	4,550	3	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	45	4,550	0.0	95	0	$10	$25	$2	2.3
Corridor - Mimeograph Area	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 5	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,140	0.2	1,261	0	$130	$444	$270	1.3
Elevator	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	3,140	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.0	60	0	$6	$18	$5	2.1
Gymnasium - Auxiliary	4	Compact Fluorescent: (3) 32W Biaxial Plug-In Lamps	Wall Switch	S	96	4,550	3, 4	Relamp	Yes	4	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	68	3,140	0.1	983	0	$102	$420	$47	3.7
Gymnasium - Auxiliary	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Gymnasium - Auxiliary	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.1	440	0	$46	$343	$55	6.3
Gymnasium - Auxiliary	8	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	4,550	1, 4	Fixture Replacement	Yes	8	LED - Fixtures: High-Bay	Occupancy Sensor	120	3,140	2.2	15,023	-3	$1,554	$5,700	$680	3.2
Gymnasium - Fitness room	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Gymnasium - Fitness room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,140	0.2	1,261	0	$130	$489	$95	3.0
Gymnasium - Fitness room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,140	0.1	420	0	$43	$189	$40	3.4

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Gymnasium - Fitness room	9	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	4,550	1, 4	Fixture Replacement	Yes	9	LED - Fixtures: High-Bay	Occupancy Sensor	120	3,140	2.4	16,901	-4	$1,748	$6,192	$730	3.1
Gymnasium - Main	8	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	8	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Gymnasium - Main	7	LED - Fixtures: High-Bay	Wall Switch	S	120	4,550	4	None	Yes	7	LED - Fixtures: High-Bay	Occupancy Sensor	120	3,140	0.2	1,303	0	$135	$220	$35	1.4
Gymnasium - Main	41	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	4,550	1, 4	Fixture Replacement	Yes	41	LED - Fixtures: High-Bay	Occupancy Sensor	120	3,140	11.1	76,993	-16	$7,962	$29,212	$3,485	3.2
Gymnasium - New	12	Compact Fluorescent: (8) 14W A19 Screw-In Lamps	Wall Switch	S	112	4,550	3, 4	Relamp	Yes	12	LED Lamps: A19 Lamps	Occupancy Sensor	79	3,140	0.5	3,453	-1	$357	$1,924	$131	5.0
Gymnasium - New	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Gymnasium - New	7	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	4,550	2, 4	Relamp & Reballast	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,140	0.3	2,382	0	$246	$751	$105	2.6
Library	2	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	3,413	3, 4	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	45	2,355	0.0	247	0	$26	$50	$4	1.8
Library	1	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	3,413	3	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	45	3,413	0.0	71	0	$7	$25	$2	3.1
Library	7	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Library	22	LED - Fixtures: Ambient - 4' - Direct/Indirect Fixture	Wall Switch	S	22	4,550	4	None	Yes	22	LED - Fixtures: Ambient - 4' - Direct/Indirect Fixture	Occupancy Sensor	22	3,140	0.1	751	0	$78	$540	$70	6.1
Library	10	LED Lamps: (1) 40W MR16 Plug-In Lamp	Wall Switch	S	40	4,550	4	None	Yes	10	LED Lamps: (1) 40W MR16 Plug-In Lamp	Occupancy Sensor	40	3,140	0.1	621	0	$64	$270	$35	3.7
Library	6	LED Lamps: (1) 40W MR16 Plug-In Lamp	Wall Switch	S	40	4,550	4	None	Yes	6	LED Lamps: (1) 40W MR16 Plug-In Lamp	Occupancy Sensor	40	3,140	0.1	372	0	$39	$270	$35	6.1
Library	31	Linear Fluorescent - T12: 2' T12 (20W) - 2L	Wall Switch	S	50	4,550	2, 4	Relamp & Reballast	Yes	31	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,140	0.9	5,938	-1	$614	$2,818	$291	4.1
Library	50	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	4,550	2, 4	Relamp & Reballast	Yes	50	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	3,140	3.9	27,107	-6	$2,803	$7,515	$1,140	2.3
Library	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.1	315	0	$33	$189	$40	4.6
Library	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.1	473	0	$49	$380	$65	6.4
Library	36	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	36	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	1.1	5,674	-1	$587	$2,125	$465	2.8
Library	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	1.0	4,965	-1	$513	$1,690	$385	2.5
Lobby - Entrance	19	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	4,550	3, 5	Relamp	Yes	19	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	45	3,140	0.5	3,133	-1	$324	$1,375	$703	2.1
Lobby - Entrance	2	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	4,550	3, 5	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	37	3,140	0.0	265	0	$27	$275	$74	7.3
Lobby - Entrance	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Lobby - Entrance	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 5	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,140	0.5	3,363	-1	$348	$1,259	$720	1.6
Locker Room - Boys	1	Compact Fluorescent: (1) 23W Spiral Plug-In Lamp	Wall Switch	S	23	4,550	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	17	4,550	0.0	30	0	$3	$17	$1	5.2

