Local Government Energy Audit Report

Alpha Public Schools

October 4, 2023

Prepared for:

Alpha Public Schools

817 North Boulevard

Alpha, New Jersey 08865

Prepared by:

TRC

317 George Street

New Brunswick, New Jersey 08901

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 on 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.

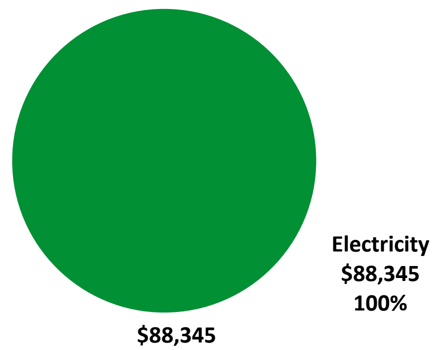
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state, and federal requirements.

Table of Contents

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Alpha Public Schools. 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: $88,345 Electricity: 711,951 kWh	
ENERGY STAR® Benchmarking Score	18 *(1-100 scale)*	This building performs below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

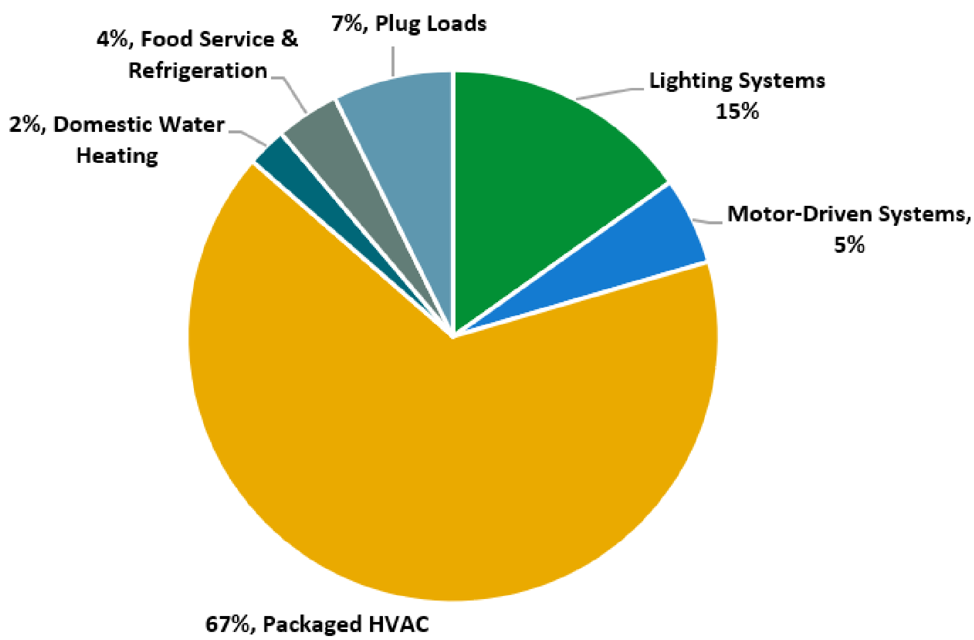


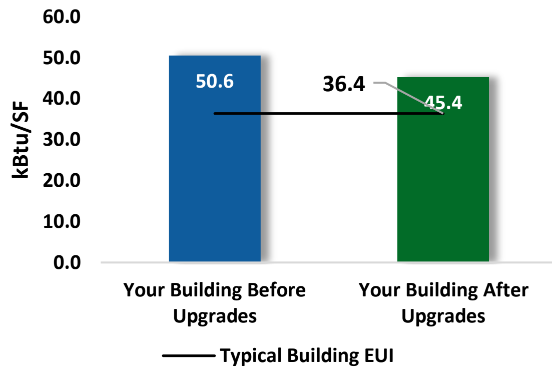
Figure 1 - Energy Use by System

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.

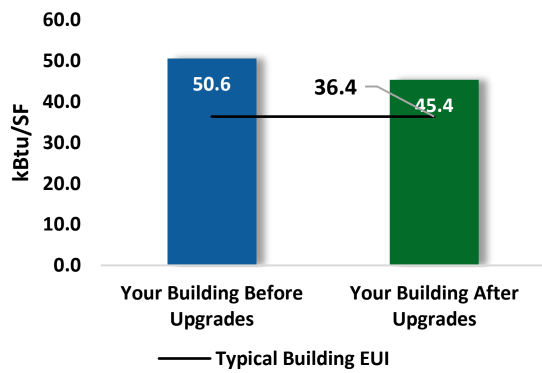
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$67,690
Potential Rebates & Incentives[1]	$11,103
Annual Cost Savings	$9,177
Annual Energy Savings	Electricity: 73,953 kWh
Greenhouse Gas Emission Savings	37 Tons
Simple Payback	6.2 Years
Site Energy Savings (All Utilities)	10%



Scenario 2: Cost Effective Package[2]

Installation Cost	$63,921
Potential Rebates & Incentives	$11,103
Annual Cost Savings	$9,133
Annual Energy Savings	Electricity: 73,594 kWh
Greenhouse Gas Emission Savings	37 Tons
Simple Payback	5.8 Years
Site Energy Savings (all utilities)	10%



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			**43,288**	**12.2**	**0**	**$5,372**	**$27,147**	**$6,494**	**$20,653**	**3.8**	**43,591**
ECM 1	Install LED Fixtures	Yes	5,982	0.0	0	$742	$3,575	$650	$2,925	3.9	6,023
ECM 2	Retrofit Fixtures with LED Lamps	Yes	37,306	12.2	0	$4,629	$23,572	$5,844	$17,728	3.8	37,567
Lighting Control Measures			**12,980**	**4.1**	**0**	**$1,611**	**$17,701**	**$4,105**	**$13,596**	**8.4**	**13,071**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	11,620	3.7	0	$1,442	$13,426	$1,795	$11,631	8.1	11,701
ECM 4	Install High/Low Lighting Controls	Yes	1,360	0.4	0	$169	$4,275	$2,310	$1,965	11.6	1,370
Variable Frequency Drive (VFD) Measures			**5,477**	**1.8**	**0**	**$680**	**$9,110**	**$400**	**$8,710**	**12.8**	**5,516**
ECM 5	Install VFDs on Constant Volume (CV) Fans	Yes	5,477	1.8	0	$680	$9,110	$400	$8,710	12.8	5,516
Unitary HVAC Measures			**359**	**0.4**	**0**	**$45**	**$3,769**	**$0**	**$3,769**	**84.6**	**362**
ECM 6	Install High Efficiency Air Conditioning Units	No	359	0.4	0	$45	$3,769	$0	$3,769	84.6	362
HVAC System Improvements			**1,273**	**0.0**	**0**	**$158**	**$143**	**$24**	**$119**	**0.8**	**1,282**
ECM 7	Install Pipe Insulation	Yes	1,273	0.0	0	$158	$143	$24	$119	0.8	1,282
Domestic Water Heating Upgrade			**299**	**0.0**	**0**	**$37**	**$124**	**$0**	**$124**	**3.4**	**301**
ECM 8	Install Low-Flow DHW Devices	Yes	299	0.0	0	$37	$124	$0	$124	3.4	301
Food Service & Refrigeration Measures			**4,122**	**0.3**	**0**	**$512**	**$607**	**$80**	**$527**	**1.0**	**4,151**
ECM 9	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	4,122	0.3	0	$512	$607	$80	$527	1.0	4,151
Custom Measures			**6,154**	**0.0**	**0**	**$764**	**$9,089**	**$0**	**$9,089**	**11.9**	**6,197**
ECM 10	Replace Electric Water Heater with Heat Pump Water Heater	Yes	6,154	0.0	0	$764	$9,089	$0	$9,089	11.9	6,197
TOTALS (COST EFFECTIVE MEASURES)			**73,594**	**18.4**	**0**	**$9,133**	**$63,921**	**$11,103**	**$52,818**	**5.8**	**74,108**
TOTALS (ALL MEASURES)			**73,953**	**18.8**	**0**	**$9,177**	**$67,690**	**$11,103**	**$56,587**	**6.2**	**74,470**

* - 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 and 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.

Options from Your Utility Company

Prescriptive and Custom Rebates

For facilities wishing to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the Prescriptive and Custom Rebates program. To participate, you can use internal resources or an outside firm or contractor to perform the final design of the ECM(s) and install the equipment. Program pre-approval may be required for some incentives. Contact your utility company for more details prior to project installation.

Direct Install

The Direct Install program provides turnkey installation of multiple measures through an authorized contractor. This program can provide incentives up to 70% or 80% of the cost of selected measures. A Direct Install contractor will assess and verify individual measure eligibility and perform the installation work. The Direct Install program is available to sites with an average peak demand of less than 200 kW.

Engineered Solutions

The Engineered Solutions program provides tailored energy-efficiency assistance and turnkey engineering services to municipalities, universities, schools, hospitals, and healthcare facilities (MUSH), non-profit entities, and multifamily buildings. The program provides all professional services from audit, design, construction administration, to commissioning and measurement and verification for custom whole-building energy-efficiency projects. Engineered Solutions allows you to install as many measures as possible under a single project as well as address measures that may not qualify for other programs.

For more details on these programs please contact your utility provider.

Options from New Jersey's Clean Energy Program

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 is designed to promote self-investment in energy efficiency. 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.

For more details on these programs please visit New Jersey's Clean Energy Program website .

