Local Government Energy Audit Report

Bethlehem Township School District

November 6, 2024

Prepared for:
Thomas B. Conley Elementary School
940 Iron Bridge Road
Asbury, New Jersey 08802

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.

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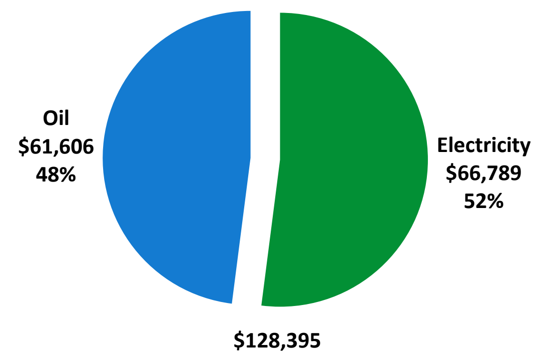
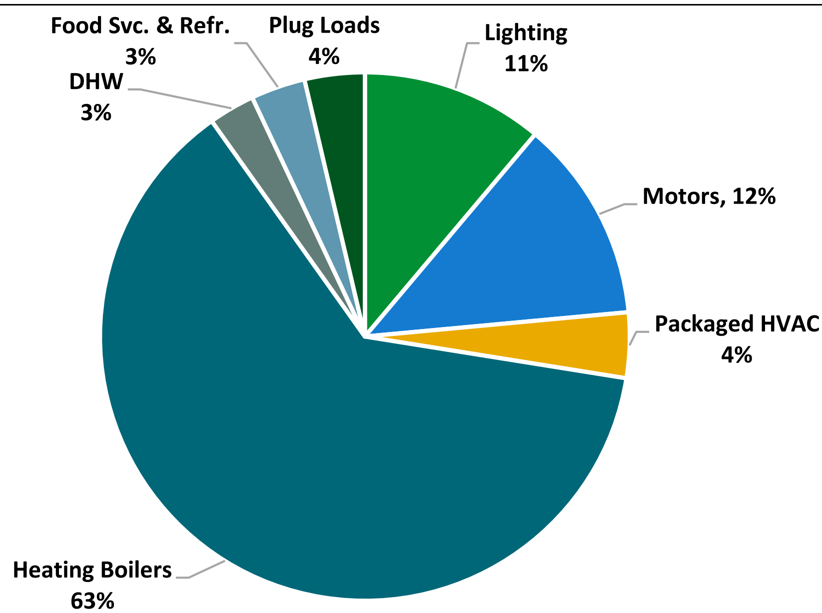
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Bethlehem Township School District. 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 Energy Utilities	Costs: $128,395 Electricity: 498,560 kWh No. 2 Fuel Oil: 20,182 Gallons	
ENERGY STAR® Benchmarking Score	23 *(1-100 scale)*	This building performs at or below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.



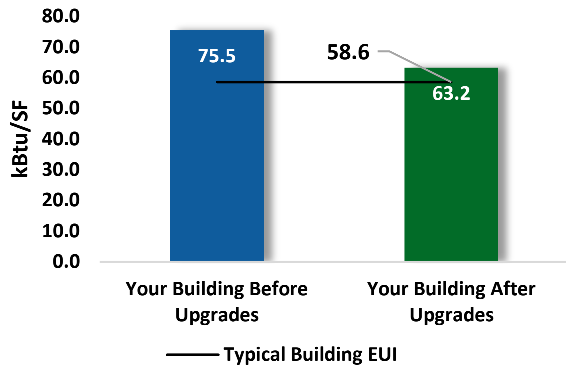
Energy Use by System

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.