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Locker Room - Boys	82	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	82	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	1.3	9,027	-2	$933	$3,117	$620	2.7
Locker Room - Boys	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,140	0.1	841	0	$87	$416	$75	3.9
Locker Room - Girls	5	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	4,550	3, 4	Relamp	Yes	5	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	3,140	0.1	662	0	$68	$395	$45	5.1
Locker Room - Girls	1	Compact Fluorescent: (2) 23W Spiral Plug-In Lamps	Wall Switch	S	46	4,550	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	33	4,550	0.0	65	0	$7	$34	$2	4.8
Locker Room - Girls	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Locker Room - Girls	47	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	47	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.7	5,174	-1	$535	$1,938	$375	2.9
Locker Room - Girls	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,140	0.1	841	0	$87	$416	$75	3.9
Lounge - Teachers	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Lounge - Teachers	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 4	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,140	0.4	2,942	-1	$304	$781	$175	2.0
Mechanical - Boiler Room	2	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	32	780		None	No	2	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	32	780	0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler Room	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	780	3	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.3	396	0	$41	$511	$140	9.1
Mechanical - Elevator Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	30	0	$3	$37	$10	8.5
Office - 109	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.4	1,891	0	$196	$708	$155	2.8
Office - 111a	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.1	709	0	$73	$434	$80	4.8
Office - 114a	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.1	315	0	$33	$189	$40	4.6
Office - 114b	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.1	473	0	$49	$226	$50	3.6
Office - 117	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.3	1,419	0	$147	$599	$125	3.2
Office - 124	10	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,140	0.3	1,963	0	$203	$995	$135	4.2
Office - 136	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.3	1,419	0	$147	$599	$125	3.2
Office - 139a	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.4	1,891	0	$196	$708	$155	2.8
Office - Athletic Trainer	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,413	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,413	0.0	66	0	$7	$18	$5	2.0
Office - Athletic Trainer	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,837	-1	$293	$927	$215	2.4
Office - Business Conference	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.3	1,419	0	$147	$599	$125	3.2
Office - Data Processing	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,413	0.0	124	0	$13	$37	$10	2.1
Office - Guidance	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Office - Guidance	32	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	32	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	1.5	7,566	-2	$782	$2,563	$585	2.5
Office - Guidance	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,413	0.0	186	0	$19	$55	$15	2.1
Office - Maintenance	18	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,413	3, 4	Relamp	Yes	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,355	0.3	1,486	0	$154	$869	$160	4.6
Office - Nurse	4	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	3,413	3, 4	Relamp	Yes	4	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	45	2,355	0.1	495	0	$51	$370	$43	6.4
Office - Nurse	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,413	0.0	124	0	$13	$37	$10	2.1
Office - Nurse	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,364	0	$244	$818	$185	2.6
Office - Pit	22	Halogen Incandescent: (1) 32W PAR20 Screw-In Lamp	Wall Switch	S	32	3,413	3, 4	Relamp	Yes	22	LED Lamps: PAR20 Lamps	Occupancy Sensor	5	2,355	0.5	2,358	0	$244	$1,024	$114	3.7
Office - Pit	3	Halogen Incandescent: (1) 32W PAR30 Screw-In Lamp	Wall Switch	S	32	3,413	3, 4	Relamp	Yes	3	LED Lamps: PAR30 Lamps	Occupancy Sensor	5	2,355	0.1	322	0	$33	$340	$44	8.9
Office - Pit	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,413	3, 4	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,355	1.1	5,554	-1	$574	$2,001	$470	2.7
Office - Principal/Main/ Athletic Director	30	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	3,413	3, 4	Relamp	Yes	30	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	45	2,355	0.7	3,711	-1	$384	$1,290	$130	3.0
Office - Principal/Main/ Athletic Director	1	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	3,413	3	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	45	3,413	0.0	71	0	$7	$25	$2	3.1
Office - Principal/Main/ Athletic Director	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,413	3, 4	Relamp	Yes	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,355	0.4	1,944	0	$201	$781	$175	3.0
Office - Projector room	1	Compact Fluorescent: (1) 23W Spiral Plug-In Lamp	Wall Switch	S	23	3,413	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	17	3,413	0.0	23	0	$2	$17	$1	7.0
Office - Student Support	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.1	709	0	$73	$434	$80	4.8
Office - Women Athletic	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.3	1,419	0	$147	$599	$125	3.2
Restroom - Female 1st Floor	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.1	550	0	$57	$361	$60	5.3
Restroom - Female Staff 1st Floor	1	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	4,550	3	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	45	4,550	0.0	95	0	$10	$25	$2	2.3
Restroom - Girls Near 115	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.1	550	0	$57	$361	$60	5.3
Restroom - Girls Near 119	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.1	550	0	$57	$361	$60	5.3
Restroom - Girls Near Cafeteria	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.1	550	0	$57	$361	$60	5.3
Restroom - Male 1st Floor	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.1	440	0	$46	$343	$55	6.3
Restroom - Male Near 115	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.1	440	0	$46	$343	$55	6.3
Restroom - Male Near 118	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.1	550	0	$57	$361	$60	5.3
Restroom - Staff Men #1	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,550	0.0	88	0	$9	$18	$5	1.5
Restroom - Staff Men #2	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	4,550	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,140	0.0	213	0	$22	$335	$47	13.1