2 Existing Conditions

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Alpha Public Schools. 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 July 13, 2023, TRC performed an energy audit at Alpha Public Schools located in Alpha, New Jersey. TRC met with facility staff to review the facility operations and help focus our investigation on specific energy-using systems.

Alpha Public Schools is a three-story, 48,000 square foot building built in 1917 with an addition in 1962. Spaces include classrooms, gymnasium, offices, cafeteria, corridors, stairwells, commercial kitchen, and basement mechanical space.

2.2 Building Occupancy

The school is fully occupied from September through June. Typical weekday occupancy is 36 staff and 207 students. Summer occupancy includes a summer day camp and continuing maintenance activities. There are no weekend activities.

Building Name	Weekday/Weekend	Operating Schedule
Alpha Public School	Weekday	6:00 AM - 7:00 PM
	Weekend	Varied

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

The 1917 building walls are concrete block over structural steel with a brick facade. The roof is flat and covered with black membrane and in poor condition. The walls are made of poured concrete with a plaster interior finish.

The 1962 addition is comprised of a flat roof supported with steel trusses and a metal deck, finished with an insulated layer and a covering of TPO. Roof encloses conditioned space. The thermal barrier is at the roof.

1962 Façade

1962 Roof

1917 Façade

Most of the windows are double glazed and have aluminum frames with a thermal break. 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 undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration.

Windows *Exterior Doors*

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. Fixture types include 2-lamp, 3-lamp, or 4-lamp, 2-foot or 4-foot-long recessed troffer or surface mounted fixtures and 2-foot fixtures with linear tube lamps. Typically, T8 fluorescent lamps use electronic ballasts.

Additionally, there are some compact fluorescent lamps (CFL), incandescent, and LED general purpose lamps. Gymnasium fixtures have manually controlled high bay 8-foot linear T8 fluorescent lamps. All exit signs are LED. Most fixtures are in fair condition. Interior lighting levels were generally sufficient.

Recessed Troffer *Pendent Mount Fixtures*

Most lighting fixtures are controlled manually and the remainder by occupancy sensors.

Wall Switch

Wall Switch

Exterior fixtures include wall packs with high intensity discharge (HID) lamps. Exterior fixtures are photocell controlled.

Wall Packs

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators are equipped with supply fan motors and electronically controlled outside air dampers and built-in electric resistance heaters. Some units are connected to condensers on the roof for cooling. They provide heating, cooling, and ventilation to classrooms. Most units were installed at the same time while a few have been replaced.

Unit Ventilators

Unitary Electric HVAC Equipment

Most classrooms and offices are cooled with window or portable air conditioning (AC) units. These vary in capacity between 0.54 tons and 1.01 tons. Most of the units are in fair condition. They range in efficiency between 9.5 EER to 12.1 EER. Some are ENERGY STAR labeled.


Window AC Units

Portable AC Unit

The facility has a ¾ ton ductless mini split unit for the server room and several outside condensing units that are connected to unit ventilators. They vary in capacity between 1.5 tons and 4 tons of cooling with an EER range of 10 and 14. One of the units is a heat pump.

Ductless Mini Split

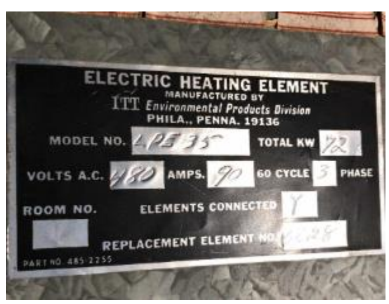
Heat Pump Condensing Unit

AC-only Condensing Unit

Air Handling Units (AHUs)

The gymnasium has two AHUs that provide heating and ventilation. Each has a 72-kW electric resistance heating element, a supply fan, and an outside air damper.

AHU



Unit Tag

Outside Air Intake

2.6 Domestic Hot Water

Hot water is produced by four electric storage water heaters including one, 40-gallon, 13.5 kW unit; two, 119-gallon, 36 kW units, and one, 300-gallon, 40.6 kW electric storage water heater. Two fractional hp circulation pumps distribute water to end uses. The circulation pumps operate continuously. The domestic hot water pipes are partially insulated, and the insulation is in fair condition.



Electric Storage Water Heaters

2.7 Food Service Equipment

The kitchen has all-electric equipment that is used to prepare meals for students and staff. Most cooking is done using an electric oven. Bulk prepared foods are held in an electric holding cabinet. Equipment is not high efficiency and is in fair condition.

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

Oven and Insulated Food Holding Cabinet

Steam Table

2.8 Refrigeration

The kitchen has a stand-up refrigerator with a solid door, two refrigerator chests, and one freezer chest. All equipment is standard and in fair condition. The walk-in refrigerator has an estimated 0.42-ton compressor located outside the kitchen equipped with 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

Refrigerated Chest

Walk-in

2.9 Plug Load and Vending Machines

You may wish to consider paying particular attention to minimizing your plug load usage. This report makes suggestions for ECMs in this area as well as energy efficient best practices. There are 25 desktop computer workstations and 197 laptops throughout the facility. Plug loads include general cafe and office equipment. There are classroom typical loads such as smartboards, projectors, and fans. There is a residential-style refrigerator and several mini refrigerators throughout the building. These vary in condition and efficiency.


Smartboard


Copier


Server Computers

2.10 Water-Using Systems

There are eight restrooms with toilets and sinks. Faucet flow rates are at 1.5 gallons per minute (gpm) or higher.

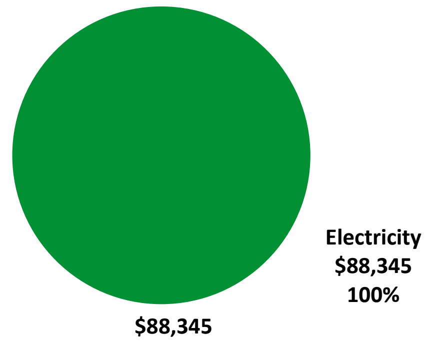

Restroom Sinks


Pre-rinse Spray Valve

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	711,951 kWh	$88,345
Total		**$88,345**



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.

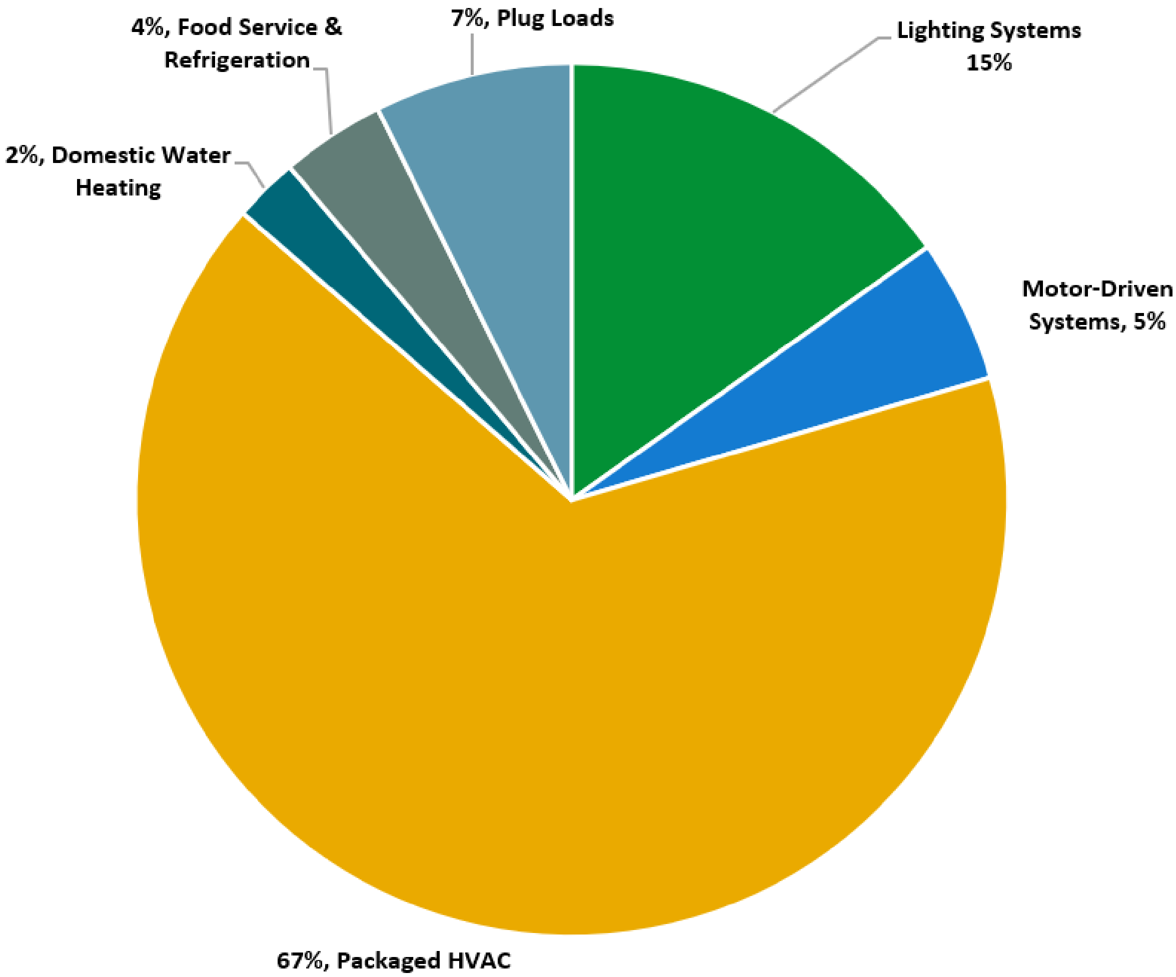
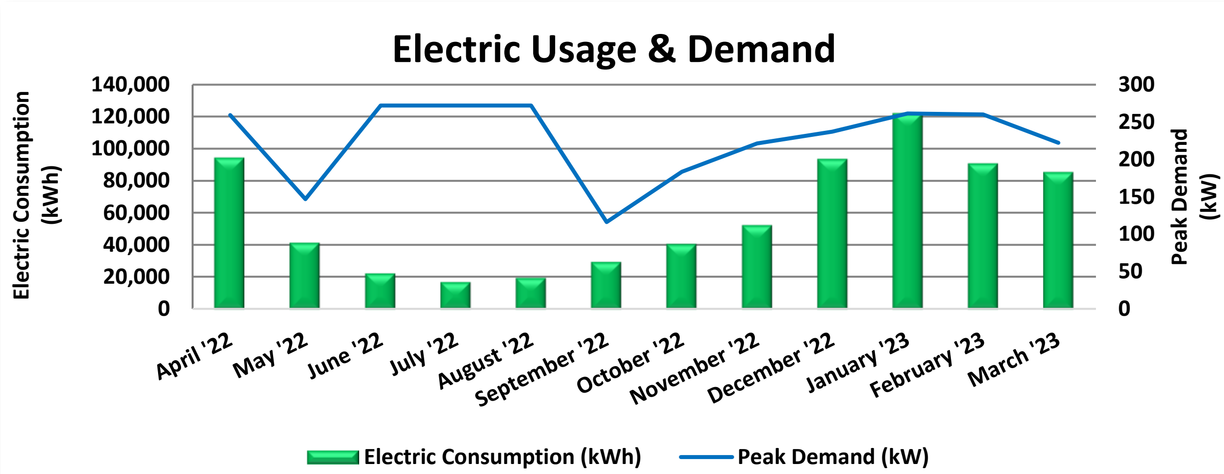