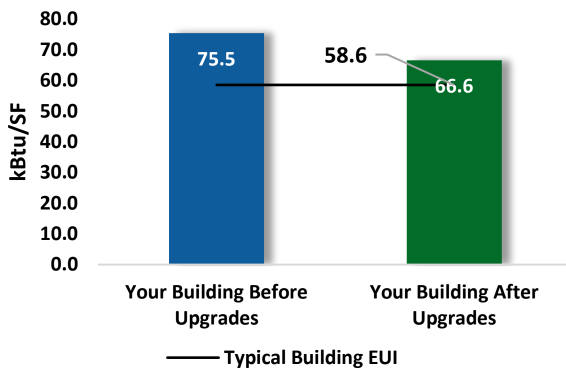
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$397,250
Potential Rebates & Incentives[1]	$37,430
Annual Cost Savings	$26,592
Annual Energy Savings	Electricity: 178,617 kWh No. 2 Fuel Oil: 873 Gallons
Greenhouse Gas Emission Savings	100 Tons
Simple Payback	13.5 Years
Site Energy Savings (All Utilities)	16%



Scenario 2: Cost Effective Package[2]

Installation Cost	$160,990
Potential Rebates & Incentives	$24,520
Annual Cost Savings	$21,623
Annual Energy Savings	Electricity: 168,594 kWh No. 2 Fuel Oil: -315 Gallons
Greenhouse Gas Emission Savings	81 Tons
Simple Payback	6.3 Years
Site Energy Savings (all utilities)	12%



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			**88,396**	**29.7**	**-37**	**$11,028**	**$63,760**	**$9,550**	**$54,210**	**4.9**	**82,966**
ECM 1	Install LED Fixtures	Yes	33,376	11.2	-14	$4,164	$25,780	$2,000	$23,780	5.7	31,326
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	6,027	2.0	-3	$752	$4,250	$500	$3,750	5.0	5,657
ECM 3	Retrofit Fixtures with LED Lamps	Yes	48,992	16.5	-20	$6,112	$33,730	$7,050	$26,680	4.4	45,983
Lighting Control Measures			**16,035**	**5.4**	**-7**	**$2,000**	**$35,170**	**$7,460**	**$27,710**	**13.9**	**15,050**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	14,401	4.8	-6	$1,797	$29,260	$3,580	$25,680	14.3	13,517
ECM 5	Install High/Low Lighting Controls	Yes	1,633	0.5	-1	$204	$5,910	$3,880	$2,030	10.0	1,533
Variable Frequency Drive (VFD) Measures			**27,127**	**7.5**	**0**	**$3,634**	**$41,500**	**$6,500**	**$35,000**	**9.6**	**27,317**
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	9,511	4.8	0	$1,274	$16,900	$2,700	$14,200	11.1	9,577
ECM 7	Install VFDs on Heating Water Pumps	Yes	17,616	2.7	0	$2,360	$24,600	$3,800	$20,800	8.8	17,739
Unitary HVAC Measures			**8,222**	**9.2**	**0**	**$1,102**	**$85,500**	**$5,200**	**$80,300**	**72.9**	**8,280**
ECM 8	Install High Efficiency Air Conditioning Units	No	8,222	9.2	0	$1,102	$85,500	$5,200	$80,300	72.9	8,280
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**165**	**$3,626**	**$146,000**	**$7,500**	**$138,500**	**38.2**	**26,936**
ECM 9	Install High Efficiency Hot Water Boilers	No	0	0.0	165	$3,626	$146,000	$7,500	$138,500	38.2	26,936
HVAC System Improvements			**955**	**0.0**	**0**	**$128**	**$120**	**$20**	**$100**	**0.8**	**961**
ECM 10	Install Pipe Insulation	Yes	955	0.0	0	$128	$120	$20	$100	0.8	961
Domestic Water Heating Upgrade			**2,453**	**0.0**	**0**	**$329**	**$250**	**$120**	**$130**	**0.4**	**2,470**
ECM 11	Install Low-Flow DHW Devices	Yes	2,453	0.0	0	$329	$250	$120	$130	0.4	2,470
Food Service & Refrigeration Measures			**13,271**	**1.4**	**0**	**$1,778**	**$16,950**	**$1,080**	**$15,870**	**8.9**	**13,364**
ECM 12	Dishwasher Replacement	Yes	9,072	1.0	0	$1,215	$10,800	$700	$10,100	8.3	9,136
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	786	0.1	0	$105	$1,120	$120	$1,000	9.5	792
ECM 14	Refrigeration Controls	No	1,801	0.0	0	$241	$4,760	$210	$4,550	18.9	1,814
ECM 15	Vending Machine Control	Yes	1,612	0.2	0	$216	$270	$50	$220	1.0	1,623
Custom Measures			**22,158**	**0.0**	**0**	**$2,968**	**$8,000**	**$0**	**$8,000**	**2.7**	**22,313**
ECM 16	Replace Electric Water Heater with Heat Pump Water Heater	Yes	22,158	0.0	0	$2,968	$8,000	$0	$8,000	2.7	22,313
TOTALS (COST EFFECTIVE MEASURES)			**168,594**	**43.9**	**-44**	**$21,623**	**$160,990**	**$24,520**	**$136,470**	**6.3**	**162,628**
TOTALS (ALL MEASURES)			**178,617**	**53.1**	**121**	**$26,592**	**$397,250**	**$37,430**	**$359,820**	**13.5**	**199,658**