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Restroom - Staff Men #3	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.0	220	0	$23	$307	$45	11.5
Restroom - Staff Women #1	1	Compact Fluorescent: (2) 23W Spiral Plug-In Lamps	Wall Switch	S	46	4,550	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	33	4,550	0.0	65	0	$7	$34	$2	4.8
Restroom - Staff Women #2	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	4,550	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	4,550	0.0	80	0	$8	$33	$6	3.2
Stair 1	3	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	4,550	2, 5	Relamp & Reballast	Yes	3	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	3,140	0.1	540	0	$56	$377	$120	4.6
Stair 2	7	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	4,550	2, 5	Relamp & Reballast	Yes	7	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	3,140	0.2	1,261	0	$130	$804	$280	4.0
Stair 4	7	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	S	46	4,550	2, 5	Relamp & Reballast	Yes	7	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	3,140	0.2	1,261	0	$130	$804	$280	4.0
Stair 5	8	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch		64	4,550	3, 5	Relamp	Yes	8	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	45	3,140	0.2	1,319	0	$136	$650	$296	2.6
Stair 5	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stair 5	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	4,550	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,550	0.0	165	0	$17	$37	$10	1.6
Storage Room 1st Floor	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	538	0.0	38	0	$4	$153	$10	36.5
Storage - 106	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	538	0.0	38	0	$4	$153	$10	36.5
Storage - 107	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	8.5
Storage - 121 Book Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3, 4	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	538	0.1	113	0	$12	$380	$30	29.9
Storage - Athletic	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	780	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.0	28	0	$3	$37	$10	9.1
Storage - Attendance Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	538	0.0	38	0	$4	$153	$10	36.5
Storage - Band Instruments	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	780	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	538	0.3	324	0	$34	$599	$90	15.2
Storage - Conference #1	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	780	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	538	0.3	324	0	$34	$599	$90	15.2
Storage - Conference #2	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	780	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	538	0.3	324	0	$34	$599	$90	15.2
Storage - Custodial	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	780	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	538	0.1	72	0	$7	$189	$20	22.7
Storage - Custodial Near Athletic Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	780	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.0	28	0	$3	$37	$10	9.1
Storage - Library	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	780	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	538	0.1	108	0	$11	$380	$30	31.3
Storage - Orchestra Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	780	3, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	538	0.2	180	0	$19	$453	$50	21.6
Vestibule - Entrance 3	1	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	4,550	3	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	45	4,550	0.0	95	0	$10	$25	$2	2.3
Vestibule - Entrance 3	12	Compact Fluorescent: (1) 23W Spiral Plug-In Lamp	Wall Switch	S	23	4,550	3, 4	Relamp	Yes	12	LED Lamps: A19 Lamps	Occupancy Sensor	17	3,140	0.1	677	0	$70	$477	$47	6.1
Vestibule - Front Entrance	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,140	0.1	841	0	$87	$416	$75	3.9

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 200	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,413	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,355	0.0	165	0	$17	$37	$10	1.6
Classroom 200	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.2	946	0	$98	$489	$95	4.0
Classroom 201	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,413	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,355	0.0	165	0	$17	$37	$10	1.6
Classroom 201	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.6	2,995	-1	$310	$1,234	$260	3.1
Classroom 202	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.6	3,152	-1	$326	$1,270	$270	3.1
Classroom 203	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,413	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,355	0.0	165	0	$17	$37	$10	1.6
Classroom 203	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.6	3,310	-1	$342	$1,307	$280	3.0
Classroom 205	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 206	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.6	3,074	-1	$318	$982	$230	2.4
Classroom 207	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,837	-1	$293	$927	$215	2.4
Classroom 208	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,837	-1	$293	$927	$215	2.4
Classroom 209	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.5	2,837	-1	$293	$927	$215	2.4
Classroom 210	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.4	1,891	0	$196	$708	$155	2.8
Classroom 211	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 212	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.4	1,891	0	$196	$708	$155	2.8
Classroom 213	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 214	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 215	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 216	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.2	1,261	0	$130	$562	$115	3.4
Classroom 217	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 218	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 219	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 220	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 221	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.4	1,891	0	$196	$708	$155	2.8
Classroom 222	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,837	-1	$293	$1,197	$250	3.2

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 225	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.4	1,891	0	$196	$708	$155	2.8
Classroom 226	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,680	-1	$277	$1,161	$240	3.3
Classroom 227	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 229	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,364	0	$244	$818	$185	2.6
Classroom 229	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.6	3,310	-1	$342	$1,307	$280	3.0
Classroom 230	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.6	3,310	-1	$342	$1,307	$280	3.0
Classroom 230	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,413	3, 4	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,355	0.5	2,837	-1	$293	$1,197	$250	3.2
Classroom 231	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,413	3, 4	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,355	0.8	4,256	-1	$440	$1,526	$340	2.7
Corridor - 2nd Floor New Wing	17	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	4,550	3, 5	Relamp	Yes	17	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	45	3,140	0.4	2,804	-1	$290	$1,100	$629	1.6
Corridor - 2nd Floor New Wing	8	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	8	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor - 2nd Floor Old Wing	16	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	4,550	3, 5	Relamp	Yes	16	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	45	3,140	0.4	2,639	-1	$273	$1,075	$592	1.8
Corridor - 2nd Floor Old Wing	10	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	10	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Janitorial Closet #1	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	8.5
Janitorial Closet #2	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	538	0.0	38	0	$4	$153	$30	31.4
Janitorial Closet 207a	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	780	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	538	0.1	72	0	$7	$189	$40	20.0
Janitorial Closet 208a	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	780	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	538	0.1	144	0	$15	$416	$75	22.9
Janitorial Closet 208b	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	780	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	780	0.0	15	0	$2	$18	$5	8.5
Office - 204	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,140	0.4	2,522	-1	$261	$708	$155	2.1
Office - 206a	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,550	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,140	0.1	946	0	$98	$434	$80	3.6
Office - 211b	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 4	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,140	0.6	4,203	-1	$435	$1,270	$270	2.3
Office - 224	112	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,550	3, 4	Relamp	Yes	112	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,140	3.4	23,538	-5	$2,434	$6,250	$1,400	2.0
Restroom - Female Staff 2nd Floor	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.1	440	0	$46	$343	$55	6.3
Restroom - Girls 2nd Floor	9	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3, 4	Relamp	Yes	9	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,140	0.1	991	0	$102	$434	$80	3.5
Restroom - Staff Men 2nd Floor	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,550	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,550	0.0	88	0	$9	$18	$5	1.5
Storage - Electric Panels	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	780	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	538	0.3	324	0	$34	$599	$90	15.2