Figure 4 - Energy Balance

3.1 Electricity

JCP&L delivers electricity under rate class General Service Secondary Space Heating.



Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
4/20/22	27	94,400	259	$1,839	$10,611
5/24/22	34	41,600	147	$1,010	$4,917
6/23/22	30	22,400	272	$941	$3,083
7/22/22	29	17,200	272	$941	$2,603
8/24/22	33	19,600	272	$941	$1,371
9/23/22	30	29,600	116	$840	$4,001
10/24/22	31	40,800	184	$1,281	$5,677
11/21/22	28	52,400	221	$1,559	$7,195
12/20/22	29	93,600	237	$1,677	$11,614
1/24/23	35	122,000	262	$1,857	$14,768
2/21/23	28	90,800	260	$1,845	$11,485
3/23/23	30	85,600	222	$1,565	$10,778
Totals	**364**	**710,000**	**272**	**$16,293**	**$88,103**
Annual	**365**	**711,951**	**272**	**$16,338**	**$88,345**

Notes:

- Peak demand of 272 kW occurred in June '22.
- Average demand over the past 12 months was 227 kW.
- The average electric cost over the past 12 months was $0.124/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.

3.2 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	18

This building performs below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

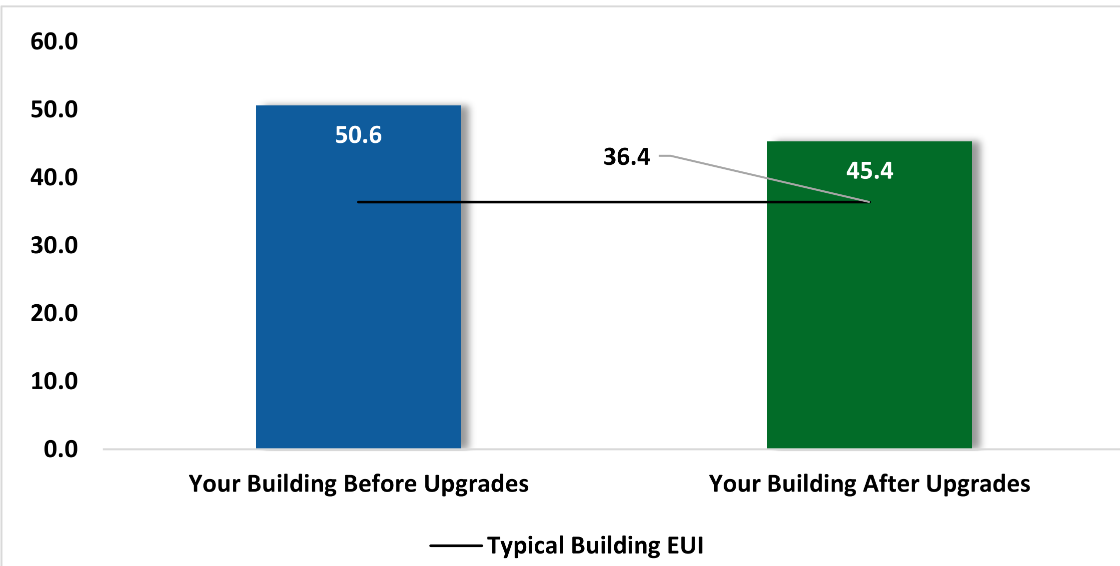


Figure 5 - Energy Use Intensity Comparison[3]

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 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 in this report are based on the previously run state rebate program SmartStart, which has been retired. Now, all investor-owned gas and electric utility companies are offering complementary energy efficiency programs directly to their customers. Some measures and proposed upgrades may be eligible for higher incentives than those shown below. The incentives in the summary tables should be used for high-level planning purposes. To verify incentives, reach out to your utility provider or visit the NJCEP website for more information.

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)
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Unitary HVAC Measures			**359**	**0.4**	**0**	**$45**	**$3,769**	**$0**	**$3,769**	**84.6**	**362**
ECM 6	Install High Efficiency Air Conditioning Units	No	359	0.4	0	$45	$3,769	$0	$3,769	84.6	362
HVAC System Improvements			**1,273**	**0.0**	**0**	**$158**	**$143**	**$24**	**$119**	**0.8**	**1,282**
ECM 7	Install Pipe Insulation	Yes	1,273	0.0	0	$158	$143	$24	$119	0.8	1,282
Domestic Water Heating Upgrade			**299**	**0.0**	**0**	**$37**	**$124**	**$0**	**$124**	**3.4**	**301**
ECM 8	Install Low-Flow DHW Devices	Yes	299	0.0	0	$37	$124	$0	$124	3.4	301
Food Service & Refrigeration Measures			**4,122**	**0.3**	**0**	**$512**	**$607**	**$80**	**$527**	**1.0**	**4,151**
ECM 9	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	4,122	0.3	0	$512	$607	$80	$527	1.0	4,151
Custom Measures			**6,154**	**0.0**	**0**	**$764**	**$9,089**	**$0**	**$9,089**	**11.9**	**6,197**
ECM 10	Replace Electric Water Heater with Heat Pump Water Heater	Yes	6,154	0.0	0	$764	$9,089	$0	$9,089	11.9	6,197
TOTALS			**73,953**	**18.8**	**0**	**$9,177**	**$67,690**	**$11,103**	**$56,587**	**6.2**	**74,470**

* - 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		**43,288**	**12.2**	**0**	**$5,372**	**$27,147**	**$6,494**	**$20,653**	**3.8**	**43,591**
ECM 1	Install LED Fixtures	5,982	0.0	0	$742	$3,575	$650	$2,925	3.9	6,023
ECM 2	Retrofit Fixtures with LED Lamps	37,306	12.2	0	$4,629	$23,572	$5,844	$17,728	3.8	37,567
Lighting Control Measures		**12,980**	**4.1**	**0**	**$1,611**	**$17,701**	**$4,105**	**$13,596**	**8.4**	**13,071**
ECM 3	Install Occupancy Sensor Lighting Controls	11,620	3.7	0	$1,442	$13,426	$1,795	$11,631	8.1	11,701
ECM 4	Install High/Low Lighting Controls	1,360	0.4	0	$169	$4,275	$2,310	$1,965	11.6	1,370
Variable Frequency Drive (VFD) Measures		**5,477**	**1.8**	**0**	**$680**	**$9,110**	**$400**	**$8,710**	**12.8**	**5,516**
ECM 5	Install VFDs on Constant Volume (CV) Fans	5,477	1.8	0	$680	$9,110	$400	$8,710	12.8	5,516
HVAC System Improvements		**1,273**	**0.0**	**0**	**$158**	**$143**	**$24**	**$119**	**0.8**	**1,282**
ECM 7	Install Pipe Insulation	1,273	0.0	0	$158	$143	$24	$119	0.8	1,282
Domestic Water Heating Upgrade		**299**	**0.0**	**0**	**$37**	**$124**	**$0**	**$124**	**3.4**	**301**
ECM 8	Install Low-Flow DHW Devices	299	0.0	0	$37	$124	$0	$124	3.4	301
Food Service & Refrigeration Measures		**4,122**	**0.3**	**0**	**$512**	**$607**	**$80**	**$527**	**1.0**	**4,151**
ECM 9	Refrigerator/Freezer Case Electrically Commutated Motors	4,122	0.3	0	$512	$607	$80	$527	1.0	4,151
Custom Measures		**6,154**	**0.0**	**0**	**$764**	**$9,089**	**$0**	**$9,089**	**11.9**	**6,197**
ECM 10	Replace Electric Water Heater with Heat Pump Water Heater	6,154	0.0	0	$764	$9,089	$0	$9,089	11.9	6,197
TOTALS		**73,594**	**18.4**	**0**	**$9,133**	**$63,921**	**$11,103**	**$52,818**	**5.8**	**74,108**

* - 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		**43,288**	**12.2**	**0**	**$5,372**	**$27,147**	**$6,494**	**$20,653**	**3.8**	**43,591**
ECM 1	Install LED Fixtures	5,982	0.0	0	$742	$3,575	$650	$2,925	3.9	6,023
ECM 2	Retrofit Fixtures with LED Lamps	37,306	12.2	0	$4,629	$23,572	$5,844	$17,728	3.8	37,567

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 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 fixture(s).