* - 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).

All Evaluated Energy Improvements[3]

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

[3] 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.

1.1 Planning Your Project

Careful planning makes for a successful energy project. When considering this scope of work, you will have some decision 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 for the largest energy consumers in the state. Customers in this category spend about $5 million a year on energy bills. This program 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 Bethlehem Township School District. 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 August 19, 2024, TRC performed an energy audit at Bethlehem Township School District located in Asbury, New Jersey. TRC met with Raymond Mulvey to review the facility operations and help focus our investigation on specific energy-using systems.

Thomas B Conley Elementary School is a single-story elementary school serving students in grades K-8 in Bethlehem Township. The building is approximately 59,584 square feet and is comprised of the original building and an addition. The original building was constructed in 1972, and the addition was put on in 2000. The building spaces include bathrooms, classrooms, gymnasium, lounge areas, cafeteria, mechanical spaces, and commercial kitchen with a walk-in fridge and freezer. The building operates year-round from 7:00 am to 6:00 pm and the classroom hours are from 8:00 am to 3:00 pm.

Recent Improvements and Facility Concerns

The facility recently completed a full lighting retrofit and a replacement of all their rooftop HVAC units. They have plans to renovate the metal roof on the 1972 building. There is also a desire from the facility to pipe a new gas line to serve the elementary school. but the project has been deferred for 3-5 years due to road repairs. There is an upcoming referendum project where the school is going to be consolidating with a nearby elementary school and building an additional wing. They use wells for water and have plans to upgrade the filtration system to filter PFAS.

2.2 Building Occupancy

The facility is occupied Monday through Friday from 7:00 am to 6:00 pm by staff, employees and students. The classroom hours are from 8:00 am to 3:00 pm with some seasonal after-school activities. Janitorial services are performed before and after hours.

Building Name	Weekday/Weekend	Operating Schedule
Classroom Hours	Weekday	8:00 AM - 3:00 PM
	Weekend	N/A
Summer Hours	Weekday	7:00 AM - 4:00 PM
	Weekend	N/A
General Operating Hours	Weekday	7:00 AM - 6:00 PM
	Weekend	N/A

Building Occupancy Schedule

2.3 Building Envelope

The old building is a modular building made of concrete with all steel trusses and a metal seam roof. The roof is in poor condition and there are plans to replace it. The new building walls are concrete block over structural steel with a stucco finish and sections that have a brick façade. The roof is flat and covered with a white membrane and is in good condition.

Most of the windows are double paned with aluminum frames. The glass-to-frame seals are in good condition as are the operable window weather seals, showing little evidence of excessive wear. Exterior doors have aluminum frames and are in good condition with undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration.