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior - Front Canopy Lights	4	Compact Fluorescent: (1) 23W Spiral Plug-In Lamp	Photocell		23	4,380	3	Relamp	No	4	LED Lamps: A19 Lamps	Photocell	17	4,380	0.0	105	0	$11	$69	$4	5.9
Exterior - Front Wallpacks	1	Metal Halide: (1) 400W Lamp	Photocell		458	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	120	4,380	0.0	1,480	0	$155	$555	$50	3.3
Exterior - Left Wallpacks	1	Compact Fluorescent: (4) 32W Biaxial Plug-In Lamps	Photocell		128	4,380	3	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Photocell	90	4,380	0.0	166	0	$17	$50	$4	2.6
Exterior - Left Wallpacks	2	Compact Fluorescent: (1) 23W Spiral Plug-In Lamp	Photocell		23	4,380	3	Relamp	No	2	LED Lamps: A19 Lamps	Photocell	17	4,380	0.0	53	0	$6	$34	$2	5.9
Exterior - Left Wallpacks	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell		20	4,380		None	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	20	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior - Left Wallpacks	2	Mercury Vapor: (1) 100W Lamp	Photocell		125	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	30	4,380	0.0	832	0	$87	$525	$100	4.9
Exterior - Rear Wallpacks	12	Compact Fluorescent: (4) 32W Biaxial Plug-In Lamps	Photocell		128	4,380	3	Relamp	No	12	LED Lamps: GX23 (Plug-In) Lamps	Photocell	90	4,380	0.0	1,997	0	$209	$600	$48	2.6
Exterior - Rear Wallpacks	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell		20	4,380		None	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	20	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior - Rear Wallpacks	3	Metal Halide: (1) 150W Lamp	Photocell		190	4,380	1	Fixture Replacement	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	1,905	0	$200	$1,037	$150	4.4
Exterior - Right Canopy Lights	6	Incandescent: (1) 60W A19 Screw-In Lamp	Photocell		60	4,380	3	Relamp	No	6	LED Lamps: A19 Lamps	Photocell	9	4,380	0.0	1,340	0	$141	$103	$6	0.7
Exterior - Right Canopy Lights	2	LED - Fixtures: Downlight Surface Mount	Photocell		23	4,380		None	No	2	LED - Fixtures: Downlight Surface Mount	Photocell	23	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior - Right Wallpacks	13	Incandescent: (1) 60W A19 Screw-In Lamp	Photocell		60	4,380	3	Relamp	No	13	LED Lamps: A19 Lamps	Photocell	9	4,380	0.0	2,904	0	$304	$224	$13	0.7
Exterior - Right Wallpacks	8	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell		20	4,380		None	No	8	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	20	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior - Right Wallpacks	1	Metal Halide: (1) 150W Lamp	Photocell		190	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	635	0	$67	$346	$50	4.4