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: exterior fixtures

ECM 2: Retrofit Fixtures with LED Lamps

Replace fluorescent, CFL, or 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 fluorescent fixtures with T8 tubes, CFL, or incandescent lamps

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		**12,980**	**4.1**	**0**	**$1,611**	**$17,701**	**$4,105**	**$13,596**	**8.4**	**13,071**
ECM 3	Install Occupancy Sensor Lighting Controls	11,620	3.7	0	$1,442	$13,426	$1,795	$11,631	8.1	11,701
ECM 4	Install High/Low Lighting Controls	1,360	0.4	0	$169	$4,275	$2,310	$1,965	11.6	1,370

Lighting controls reduce energy use by turning off or lowering lighting fixture power levels when not in use. A comprehensive approach to lighting design should upgrade the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 3: 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: offices, classrooms, library, and restrooms

ECM 4: 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 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		**5,477**	**1.8**	**0**	**$680**	**$9,110**	**$400**	**$8,710**	**12.8**	**5,516**
ECM 5	Install VFDs on Constant Volume (CV) Fans	5,477	1.8	0	$680	$9,110	$400	$8,710	12.8	5,516

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 5: 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.

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: gymnasium

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		**359**	**0.4**	**0**	**$45**	**$3,769**	**$0**	**$3,769**	**84.6**	**362**
ECM 6	Install High Efficiency Air Conditioning Units	359	0.4	0	$45	$3,769	$0	$3,769	84.6	362

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 window AC units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 6: Install High Efficiency Air Conditioning Units

Replace standard efficiency window air conditioning units with high efficiency window 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.

Affected Units: classroom 12 and 13

4.5 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		**1,273**	**0.0**	**0**	**$158**	**$143**	**$24**	**$119**	**0.8**	**1,282**
ECM 7	Install Pipe Insulation	1,273	0.0	0	$158	$143	$24	$119	0.8	1,282

ECM 7: 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.

4.6 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		**299**	**0.0**	**0**	**$37**	**$124**	**$0**	**$124**	**3.4**	**301**
ECM 8	Install Low-Flow DHW Devices	299	0.0	0	$37	$124	$0	$124	3.4	301

ECM 8: 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. Pre-rinse spray valves (PRSVs), often used in commercial and institutional kitchens, remove food waste from dishes prior to dishwashing.

Additional cost savings may result from reduced water usage.

4.7 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		**4,122**	**0.3**	**0**	**$512**	**$607**	**$80**	**$527**	**1.0**	**4,151**
ECM 9	Refrigerator/Freezer Case Electrically Commutated Motors	4,122	0.3	0	$512	$607	$80	$527	1.0	4,151

ECM 9: Refrigerator/Freezer Case Electrically Commutated Motors

Replace shaded pole or permanent split capacitor (PSC) motors with electronically commutated (EC) motors in walk-in. 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.

Affected Units: medium temp freezer

4.8 Custom 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)
Custom Measures		**6,154**	**0.0**	**0**	**$764**	**$9,089**	**$0**	**$9,089**	**11.9**	**6,197**
ECM 10	Replace Electric Water Heater with Heat Pump Water Heater	6,154	0.0	0	$764	$9,089	$0	$9,089	11.9	6,197

CM 10: Replace Electric Water Heater with Heat Pump Water Heater

A typical electric water heater uses electric resistance coils to heat water at a coefficient of performance (COP) of 1. Air source heat pump water heaters (HPWH) use a refrigeration cycle to transfer heat from the surrounding air to the domestic water. The typical average COP for a HPWH is about 2.5, so they require significantly less electricity to produce the same amount of hot water as a traditional electric water heater. There are two types of HPWH, those integrated with the heat pump and storage tank in the same unit, and those that are split into two sections (with the storage tank separate from the heat pump). The following addresses integrated HPWH.

HPWH reject cold air. As such, they need to be installed in an unconditioned space of about 750 cubic feet with good ventilation. Ideal locations are garages, large enclosed, unconditioned storage areas, or areas with excess heat such as a furnace or boiler room.[4] The HPWH will also produce condensate so accommodations for draining the condensate need to be provided.

Most HPWH operate effectively down to an air temperature of 40 °F. Below that temperature, an electric resistance booster heater is typically required to achieve full heating capacity. It is critical that the HPWH controls are set up so that the electric resistance heat only engages when the air temperature is too cold for the HPWH to extract heat from it. HPWHs have a slow recovery. During periods of high demand, the electric resistance heating element, if enabled, may be energized to maintain set point, thus reducing the overall efficiency of the unit. It is recommended that a careful analysis of the hot water demand be conducted to determine if the application makes economic sense, and the HPWH heating capacity and storage are properly sized.

HPWH operate most effectively when the temperature difference between the incoming and outgoing water is high. Generally, this means that cold make-up water should be piped to the bottom of the tank and return water should be piped to the top of the tank in order to maintain stratification within the storage tank. Water should be drawn from the bottom of the tank to be heated. If there is a DHW recirculation pump, it should only be operated during high hot water demand periods.

Affected Units: two, 36 kW units in mechanical room

[4] https://basc.pnnl.gov/code-compliance/heat-pump-water-heaters-code-compliance-brief#:~:text=HPWH%20must%20have%20unrestricted%20airflow,depending%20on%20size%20of%20system

4.9 Measures for Future Consideration

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

Alpha 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 to a Heat Pump System

Electric resistance heating units work by passing an electric current through wires to heat them. The system is 100% efficient since for every unit of electricity consumed, one unit of heat is produced.

But there is a way to convert electricity to create heat at better than a 1:1 ratio. Heat pumps operate on a more efficient principle, the *refrigeration cycle*. Instead of directly converting electricity to heat, electricity does the work, via a compressor, of moving refrigerant through a system that transfers heat from a cooler place to a warmer place. That system can move three to five as much energy as is available using electric resistance heating methods. Heat pumps work in a similar manner to an air conditioner, except they reverse the cooling process to circulate warm air instead of cold air. Also, heat pumps are generally capable of dispensing refrigerated air as they can typically be operated in air conditioning mode.

Electric resistance heat, including electric furnaces and baseboard heaters, can be inexpensive to install but often expensive to run. Facilities with these systems can save substantial energy at a moderate cost by installing heat pumps when they replace a central air conditioner.

Even in buildings without central air-conditioning, there are opportunities to save energy when an existing electric furnace needs to be replaced, as well as opportunities to install ductless electric heat pumps in buildings with baseboard electric heaters and electric fan coils. Unit ventilators with built-in electric resistance heaters can be replaced with unit ventilators with integrated heat pumps.

Electric heat pumps have high coefficient of performance (COP) ratings and are substantially more efficient than traditional electric heating systems. Further investigation is required to determine whether installing a heat pump system is a cost-effective solution when replacing existing electrical heating systems.

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[5]. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

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.

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

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.

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.

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.

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 BAS 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.

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.

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[6] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[7] 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.

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

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

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.

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.

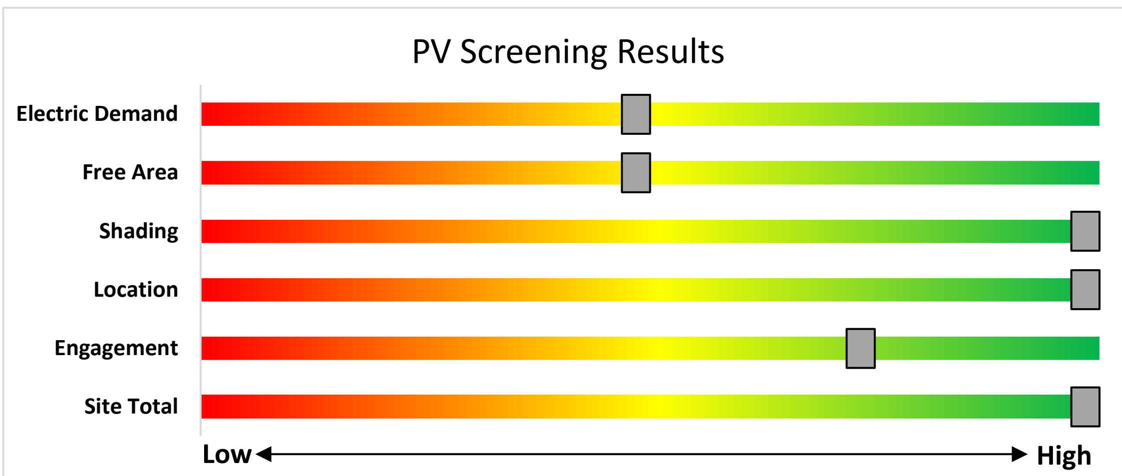
6.1 Solar Photovoltaic

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 a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential. A 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	75	kW DC STC
Electric Generation	89,353	kWh/yr
Displaced Cost	$11,090	/yr
Installed Cost	$195,000	

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.