Front Door of New Building

Side Door of New Building

Windows of New Building

Old Building Windows

Old Building Door

Old Building Walls

New Building Walls

Old Building Walls and Roof

2.4 Lighting Systems

The primary interior lighting system uses various types of LED lamps and linear tubes. The facility had a recent lighting retrofit as part of a Direct Install program and replaced the existing 32-Watt linear fluorescent T8 lamps and several 40-Watt T12 fixtures. Fixture types include 2-lamp, 3-lamp, or 4-lamp, 4-foot-long troffers in the hallways, classrooms, storage rooms, kitchen and mechanical spaces, LED recesses cans in the corridors lobby and above doorways, and surface mounted integrated fixtures in the hallways.

The previous linear fluorescent fixtures have been converted to operate LED tube lamps. Additionally, there are some LED general purpose lamps.

The gymnasium fixtures have manually controlled high bay integrated LED lamps that were recently installed. The facility replaced the 70-Watt high bay metal halides that had been there previously. Most of the exit signs are LED; however, there are a few that appeared to be inoperable.

Most fixtures are in good condition and the interior lighting levels were generally sufficient.

The exterior lights are all LED. The building exterior is illuminated by integrated LED wall packs and wall sconces. In the parking lot there are one-arm and two-arm pole mounted LED fixtures. All the exterior fixtures are controlled by a timeclock.

LED Linear Tubes & Integrated

LED Lamps

LED Wall Pack

Exit Sign

Wall Sconce

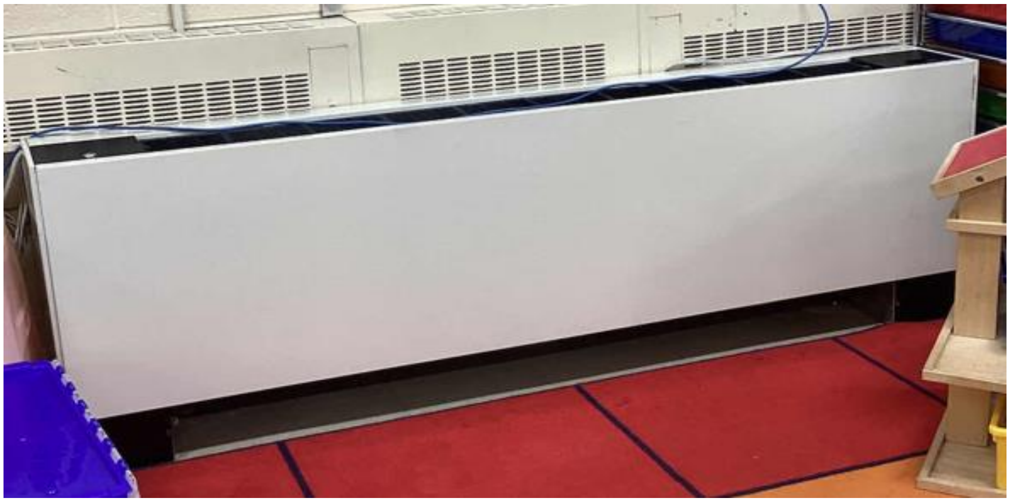
LED Parking Lot Lights

2.5 Air Handling Systems

Unit Ventilators

The horizontal unit ventilators are equipped with supply fan motors and are connected to the heating hot water boiler system in the old building. These units provide heating and ventilation to classrooms. The units were installed about twenty years ago and are at the end of their useful life. The vertical Airedale unit ventilators in the new building are connected to the new building's heating hot water boiler and the rooftop units. These units have supply fans that blow over coils to provide heating, cooling, and ventilation to classrooms. These units are also nearing the end of their useful life

Classroom Airedale



Classroom Unit Ventilator

Unitary Electric HVAC Equipment

Various office areas throughout the school are conditioned by unitary electric HVAC equipment. These include four split air conditioning (AC) systems in the courtyard and on the exterior of the old building that condition the main office, room 121, library, and nurse's office. The unit conditioning the main office is operating within its useful lifetime and has a cooling capacity of 2 tons and a cooling efficiency of 11 EER. The other three units are operating outside their lifetime. The condensing unit serving the library is 5 tons and has a cooling efficiency of 10 EER. The unit serving the nurse's office is 2 tons and has a cooling efficiency of 9 EER. The unit serving room 121 is 3.5 tons and has a cooling mode efficiency of 9 EER.