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?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Roof	MAUs 1 - 4	4	Supply Fan	3.0	82.5%	No	Modine		W	3,380	7	No	89.5%	Yes	4	3.9	15,690	0	$1,645	$15,536	$800	9.0
Roof	ERU-1 - Instrumental Music Room 127	1	Supply Fan	3.0	90.2%	No	AAON		B	3,380	7	No	90.2%	Yes	1	0.9	3,145	0	$330	$3,884	$200	11.2
Roof	ERU-1 - Instrumental Music Room 127	1	Exhaust Fan	2.0	84.0%	No	AAON		B	3,413	7	No	86.5%	Yes	1	0.6	2,391	0	$251	$3,261	$100	12.6
Roof	RTU-1 - 1st Floor VAVs 1-6	1	Supply Fan	3.0	84.0%	No	Lennox		W	3,380	6	No	89.5%	Yes	1	0.9	3,751	0	$393	$3,884	$200	9.4
Roof	RTU-2 - 1st Floor VAVs 7-13	1	Supply Fan	3.0	84.0%	No	Lennox		W	3,380	6	No	89.5%	Yes	1	0.9	3,751	0	$393	$3,884	$200	9.4
Roof	RTU-3 - Classroom 103	1	Supply Fan	1.5	84.0%	No	Lennox		W	3,380	7	No	86.5%	Yes	1	0.4	1,776	0	$186	$3,391	$75	17.8
Classrooms	Unit Ventilators	38	Fan Coil Unit	0.3	62.5%	No			W	3,413		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Gymnasium	Air Handling Units	3	Supply Fan	2.0	84.0%	No			W	3,380		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Gymnasium	Air Handling Units	3	Heating Hot Water Pump	1.0	82.5%	No			W	2,745		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	School Buildings	6	Exhaust Fan	0.5	75.0%	No			W	3,413		No	75.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	School Buildings	16	Exhaust Fan	0.3	62.5%	No			W	3,413		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	School Buildings	7	Exhaust Fan	0.3	65.0%	No			W	3,413		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	School Buildings	10	Exhaust Fan	0.2	60.0%	No			W	3,413		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	School Buildings	3	Exhaust Fan	1.0	82.5%	No			W	3,413		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	School Buildings	4	Exhaust Fan	1.5	84.0%	No			W	3,413	7	No	86.5%	Yes	4	1.9	7,174	0	$752	$13,562	$300	17.6
Roof	School Buildings	6	Exhaust Fan	2.0	84.0%	No			W	3,413	7	No	86.5%	Yes	6	3.7	14,347	0	$1,504	$19,566	$600	12.6
Roof	Auditorium & Hallways	4	Exhaust Fan	3.0	86.5%	No			W	3,413	7	No	89.5%	Yes	4	3.7	14,043	0	$1,472	$15,536	$800	10.0
Roof	Boiler Room & Auditorium	3	Exhaust Fan	5.0	87.5%	No			W	3,413	7	No	89.5%	Yes	3	4.6	17,024	0	$1,785	$12,229	$2,700	5.3
Roof	Kitchen	1	Kitchen Hood Exhaust Fan	5.0	87.5%	No			W	5,250	10	No	89.5%	Yes	1	0.1	12,571	39	$1,586	$4,076	$900	2.0
Roof	Kitchen	2	Kitchen Hood Exhaust Fan	3.0	86.5%	No			W	5,250	10	No	89.5%	Yes	2	0.1	15,140	39	$1,856	$7,768	$400	4.0

		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?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical - Boiler Room	Cafeteria - Dual Pump P1 (CHW & HHW)	1	Water Supply Pump	5.0	89.5%	No	Marathon		B	4,550	11	No	89.5%	Yes	1	0.5	7,111	0	$746	$4,076	$900	4.3
Mechanical - Boiler Room	2nd Floor Classrooms - Dual Pump P2 (CHW & HHW)	1	Water Supply Pump	7.5	89.5%	No	Dayton		B	4,550	11	No	91.7%	Yes	1	0.8	11,127	0	$1,167	$4,761	$1,000	3.2
Mechanical - Boiler Room	1st Floor Classrooms - Dual Pump P3 (CHW & HHW)	1	Water Supply Pump	7.5	89.5%	No	Baldor		B	4,550	11	No	91.0%	Yes	1	0.8	10,983	0	$1,151	$4,738	$1,000	3.2
Mechanical - Boiler Room	Classrooms 128 & 129 - Dual Pump P4 (CHW & HHW)	1	Water Supply Pump	2.0	86.5%	No	Dayton		W	4,550	11	No	86.5%	Yes	1	0.2	2,943	0	$309	$3,623	$100	11.4
Mechanical - Boiler Room	Auditorium - Dual Pump P5 (CHW & HHW)	1	Water Supply Pump	7.5	89.5%	No	Dayton		B	4,550	11	No	91.7%	Yes	1	0.8	11,127	0	$1,167	$4,761	$1,000	3.2
Mechanical - Boiler Room	ESL & Library - Dual Pump P6 (CHW & HHW)	1	Water Supply Pump	5.0	87.5%	No	Lincoln		B	4,550	11	No	89.5%	Yes	1	0.5	7,566	0	$793	$4,076	$900	4.0
Mechanical - Boiler Room	Rooms 120, 125, 135, Nurses Office, Main Office - Dual Pump P7 (CHW & HHW)	1	Water Supply Pump	7.5	89.5%	No	Dayton		B	4,550	11	No	91.7%	Yes	1	0.8	11,127	0	$1,167	$4,761	$1,000	3.2
Mechanical - Boiler Room	Music Room - Dual Pump P8 (CHW & HHW)	1	Water Supply Pump	5.0	87.5%	No	Lincoln		B	4,550	11	No	89.5%	Yes	1	0.5	7,566	0	$793	$4,076	$900	4.0
Mechanical - Boiler Room	Hallways, Gyms, Locker Rooms, Guidance Office	1	Heating Hot Water Pump	20.0	93.0%	No	Weg		W	2,745	9	No	93.0%	Yes	1	1.9	16,514	0	$1,731	$8,582	$1,300	4.2
Mechanical - Boiler Room	Cooling System - CSI, Room 133, Attendance Office	1	Chilled Water Pump	2.0	84.0%	No			W	3,391	8	No	86.5%	Yes	1	0.4	2,376	0	$249	$3,261	$100	12.7
Mechanical - Boiler Room	Heating System - New Wing	2	Heating Hot Water Pump	10.0	92.4%	No			B	2,745	9	No	92.4%	Yes	2	1.9	16,622	0	$1,743	$10,303	$2,200	4.6
Roof	Cooling Tower	1	Cooling Tower Fan	15.0	93.0%	Yes	BAC	XES3E-1020-06L	W	3,391		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler Room	Condenser Water	1	Condenser Water Pump	20.0	93.0%	No	Baldor		W	3,391	8	No	93.0%	Yes	1	3.7	20,401	0	$2,139	$8,582	$1,300	3.4
Gymnasiums	Basketball Hoop Motors	12	Other	0.2	60.0%	No			W	400		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Elevator Room	Elevator	1	Other	20.0	93.0%	No			W	400		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler Room	Boilers	4	Combustion Air Fan	5.0	89.5%	No	Aerco		W	2,745		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Classrooms	Classrooms - Airedale Units (ACs)	19	Fan Coil Unit	0.3	65.0%	No			W	3,413		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0