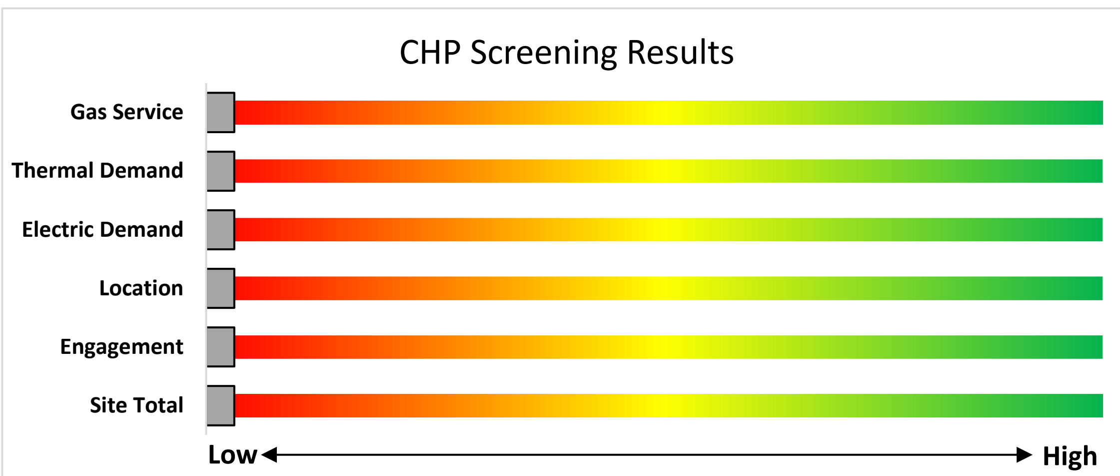


Figure 9 - Combined Heat and Power Screening

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 Electric Vehicles (EV)

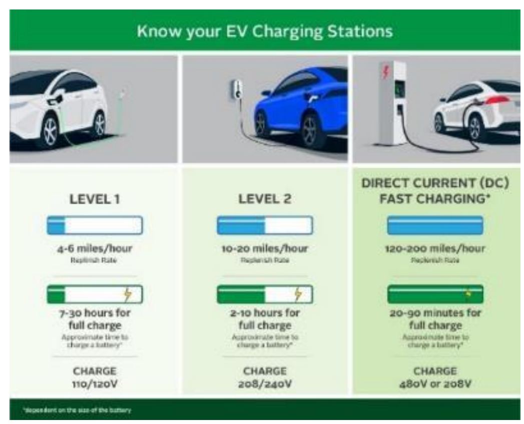
All electric vehicles (EVs) have an electric motor instead of an internal combustion engine. EVs function by plugging into a charge point, taking electricity from the grid, and then storing it in rechargeable batteries. Although electricity production may contribute to air pollution, the U.S. EPA categorizes all-electric vehicles as zero-emission vehicles because they produce no direct exhaust or tailpipe emissions.

EVs are typically more expensive than similar conventional and hybrid vehicles, although some cost can be recovered through fuel savings, federal tax credit, or state incentives.

7.1 Electric Vehicle Charging

EV charging stations provide a means for electric vehicle operators to recharge their batteries at a facility. While many EV drivers charge at home, others do not have access to regular home charging, and the ability to charge at work or in public locations is critical to making EVs practical for more drivers. Charging can also be used for electric fleet vehicles, which can reduce fuel and maintenance costs for fleets that replace gas or diesel vehicles with EVs.

EV charging comes in three main types. For this assessment, the screening considers addition of Level 2 charging, which is most common at workplaces and other public locations. Depending on the site type and usage, other levels of charging power may be more appropriate.



The preliminary assessment of EV charging at the facility shows that there is medium potential for adding EV chargers to the facility's parking, based on potential costs of installation and other site factors.

The primary costs associated with installing EV charging are the charger hardware and the cost to extend power from the facility to parking spaces. This may include upgrades to electric panels to serve increased loads.

The type and size of the parking area impact the costs and feasibility of adding EV charging. Parking structure installations can be less costly than surface lot installations as power may be readily available, and equipment and wiring can be surface mounted. Parking lot installations often require trenching through concrete or asphalt surface. Large parking areas provide greater flexibility in charger siting than smaller lots.

The location and capacity of facility electric panels also impact charger installation costs. A Level 2 charger generally requires a dedicated 208-240V, 40 Amp circuit. The electric panel nearest the planned installation may not have available capacity and may need to be upgraded to serve new EV charging loads. Alternatively, chargers could be powered from a more distant panel. The distance from the panel to the location of charging stations ties directly to costs, as conduits, cables, and potential trenching costs all increase on a per-foot basis. The more charging stations planned, the more likely it is that additional electrical capacity will be needed.

Other factors to consider when planning for EV charging at a facility include who the intended users are, how long they park vehicles at the site, and whether they will need to pay for the electricity they use.

The graphic below displays the results of the EV charging assessment conducted as part of this audit. The position of each slider indicates the impact each factor has on the feasibility of installing EV charging at the site.

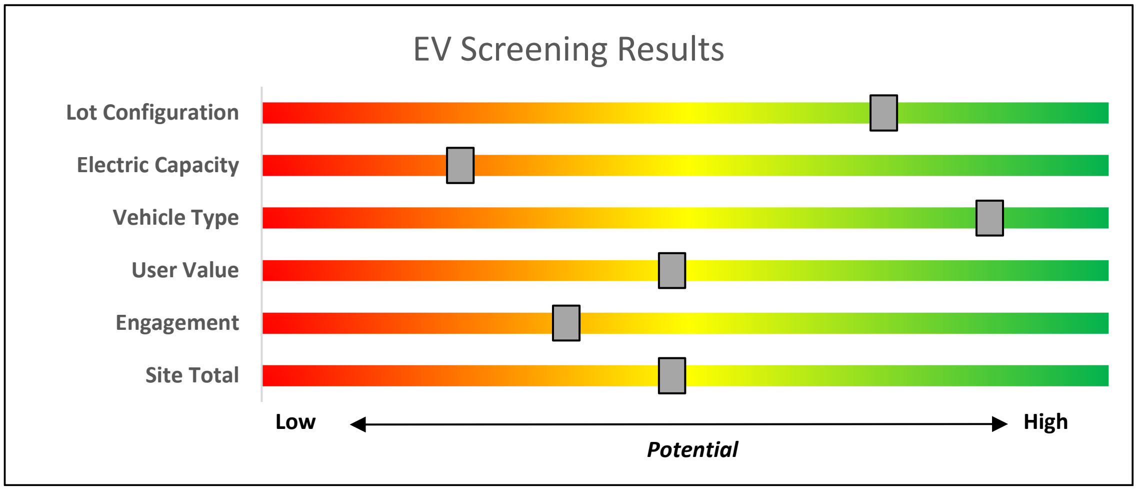


Figure 10 – EV Charger Screening

Electric Vehicle Programs Available

New Jersey is leading the way on electric vehicle (EV) adoption on the East Coast. There are several programs designed to encourage EV adoption in New Jersey, which is crucial to reaching a 100% clean energy future.

NJCEP offers a variety of EV programs for vehicles, charging stations, and fleets. Certain EV charging stations that receive electric utility service from Atlantic City Electric Company (ACE) or Public Service Electric & Gas Company (PSE&G), may be eligible for additional electric vehicle charging incentives directly from the utility. Projects may be eligible for both the incentives offered by this BPU program and incentives offered by ACE or PSE&G, up to 90% of the combined charger purchase and installation costs. Please check ACE or PSE&G program eligibility requirements before purchasing EV charging equipment, as additional conditions on types of eligible chargers may apply for utility incentives.

Both Jersey Central Power & Light (JCP&L) and Rockland Electric (RECO) have filed proposals for EV charging programs. BPU staff is currently reviewing those proposals.

For more information and to keep up to date on all EV programs please visit https://www.njcleanenergy.com/commercial-industrial/programs/electric-vehicle-programs

8 Project Funding and Incentives

Ready to improve your building's performance? New Jersey's Clean Energy Programs and Utility Energy Efficiency Programs can help. Pick the program that works best for you. This section provides an overview of currently available incentive programs in.

8.1 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.

Prescriptive and Custom

The Prescriptive and Custom rebate program through your utility provider offers incentives for installing prescriptive and custom energy efficiency measures at your facility. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades. This program serves most common equipment types and sizes.

Equipment Examples

Lighting
Lighting Controls
HVAC Equipment
Refrigeration
Gas Heating
Gas Cooling
Commercial Kitchen Equipment
Food Service Equipment
Variable Frequency Drives
Electronically Commutate Motors
Variable Frequency Drives
Plug Loads Controls
Washers and Dryers
Agricultural
Water Heating

The Prescriptive program provides fixed incentives for specific energy efficiency measures. Prescriptive incentives vary by equipment type. The Custom program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentives.

Direct Install

Direct Install is a turnkey program available to existing small to medium-sized facilities with an average peak electric demand that does not exceed 200 kW or less over the recent 12-month period. You work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives, and controls

Incentives

The program pays up to 70% of the total installed cost of eligible measures.