Several classrooms in the old building have portable AC units that are used for space cooling. These units have a cooling capacity of 1.17 tons and a cooling efficiency of 7.8 EER. The only unitary electric HVAC equipment serving the new building is a rooftop mounted spit system AC. This unit serves the boys' and girls' restrooms.

Courtyard Condensing Units

Exterior Condensing Units

GE Portable AC

Airedale Mini-Split

<u>Unitary Heating Equipment</u>

The kitchen and storage room 112 are heated by electric resistance heaters with an estimated capacity of 7.5kW. These units are in good condition and controlled by a manual dial thermostat on the units themselves.

Electric Unit Heater

Packaged Units

The new building is served by multiple packaged rooftop units with direct expansion cooling and heating hot water coils fed by the boiler. The gym, STEM lab, classrooms, art room, and music room are cooled by the rooftop units and unit ventilators, which are equipped with refrigerant coils. The units were recently replaced and are in great condition. The scheduling for the units and supply air temperatures are controlled by the facility BMS. Classroom occupants have a 5-degree level of control over the space temperature, which is controlled by a local programmable thermostat tied to the BMS.

The new building is served by multiple packaged roof top units, including:

Unit	Area Served	Size	Efficiency
RTU-1	Classrooms	14.6 Tons	14.5 SEER
RTU-2	STEM Lab	8.6 Tons	15.2 SEER
RTU-3	Classrooms 127 & 128	7 Tons	15.2 SEER
RTU-4	Art Room	7 Tons	15.2 SEER
RTU-5	Music Room	7 Tons	15.2 SEER
RTU-6	Gymnasium North	12.5 Tons	9.7 SEER
RTU-7	Gymnasium South	13.5 Tons	9.7 SEER

Refer to Appendix A for detailed information about each unit.


RTU 1 and 2


RTU 4 and 5

RTU 3


Gymnasium RTU

2.6 Heating Hot Water Systems

Four heating hot water boilers serve the building's heating load. Two HB Smith 1,139 MBh No. 2 oil-fired heating hot water boilers serve the old building and two Smith cast iron 1,014 MBh heating hot water boilers serve the new building. The combustion air fans are non-modulating and have an efficiency of 70%. In the old building, two, 5 hp heating hot water pumps deliver hot water to end use. The boilers in the new building have two, 7.5 hp heating hot water pumps that serve the new addition, and a fuel oil pump that pumps the fuel oil to the combustion chamber from the fuel tanks. The boilers are configured in lead-lag arrangement and only one of the boilers is required under normal conditions. Occasionally two boilers operate under high load conditions. These boilers are original to the building and in poor condition. TRC recommends replacing the boilers. If the supply water temperatures are below 130º, it is possible to install a condensing hot water system. Supply temperatures are controlled through the facility BMS.