Packaged 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 (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Office - 124	Office - 124	1	Window AC	1.17		10.70		Friedrich	SS14L10-B	B	12	Yes	1	Window AC	1.17		12.00		0.1	142	0	$15	$763	$0	51.4
Roof	MAU 1 - Science Classroom 238	1	Forced Air Furnace		120.00		0.8 Et	Modine		B	15	Yes	1	Forced Air Furnace		120.00		0.97 AFUE	0.0	0	11	$72	$6,123	$500	77.9
Roof	MAU 2 - Science Classroom 236	1	Forced Air Furnace		120.00		0.8 Et	Modine		B	15	Yes	1	Forced Air Furnace		120.00		0.97 AFUE	0.0	0	11	$72	$6,123	$500	77.9
Roof	MAU 3 - Science Classroom 239	1	Forced Air Furnace		120.00		0.8 Et	Modine		B	15	Yes	1	Forced Air Furnace		120.00		0.97 AFUE	0.0	0	11	$72	$6,123	$500	77.9
Roof	MAU 4 - Science Classroom 237	1	Forced Air Furnace		120.00		0.8 Et	Modine		B	15	Yes	1	Forced Air Furnace		120.00		0.97 AFUE	0.0	0	11	$72	$6,123	$500	77.9
Roof	ERU-1 - Instrumental Music Room 127	1	Package Unit	8.00		11.00		AAON	RM-008	B	12	Yes	1	Package Unit	8.00		14.00		0.9	1,870	0	$196	$10,619	$632	50.9
Roof	RTU-1 - 1st Floor VAVs 1-6	1	Package Unit	8.50		11.00		Lennox	LCA102H2BN3G	B	12	Yes	1	Package Unit	8.50		14.00		1.0	1,987	0	$208	$11,029	$672	49.7
Roof	RTU-2 - 1st Floor VAVs 7-13	1	Package Unit	8.50		11.00		Lennox	LCA102H2BN3G	B	12	Yes	1	Package Unit	8.50		14.00		1.0	1,987	0	$208	$11,029	$672	49.7
Roof	RTU-3 - Classroom 103	1	Package Unit	4.00		11.00		Lennox	LCA048H2BN3G	B	12	Yes	1	Package Unit	4.00		16.00		0.7	1,364	0	$143	$7,418	$412	49.0
Roof	DSCU-2 - Classroom	1	Ductless Mini-Split HP	0.96	11.50	13.00	7.7 HSPF	Daikin	RXS12DVJU	B	13	Yes	1	Ductless Mini-Split HP	0.96	11.50	18.00	3.8 COP	0.4	755	0	$79	$5,193	$0	65.6
Elster Memorial Courtyard	School Building	1	Split-System	5.00		13.00		ICP	N4A360GHC300	W		No							0.0	0	0	$0	$0	$0	0.0
Elster Memorial Courtyard	School Building	1	Ductless Mini-Split AC	1.92		10.00		Fujitsu	AOU24C1	B	12	Yes	1	Ductless Mini-Split AC	1.92		18.00		0.5	1,022	0	$107	$5,537	$0	51.7
Roof	ACCU-8	1	Split-System	1.50		13.00		ICP	N2A318AKA100	B		No							0.0	0	0	$0	$0	$0	0.0
Roof	ACCU-9 - Storeroom	1	Split-System	1.50		13.00		ICP	N2A318AKA100	B		No							0.0	0	0	$0	$0	$0	0.0
Roof	TV Studio	1	Split-System	5.00		16.00		ICP	NXA660GKA100	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	ACCU-1 Study Hall	1	Split-System	3.00		13.00		ICP	N2A336AKA200	B		No							0.0	0	0	$0	$0	$0	0.0
Roof	ACCU-2 Study Hall	1	Split-System	3.00		13.00		ICP	N2A336AKA200	B		No							0.0	0	0	$0	$0	$0	0.0
Roof	ACCU-11 Offices	1	Split-System	2.00		13.00		ICP	N2A324AKA200	B		No							0.0	0	0	$0	$0	$0	0.0
Roof	Server / Data Room	1	Split-System	5.00		13.00		ICP	N4A360GHC300	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Server / Data Room	1	Ductless Mini-Split AC	2.00		10.00		Airedale		B	12	Yes	1	Ductless Mini-Split AC	2.00		18.00		0.5	1,067	0	$112	$5,642	$0	50.5