How to Participate

To participate in Direct Install, you will work with a participating contractor. The contractor will be paid the measure incentives directly by the program, which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the Direct Install program, subject to program rules and eligibility, while the remaining percent of the cost is paid to the contractor by the customer.

Engineered Solutions

The Engineered Solutions Program provides tailored energy-efficiency assistance and services to municipalities, universities, schools, hospitals and healthcare facilities (MUSH), non-profit entities, and multifamily buildings. Customers receive expert guided services, including investment-grade energy auditing, engineering design, installation assistance, construction administration, commissioning, and measurement and verification (M&V) services to support the implementation of cost-effective and comprehensive efficiency projects. Engineered Solutions is generally a good option for medium to large sized facilities with a peak demand over 200 kW looking to implement as many measures as possible under a single project to achieve deep energy savings. Engineered Solutions has an added benefit of addressing measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program loan also use this program. Incentives for this program are based on project scope and energy savings achieved.

For more information on any of these programs, contact your local utility provider or visit https://www.njcleanenergy.com/transition.

8.2 New Jersey's Clean Energy Programs

Save money while saving the planet! New Jersey's Clean Energy Program is a statewide program that offers incentives, programs, and services that benefit New Jersey residents, businesses, educational, non-profit, and government entities to help them save energy, money, and the environment.

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.

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.

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.

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 (dc). The program is currently under development. 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.

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.

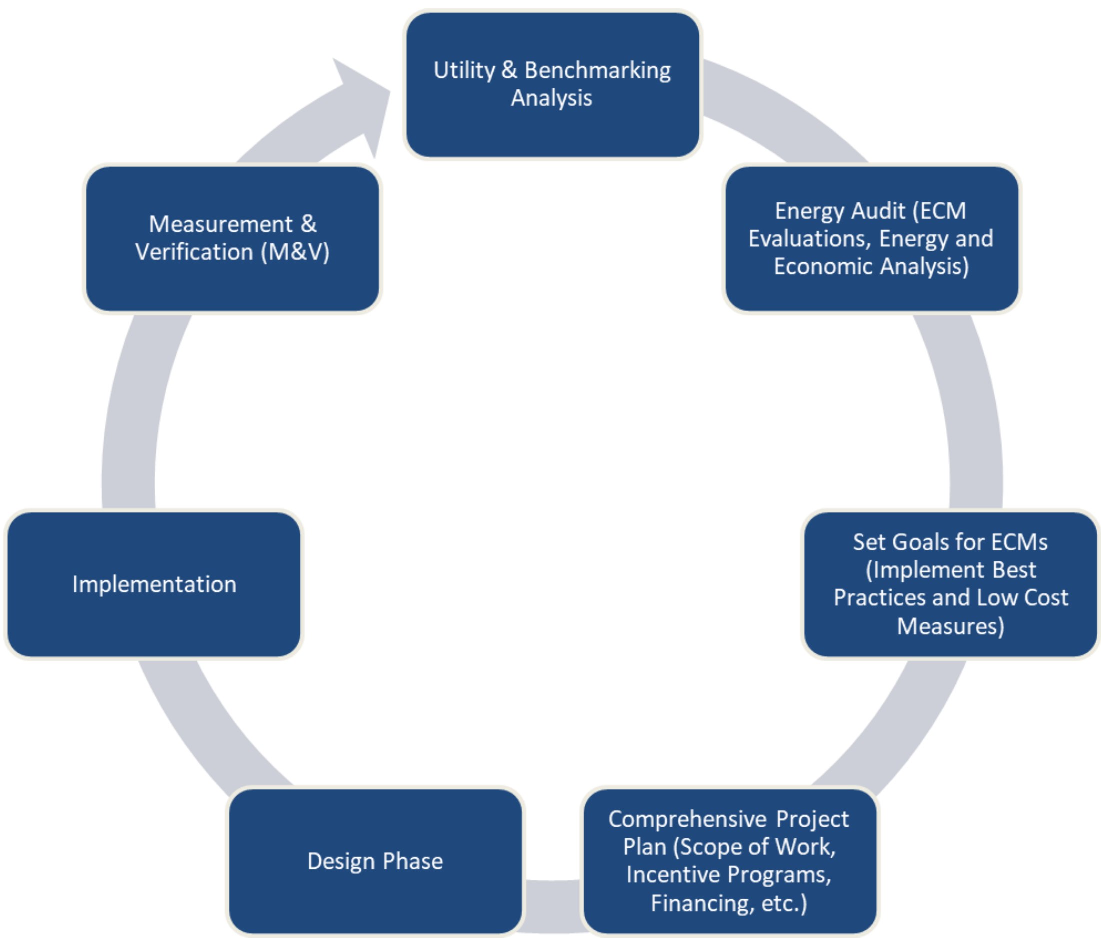


Figure 11 – Project Development Cycle

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[8].

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[9].

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

[9] 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
Boys Locker Room 1	7	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	S	18	2,860	3	None	Yes	7	LED Lamps: (2) 9W A19 Screw-In Lamps	Occupancy Sensor	18	1,973	0.0	90	0	$11	$270	$35	20.9
Classroom 1	9	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	2,860	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	1,973	0.4	1,258	0	$156	$1,067	$215	5.5
Classroom 10	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.4	1,167	0	$145	$708	$155	3.8
Classroom 11	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.4	1,167	0	$145	$708	$155	3.8
Classroom 11	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	389	0	$48	$416	$75	7.1
Classroom 11	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,860	0.0	76	0	$9	$37	$10	2.8
Classroom 2	9	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	2,860	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	1,973	0.4	1,258	0	$156	$1,067	$215	5.5
Classroom 3	2	Linear Fluorescent - T8: 4.75' T8 (44W) - 2L	Wall Switch	S	84	2,860	3	None	Yes	2	Linear Fluorescent - T8: 4.75' T8 (44W) - 2L	Occupancy Sensor	84	1,973	0.0	121	0	$15	$116	$20	6.4
Classroom 3	6	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	2,860	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	1,973	0.3	838	0	$104	$801	$155	6.2
Classroom 5	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	S	18	2,860		None	No	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	18	2,860	0.0	0	0	$0	$0	$0	0.0
Classroom 5	8	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	2,860	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	1,973	0.3	1,118	0	$139	$978	$195	5.6
Classroom 4	2	Linear Fluorescent - T8: 4.75' T8 (44W) - 2L	Wall Switch	S	84	2,860		None	No	2	Linear Fluorescent - T8: 4.75' T8 (44W) - 2L	Wall Switch	84	2,860	0.0	0	0	$0	$0	$0	0.0
Classroom 4	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	S	18	2,860		None	No	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	18	2,860	0.0	0	0	$0	$0	$0	0.0
Classroom 4	6	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	2,860	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	1,973	0.3	838	0	$104	$801	$155	6.2
Classroom 6	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	S	18	2,860		None	No	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	18	2,860	0.0	0	0	$0	$0	$0	0.0
Classroom 6	8	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	2,860	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	1,973	0.3	1,118	0	$139	$978	$195	5.6
Classroom 7	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,860	0.0	76	0	$9	$37	$10	2.8
Classroom 7	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.3	875	0	$109	$599	$125	4.4
Classroom 8	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.3	875	0	$109	$599	$125	4.4
Corridor 2	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 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	389	0	$48	$371	$180	4.0
Corridor 2	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	195	0	$24	$298	$90	8.6
Corridor 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	389	0	$48	$371	$180	4.0
Corridor 2	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	292	0	$36	$335	$135	5.5
Corridor 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	389	0	$48	$371	$180	4.0