		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 (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	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	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Main Office	1	Ductless Mini-Split AC	2.00		10.00				B	12	Yes	1	Ductless Mini-Split AC	2.00		18.00		0.5	1,067	0	$112	$5,642	$0	50.5
Roof	ACCU-3 Study Hall	1	Split-System	3.00		13.00		ICP	N2A336AKA200	B		No							0.0	0	0	$0	$0	$0	0.0
Roof	ACCU-10 Offices	1	Split-System	1.50		13.00		ICP	N2A318AKA100	B		No							0.0	0	0	$0	$0	$0	0.0
Roof	DSCU-1 Offices	1	Ductless Mini-Split HP	0.96	11.50	13.00	7.7 HSPF	Daikin	RXS12DVJU	B	13	Yes	1	Ductless Mini-Split HP	0.96	11.50	18.00	3.8 COP	0.4	755	0	$79	$5,193	$0	65.6
Roof	ACCU-4 Band Office	1	Split-System	2.00		13.00		ICP	N2A324AKA200	B		No							0.0	0	0	$0	$0	$0	0.0
Roof	ACCU-5 Attendance Office	1	Split-System	2.00		13.00		ICP	N2A324AKA200	B		No							0.0	0	0	$0	$0	$0	0.0
Roof	ACCU-6 Nurses Office	1	Split-System	2.00		13.00		ICP	N2A324AKA200	B		No							0.0	0	0	$0	$0	$0	0.0
Roof	ACCU-7	1	Split-System	2.00		13.00		ICP	N2A324AKA200	B		No							0.0	0	0	$0	$0	$0	0.0

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)	Manufacturer	Model	Remaining Useful Life	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical - Boiler Room	Cooling System	1	Water-Cooled Screw Chiller	400.00	Trane	RTHD D1G2G2	B	14	Yes	1	Water-Cooled Screw Chiller	Variable	400.00	0.63	0.40	14.7	31,360	0	$3,288	$202,039	$14,800	56.9

Space Heating Boiler 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)	Manufacturer	Model	Remaining Useful Life	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical - Boiler Room	Heating System	4	Condensing Hot Water Boiler	4,700	Aerco	BMK5000	W		No						0.0	0	0	$0	$0	$0	0.0

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical - Boiler Room	Domestic Hot Water	16	6	2.00	0.0	0	5	$33	$43	$12	1.0

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical - Boiler Room	Domestic Hot Water	1	Storage Tank Water Heater (> 50 Gal)	Rheem	GP100-250A	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Tenafly High School	17	57	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	27	$186	$409	$204	1.1

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions				Proposed Conditions				Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Manufacturer	Model	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Cafeteria	1	Cooler (35F to 55F)	Bohn		18, 19	Yes	No	Yes	0.1	1,004	0	$105	$2,281	$155	20.2

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Cafeteria	1	Stand-Up Refrigerator, Glass Door (16 - 30 cu. ft.)			No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	True	T-49F	No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	Turbo Air	M3F47-2	No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	2	Stand-Up Freezer, Solid Door (>50 cu. ft.)	Traulsen	G22010	No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Traulsen	G20000	No		No	0.0	0	0	$0	$0	$0	0.0

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Cafeteria	1	Ice Making Head (<450 lbs/day), Batch	Manitowoc	IY0324A-161	No		No	0.0	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	Manufacturer	Model	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Cafeteria	1	Gas Rack Oven (Single)	Vulcan		No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Gas Fryer	Pitco		No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	2	Insulated Food Holding Cabinet (Full Size)	Metro		No		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Gas Convection Oven (Full Size)	Vulcan		Yes		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Gas Convection Oven (Half Size)	Turbofan		Yes		No	0.0	0	0	$0	$0	$0	0.0
Classroom 135 - Home Economics	3	Gas Rack Oven (Single)			No		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Tenafly High School	1	Clothes Dryer	1,800	Yes		
Tenafly High School	1	Clothes Washer	1,200	Yes		
Tenafly High School	8	Coffee Machine	800	No		
Tenafly High School	192	Desktop	270	No		
Tenafly High School	1	Dishwasher (Undercounter)	1,000	Yes		
Tenafly High School	2	Fan (Ceiling)	200	No		
Tenafly High School	21	Microwave	1,000	No		
Tenafly High School	33	Printer (Medium/Small)	450	No		
Tenafly High School	5	Printer/Copier (Large)	600	No		
Tenafly High School	2	Projector	240	No		
Tenafly High School	9	Refrigerator (Mini)	175	No		
Tenafly High School	6	Refrigerator (Residential)	340	No		
Tenafly High School	56	Smart Board	215	Yes		
Tenafly High School	121	Television	224	No		
Tenafly High School	1	Toaster	800	No		
Tenafly High School	1	Toaster Oven	1,000	No		
Tenafly High School	1	Serving Table (Chilled/Heated)	3,400	No		
Tenafly High School	5	Treadmill	2,000	No		
Tenafly High School	4	Shop Equipment	500	No		
Tenafly High School	1	Warming Cabinet	225	No		
Tenafly High School	3	Residential Oven	1,200	No		
Tenafly High School	1	Server	3,000	No		

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Tenafly High School	1	Refrigerated	20	Yes	0.2	1,612	0	$169	$230	$50	1.1
Tenafly High School	1	Non-Refrigerated	N/A	No	0.0	0	0	$0	$0	$0	0.0
Tenafly High School	1	Glass Fronted Refrigerated	20	Yes	0.1	1,209	0	$127	$230	$50	1.4

Appendix B: ENERGY STAR® Statement of Energy Performance

Energy use intensity (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.

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ENERGY STAR® Statement of Energy Performance

71

ENERGY STAR® Score[1]

Tenafly High School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 260,715
Built: 1972

For Year Ending: May 31, 2021
Date Generated: August 26, 2022

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
Tenafly High School 19 Columbus Drive Tenafly, New Jersey 07670	Tenafly Public Schools 500 Tenafly Road Tenafly, NJ 07670 201-816-4504	Victor Annaya 500 Tenafly Road Tenafly, NJ 07670 201-816-4504 vanaya@tenafly.k12.nj.us

Property ID: 20965505

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
60.6 kBtu/ft²

Source EUI
93.1 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	4,463,088 (28%)
Natural Gas (kBtu)	8,984,837 (57%)
Electric - Solar (kBtu)	2,339,282 (15%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	76.6
National Median Source EUI (kBtu/ft²)	117.8
% Diff from National Median Source EUI	-21%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	1,109

Signature & Stamp of Verifying Professional

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

LP Signature: ______________________Date: ___________

Licensed Professional

____ ________
,
(___)____-______
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Professional Engineer or Registered Architect Stamp (if applicable)

APPENDIX C: GLOSSARY

TERM	DEFINITION
Blended Rate	Used to calculate fiscal savings associated with measures. The blended rate is calculated by dividing the amount of your bill by the total energy use. For example, if your bill is $22,217.22, and you used 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
Btu	*British thermal unit*: a unit of energy equal to the amount of heat required to increase the temperature of one pound of water by one-degree Fahrenheit.
CHP	*Combined heat and power*. Also referred to as cogeneration.
COP	*Coefficient of performance*: a measure of efficiency in terms of useful energy delivered divided by total energy input.
Demand Response	Demand response reduces or shifts electricity usage at or among participating buildings/sites during peak energy use periods in response to time-based rates or other forms of financial incentives.
DCV	*Demand control ventilation*: a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
US DOE	*United States Department of Energy*
EC Motor	*Electronically commutated motor*
ECM	*Energy conservation measure*
EER	*Energy efficiency ratio*: a measure of efficiency in terms of cooling energy provided divided by electric input.
EUI	*Energy Use Intensity:* measures energy consumption per square foot and is a standard metric for comparing buildings' energy performance.
Energy Efficiency	Reducing the amount of energy necessary to provide comfort and service to a building/area. Achieved through the installation of new equipment and/or optimizing the operation of energy use systems. Unlike conservation, which involves some reduction of service, energy efficiency provides energy reductions without sacrifice of service.
ENERGY STAR®	ENERGY STAR® is the government-backed symbol for energy efficiency. The ENERGY STAR® program is managed by the EPA.
EPA	*United States Environmental Protection Agency*
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
GHG	*Greenhouse gas* gases that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.
gpf	*Gallons per flush*

gpm	*Gallon per minute*
HID	*High intensity discharge:* high-output lighting lamps such as high-pressure sodium, metal halide, and mercury vapor.
hp	*Horsepower*
HPS	*High-pressure sodium*: a type of HID lamp.
HSPF	*Heating seasonal performance factor:* a measure of efficiency typically applied to heat pumps. Heating energy provided divided by seasonal energy input.
HVAC	*Heating, ventilating, and air conditioning*
IHP 2014	US DOE Integral Horsepower rule. The current ruling regarding required electric motor efficiency.
IPLV	*Integrated part load value:* a measure of the part load efficiency usually applied to chillers.
kBtu	One thousand British thermal units
kW	*Kilowatt*: equal to 1,000 Watts.
kWh	*Kilowatt-hour*: 1,000 Watts of power expended over one hour.
LED	*Light emitting diode*: a high-efficiency source of light with a long lamp life.
LGEA	*Local Government Energy Audit*
Load	The total power a building or system is using at any given time.
Measure	A single activity, or installation of a single type of equipment, that is implemented in a building system to reduce total energy consumption.
MH	*Metal halide*: a type of HID lamp.
MBh	*Thousand Btu per hour*
MBtu	*One thousand British thermal units*
MMBtu	*One million British thermal units*
MV	*Mercury Vapor:* a type of HID lamp.
NJBPU	*New Jersey Board of Public Utilities*
NJCEP	*New Jersey's Clean Energy Program:* NJCEP is a statewide program that offers financial incentives, programs and services for New Jersey residents, business owners and local governments to help them save energy, money, and the environment.
psig	Pounds per square inch gauge
Plug Load	Refers to the amount of power used in a space by products that are powered by means of an ordinary AC plug.
PV	*Photovoltaic:* refers to an electronic device capable of converting incident light directly into electricity (direct current).

SEER	*Seasonal energy efficiency ratio:* a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	*Statement of energy performance:* a summary document from the ENERGY STAR® Portfolio Manager®.
Simple Payback	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
SREC	*Solar renewable energy credit*: a credit you can earn from the state for energy produced from a photovoltaic array.
TREC	*Transition Incentive Renewable Energy Certificate:* a factorized renewable energy certificate you can earn from the state for energy produced from a photovoltaic array.
T5, T8, T12	A reference to a linear lamp diameter. The number represents increments of 1/8th of an inch.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
therm	100,000 Btu. Typically used as a measure of natural gas consumption.
tons	A unit of cooling capacity equal to 12,000 Btu/hr.
Turnkey	Provision of a complete product or service that is ready for immediate use.
VAV	*Variable air volume*
VFD	*Variable frequency drive*: a controller used to vary the speed of an electric motor.
WaterSense™	The symbol for water efficiency. The WaterSense™ program is managed by the EPA.
Watt (W)	Unit of power commonly used to measure electricity use.