	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
Corridor 2	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.3	973	0	$121	$815	$450	3.0
Corridor 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	389	0	$48	$371	$180	4.0
Dining Area 1	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
Dining Area 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	2,860	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	None	29	2,860	0.0	76	0	$9	$37	$10	2.8
Dining Area 1	36	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	36	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	1.1	3,502	0	$435	$2,125	$465	3.8
Dining Area 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	195	0	$24	$189	$40	6.2
Exterior 2	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch		9	2,860		None	No	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	2,860	0.0	0	0	$0	$0	$0	0.0
Exterior 2	3	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch		9	2,860		None	No	3	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	2,860	0.0	0	0	$0	$0	$0	0.0
Exterior 2	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch		9	2,860		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	2,860	0.0	0	0	$0	$0	$0	0.0
Exterior 2	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch		9	2,860		None	No	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	2,860	0.0	0	0	$0	$0	$0	0.0
Exterior 2	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch		9	2,860		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	2,860	0.0	0	0	$0	$0	$0	0.0
Exterior 2	3	Metal Halide: (1) 70W Lamp	Photocell		95	4,380	1	Fixture Replacement	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	21	4,380	0.0	972	0	$121	$618	$150	3.9
Exterior 2	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	$79	$346	$50	3.8
Exterior 2	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	$236	$1,037	$150	3.8
Exterior 2	2	Metal Halide: (1) 150W Lamp	Photocell		190	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	1,270	0	$158	$692	$100	3.8
Exterior 2	1	Metal Halide: (1) 175W Lamp	Photocell		215	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	53	4,380	0.0	710	0	$88	$385	$50	3.8
Exterior 2	1	Metal Halide: (1) 50W Lamp	Wall Switch		72	2,860	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	15	2,860	0.0	163	0	$20	$166	$50	5.7
Exterior 2	1	Metal Halide: (1) 50W Lamp	Wall Switch		72	2,860	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	15	2,860	0.0	163	0	$20	$166	$50	5.7
Exterior 2	1	Metal Halide: (1) 50W Lamp	Wall Switch		72	2,860	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	15	2,860	0.0	163	0	$20	$166	$50	5.7
Girls Locker Room	7	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	S	18	2,860	3	None	Yes	7	LED Lamps: (2) 9W A19 Screw-In Lamps	Occupancy Sensor	18	1,973	0.0	90	0	$11	$270	$35	20.9
Gymnasium 1	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Gymnasium 1	19	Incandescent: (1) 75W PAR30 Screw-In Lamp	Wall Switch	S	75	2,860	2, 3	Relamp	Yes	19	LED Lamps: PAR30 Lamps	Occupancy Sensor	12	1,973	0.9	2,937	0	$364	$981	$127	2.3
Gymnasium 1	3	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	60	2,860	3	None	Yes	3	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	60	1,973	0.0	129	0	$16	$270	$35	14.7
Gymnasium 1	41	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	2,860	2, 3	Relamp	Yes	41	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	1,973	1.8	5,729	0	$711	$4,439	$925	4.9
Janitorial 1	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	S	18	500		None	No	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	18	500	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
Kitchen 1	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.2	778	0	$97	$562	$115	4.6
Kitchen 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	195	0	$24	$189	$40	6.2
Lobby B	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	2,860		None	No	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	2,860	0.0	0	0	$0	$0	$0	0.0
Mechanical 1	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	345	0.1	51	0	$6	$380	$65	49.7
Office - Dressing Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,860	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,860	0.0	130	0	$16	$73	$20	3.3
Office - Enclosed 7	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	389	0	$48	$416	$75	7.1
Office - Enclosed 7A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	195	0	$24	$189	$40	6.2
Office - Enclosed Nurse	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	0.3	875	0	$109	$599	$125	4.4
Office - Enclosed Rm 9	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	389	0	$48	$416	$75	7.1
Office - Enclosed Rm 9A	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.2	486	0	$60	$453	$85	6.1
Office - GYM	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,860	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,860	0.0	130	0	$16	$73	$20	3.3
Office - GYM B	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,860	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,860	0.0	130	0	$16	$73	$20	3.3
Restroom - Classroom 11	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	S	18	2,860		None	No	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	18	2,860	0.0	0	0	$0	$0	$0	0.0
Restroom - Male 1	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,973	2	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	264	0	$33	$183	$50	4.1
Restroom - Male 2	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,973	2	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	264	0	$33	$183	$50	4.1
Restroom - Unisex Nurse	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	2,860		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	2,860	0.0	0	0	$0	$0	$0	0.0
Restroom - Unisex Nurse	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,860	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,860	0.0	37	0	$5	$33	$6	5.8
Storage Gym	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.0	13	0	$2	$37	$10	16.0
Storage Kitchen	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.0	13	0	$2	$37	$10	16.0
Classroom 12	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,860	0.0	76	0	$9	$37	$10	2.8
Classroom 12	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	195	0	$24	$189	$40	6.2
Classroom 13	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	195	0	$24	$189	$40	6.2
Classroom 13	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.3	875	0	$109	$599	$125	4.4
Classroom 14	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.3	875	0	$109	$599	$125	4.4
Classroom 14	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	195	0	$24	$189	$40	6.2

	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 15	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.3	875	0	$109	$599	$125	4.4
Classroom 15	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	195	0	$24	$189	$40	6.2
Classroom 15A	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.2	584	0	$72	$489	$95	5.4
Classroom 16	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	195	0	$24	$189	$40	6.2
Classroom 16	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.4	1,167	0	$145	$708	$155	3.8
Classroom 16	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	389	0	$48	$416	$75	7.1
Classroom 17	8	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	2,860	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	1,973	0.3	1,118	0	$139	$978	$195	5.6
Classroom 18	1	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	2,860	2	Relamp	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,860	0.0	88	0	$11	$89	$20	6.3
Classroom 19	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.3	875	0	$109	$599	$125	4.4
Classroom 20	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.3	875	0	$109	$599	$125	4.4
Corridor 3	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
Corridor 3	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.2	486	0	$60	$408	$225	3.0
Corridor 3	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.3	875	0	$109	$779	$405	3.4
Corridor 3	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	292	0	$36	$335	$135	5.5
Corridor 3	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	195	0	$24	$298	$90	8.6
Corridor 3	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,973	0.1	389	0	$48	$371	$180	4.0
Enclosed - Library	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,860	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,973	0.2	584	0	$72	$489	$95	5.4
Janitorial 2	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	S	18	500		None	No	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	18	500	0.0	0	0	$0	$0	$0	0.0
Library 1	1	Linear Fluorescent - T8: 4.75' T8 (44W) - 2L	Wall Switch	S	84	2,860		None	No	1	Linear Fluorescent - T8: 4.75' T8 (44W) - 2L	Wall Switch	84	2,860	0.0	0	0	$0	$0	$0	0.0
Library 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	195	0	$24	$189	$40	6.2
Library 1	22	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	2,860	2, 3	Relamp	Yes	22	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	1,973	1.0	3,074	0	$381	$2,487	$510	5.2
Office - Faculty Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.1	195	0	$24	$189	$40	6.2
Restroom - Boys 2	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.2	486	0	$60	$453	$85	6.1
Restroom - Female 2	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	S	18	2,860		None	No	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	18	2,860	0.0	0	0	$0	$0	$0	0.0
Restroom - Female 2	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,860	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,860	0.0	37	0	$5	$33	$6	5.8

	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
Restroom - Girls 2	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.2	486	0	$60	$453	$85	6.1
Restroom - Male 2	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,860	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,860	0.0	37	0	$5	$33	$6	5.8
Server Room 21A	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.1	53	0	$7	$146	$40	16.0
Storage B	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	2	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.1	40	0	$5	$110	$30	16.0
Office - Enclosed 23	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	S	18	2,860		None	No	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	18	2,860	0.0	0	0	$0	$0	$0	0.0
Office - Enclosed 24	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	S	18	2,860		None	No	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	18	2,860	0.0	0	0	$0	$0	$0	0.0
Classroom B1	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 B1	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,860	2, 3	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,973	0.3	1,028	0	$128	$708	$155	4.3
Classroom B2	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 B2	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,860	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,860	0.0	76	0	$9	$37	$10	2.8
Classroom B2	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,860	2, 3	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,973	0.3	857	0	$106	$635	$135	4.7
Corridor 1	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
Corridor 1	4	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	2,860	4	None	Yes	4	LED Lamps: (1) 9W A19 Screw-In Lamp	High/Low Control	9	1,973	0.0	26	0	$3	$225	$140	26.5
Electrical Room 1	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	345	0.2	136	0	$17	$562	$115	26.5
Storage 1	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	500		None	No	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	500	0.0	0	0	$0	$0	$0	0.0
Storage 2	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	500		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	500	0.0	0	0	$0	$0	$0	0.0
Storage 3	4	Compact Fluorescent: (1) 13W Spiral Plug-In Lamp	Wall Switch	S	13	500		None	No	4	Compact Fluorescent: (1) 13W Spiral Plug-In Lamp	Wall Switch	13	500	0.0	0	0	$0	$0	$0	0.0
Storage 4	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.0	27	0	$3	$73	$20	16.0
Storage 5	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	500		None	No	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	500	0.0	0	0	$0	$0	$0	0.0
Storage B2	1	Compact Fluorescent: (1) 23W Biaxial Plug-In Lamp	Wall Switch	S	23	500	2	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	17	500	0.0	2	0	$0	$13	$1	38.1
Storage B2	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	2	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.1	40	0	$5	$110	$30	16.0
Stairs A	2	Compact Fluorescent: (2) 40W Biaxial Plug-In Lamps	Wall Switch		80	2,860	2, 4	Relamp	Yes	2	LED Lamps: PL-L (Biax) Lamps	High/Low Control	56	1,973	0.1	192	0	$24	$279	$74	8.6
Stairs A	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
Stairs A	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch		33	2,860	2, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	1,973	0.0	99	0	$12	$290	$82	17.0
Stairs B	2	Compact Fluorescent: (2) 40W Biaxial Plug-In Lamps	Wall Switch		80	2,860	2, 4	Relamp	Yes	2	LED Lamps: PL-L (Biax) Lamps	High/Low Control	56	1,973	0.1	192	0	$24	$279	$74	8.6

Location	Existing Conditions: Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	Proposed Conditions: ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Energy Impact & Financial Analysis: 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
Stairs B	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
Stairs B	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch		33	2,860	2, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	1,973	0.0	99	0	$12	$290	$82	17.0
Stairs C	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch		33	2,860	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,860	0.0	37	0	$5	$33	$6	5.8

Motor Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions: Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	Proposed Conditions: ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Energy Impact & Financial Analysis: 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
Electrical Room 1	Alpha Public School	2	Air Compressor	0.8	82.5%	No	Baldor	35B101T469H3	W	1,000		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 1	Alpha Public School	5	Exhaust Fan	0.5	70.0%	No	Unknown	Unknown	W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 1	Alpha Public School	1	Exhaust Fan	0.3	65.0%	No	Unknown	Unknown	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 1	Alpha Public School	2	Exhaust Fan	0.8	70.0%	No	Unknown	Unknown	W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Storage Gym	Alpha Public School	1	DHW Circulation Pump	0.5	70.0%	No	Bell & Gossett	Unknown	W	8,760		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Storage 2	Alpha Public School	1	DHW Circulation Pump	0.5	70.0%	No	Bell & Gossett	Unknown	W	8,760		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Gymnasium 1	Gymnasium 1	1	Other	0.5	70.0%	No	Unknown	Unknown	W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Gymnasium 1	Gymnasium 1	2	Supply Fan	3.0	87.5%	No	Unknown	Unknown	W	2,745	5	No	89.5%	Yes	2	1.8	5,477	0	$680	$9,110	$400	12.8
Alpha Public School	Alpha Public School	21	Supply Fan	0.2	65.0%	No	Unknown	Unknown	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Alpha Public School	Alpha Public School	2	Supply Fan	0.3	65.0%	No	Unknown	Unknown	W	2,745		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
Gymnasium 1	Gymnasium 1	2	Electric Forced Air Furnace		245.66		1 COP	ITT	LPE35	B		No							0.0	0	0	$0	$0	$0	0.0
Alpha Public Schools	Alpha Public Schools	20	Unit Ventilator		7.17		1 COP	ITT	700C	B		No							0.0	0	0	$0	$0	$0	0.0
Alpha Public Schools	Alpha Public Schools	6	Fan Coil		10.24		1 COP	ITT	E37 F	B		No							0.0	0	0	$0	$0	$0	0.0
Dining Area 1	Dining Area 1	2	Unit Ventilator		81.89		1 COP	ITT	Unknown	B		No							0.0	0	0	$0	$0	$0	0.0
Exterior 2	Alpha Public Schools	6	Split-System	4.00		12.00		Lennox	SSB048H4S44G	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior 2	Alpha Public Schools	1	Split-System	1.50	18.00	14.00	3.62 COP	Goodman	SSZ140181AC	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior 2	Alpha Public Schools	5	Split-System	3.00		10.00		York	AC036X1341A	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior 2	Alpha Public Schools	3	Split-System	3.50		13.00		Trane	4TTA3042A4000BA	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior 1	Alpha Public Schools	1	Ductless Mini-Split AC	0.75		10.00		EMI	WLHG09D0	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 11	Classroom 11	1	Window AC	1.00		12.10		GE	AEM12AXH1	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 3	Classroom 3	1	Window AC	0.99		11.00		GE	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 7	Classroom 7	1	Window AC	1.01		11.50		GE	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 8	Classroom 8	1	Window AC	1.01		11.50		GE	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Dining Area 1	Dining Area 1	2	Window AC	1.01		11.50		GE	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Office - Enclosed Rm 9	Office - Enclosed Rm 9	1	Window AC	0.96		12.10		GE	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Office - Enclosed Rm 9A	Office - Enclosed Rm 9A	1	Window AC	0.83		10.80		Electrolux	FAC107P1A	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 12	Classroom 12	2	Window AC	1.00		9.80		GE	AGV12AJG1	B	6	Yes	2	Window AC	1.00		12.00		0.2	180	0	$22	$1,884	$0	84.6
Classroom 13	Classroom 13	2	Window AC	1.00		9.80		GE	AGV12AHG1	B	6	Yes	2	Window AC	1.00		12.00		0.2	180	0	$22	$1,884	$0	84.6
Classroom 16	Classroom 16	1	Window AC	1.00		12.10		LG	LW1217ERSM	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 16	Classroom 16	1	Window AC	1.00		10.80		GE	AEM12AMG1	W		No							0.0	0	0	$0	$0	$0	0.0

		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
Office - Enclosed 23	Office - Enclosed 23	1	Window AC	0.54		11.00		Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom B2	Classroom B2	1	Window AC	0.83		9.50		Everstar	MPK-10CR	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 11	Classroom 11	1	Window AC	1.00		12.10		GE	AEM12AXH1	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 15A	Classroom 15A	1	Unit Ventilator	1.00	7.17	10.00	1 COP	Comitale	CRPOC184-000AZ	B		No							0.0	0	0	$0	$0	$0	0.0
Alpha Public Schools	Alpha Public Schools	3	Unit Ventilator		10.24		1 COP	Nesbitt	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0

Pipe Insulation Recommendations

Location	Area(s)/System(s) Affected	Recommendation Inputs: ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Energy Impact & Financial Analysis: 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 1	Alpha Public Schools	7	12	1.00	0.0	1,273	0	$158	$143	$24	0.8

DHW Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions: System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	Proposed Conditions: ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Energy Impact & Financial Analysis: 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 1	Alpha Public Schools	2	Storage Tank Water Heater (> 50 Gal)	AO Smith	DVE 120A 916	W		No						0.0	0	0	$0	$0	$0	0.0
Storage GYM	Alpha Public Schools	1	Storage Tank Water Heater (> 50 Gal)	Cemline Corp	V300EHB40.503	W		No						0.0	0	0	$0	$0	$0	0.0
Storage 2	Alpha Public Schools	1	Storage Tank Water Heater (≤ 50 Gal)	Cemline Corp	V40EHB13.503	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

Location	Recommedation Inputs: ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Energy Impact & Financial Analysis: 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
Kitchen 1	8	1	Pre-Rinse Spray Valve	2.20	1.28	0.0	299	0	$37	$124	$0	3.4

Walk-In Cooler/Freezer Inventory & Recommendations

Location	Existing Conditions: Cooler/ Freezer Quantity	Case Type/Temperature	Manufacturer	Model	Proposed Conditions: ECM #	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Energy Impact & Financial Analysis: 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	1	Medium Temp Freezer (0F to 30F)	Russell	RLH215L44-E/AE26-92B-DS	9	Yes	No	No	0.3	4,122	0	$512	$607	$80	1.0

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
Kitchen 1	1	Freezer Chest	Unknown	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	1	Refrigerator Chest	Powers Equipment	681	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	1	Refrigerator Chest	TRUE	TMC-58	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	Dukers	Unknown	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
Kitchen 1	1	Insulated Food Holding Cabinet (3/4 Size)	Metro C5	3 Series	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	1	Gas Rack Oven (Single)	Garland	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	1	Electric Combination Oven/Steam Cooker (<15 Pans)	Unknown	Unknown	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
Elctrical Room 1	1	Pnumatic Air Dryer	200	Yes	SPX Hankison	HPR5-10115
Alpha Public Schools	4	Coffee Machine	800	No	Varied	Varied
Storage 3	1	Dehumidifier	704	No	Therma Star	4029700
Alpha Public Schools	25	Desktop	250	No	Varied	Varied
Server Room 21A	3	Misc. Computer Equipment	750	No	Varied	Varied
Alpha Public Schools	46	Ceiling Fan	200	No	Varied	Varied
Mechanical 1	1	Fan	200	No	Unknown	Unknown
Alpha Public Schools	197	Laptop	150	No	Varied	Varied
Alpha Public Schools	5	Microwave	1,000	No	Unknown	Unknown
Alpha Public Schools	9	Printer	150	No	Unknown	Unknown
Alpha Public Schools	3	Copier	1,500	Yes	Savin	Varied
Alpha Public Schools	19	Projector	150	No	Epson	Unknown
Alpha Public Schools	7	Mini Refrigerator	126	No	Varied	Varied
Dining Area 1	1	Refrigerator	300	No	Eelectrolux	FFTR1814QW1
Office - Room 9	1	Scanner	75	No	Unknown	Unknown
Classroom 1	1	Smart Board	150	Yes	Smart Board	Unknown
Office - Faculty Room	1	Toaster Oven	1,500	No	Unknown	Unknown
Dining Area 1	1	Water Fountain	150	No	Elkay	FD700_10_1J_MDN

Custom (High Level) Measure Analysis

Electric Tank Water Heater to HPWH

NOTE: HPWH calculation should not be used for existing water heaters with a storage capacity greater than 120 gal.

Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis										
Description	Area(s)/System(s) Served	SF of Area Served	Fuel Type	Input Capacity per Unit (kW)	Tank Capacity per Unit (Gal)	Description	COP	Tank Capacity per Unit (Gal)	Estimated Unit Cost	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Base Incentives	Enhanced Incentives	Total Incentives	Total Net Cost	Payback w/o Incentives in Years	Payback w/ Incentives in Years
Storage Tank Water Heater (>50 Gal)	Mechanical 1	2,500	Electric	36.0	119	Heat Pump Water Heater	2.5	119	$4,544.73	0.00	3,077	0	$382	$4,545	$0	$0	$0	$4,545	11.90	11.90
Storage Tank Water Heater (>50 Gal)	Mechanical 1	2,500	Electric	36.0	119	Heat Pump Water Heater	2.5	119	$4,544.73	0.00	3,077	0	$382	$4,545	$0	$0	$0	$4,545	11.90	11.90
			Electric																	

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

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ENERGY STAR® Score[1]

Alpha Public School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 48,000
Built: 1913

For Year Ending: February 28, 2023
Date Generated: August 03, 2023

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
Alpha Public School 817 North Boulevard Phillipsburg, New Jersey 08865	Alpha Public School 817 North Boulevard Alpha, NJ 08865 (908) 454-5000	Tim Mantz 817 North Boulevard Alpha, NJ 08865 (908) 454-5000 tmantz@apsedu.org

Property ID: 27488979

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
51.3 kBtu/ft²

Source EUI
143.6 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	2,462,281 (100%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	36.4
National Median Source EUI (kBtu/ft²)	102.1
% Diff from National Median Source EUI	41%

Annual Emissions

Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	214

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

____ ________
,
(___)____-______
____

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 (II)	*Solar renewable energy credit*: a credit 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 $1/8^{th}$ 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.