Old Building Boilers 1 and 2

Heating Hot Water Pump

Combustion Air Fan

New Building Boilers 1 and 2

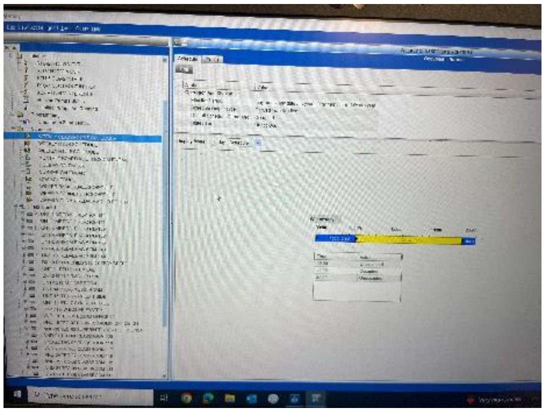
Heating Hot Water Pumps

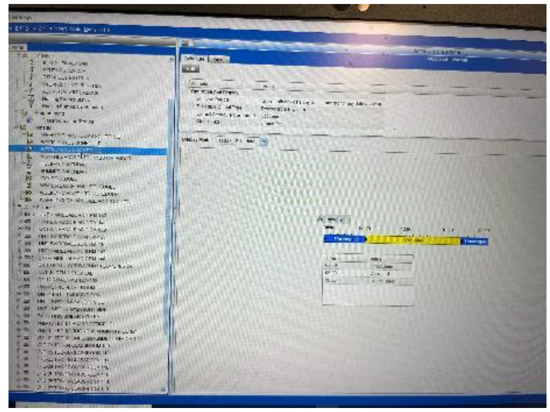
Fuel Oil Pump

2.7 Building Automation System (BAS)

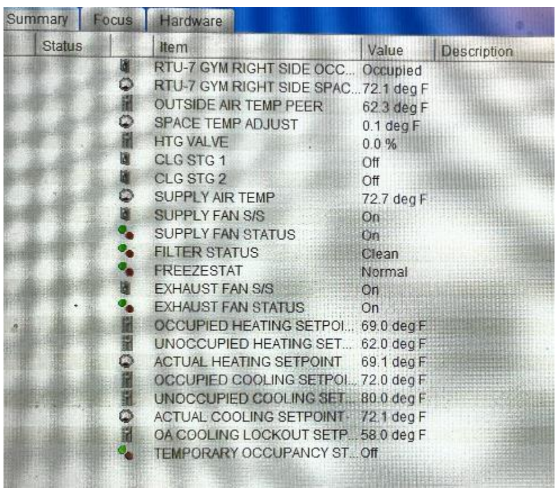
A BAS controls the HVAC equipment, boilers, air handlers, and packaged units throughout the building. The BAS provides equipment scheduling control, monitors and controls space temperatures, supply air temperatures, and heating water loop temperatures.

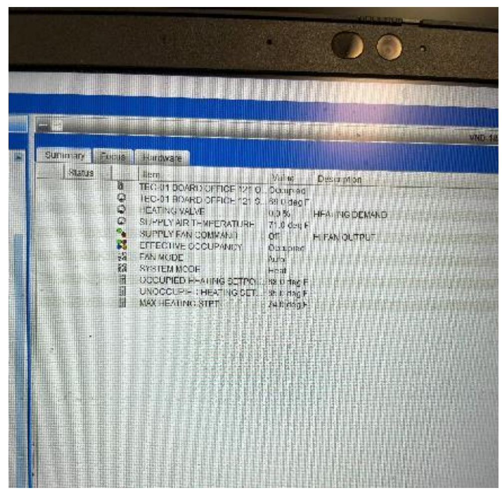
The site staff expressed an interest in expanding the level of control provided by the BAS, replacing the BAS, and receiving additional training on operating the BAS.



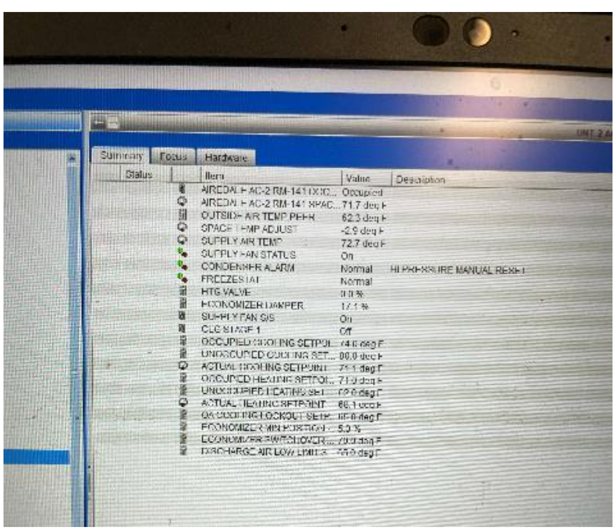


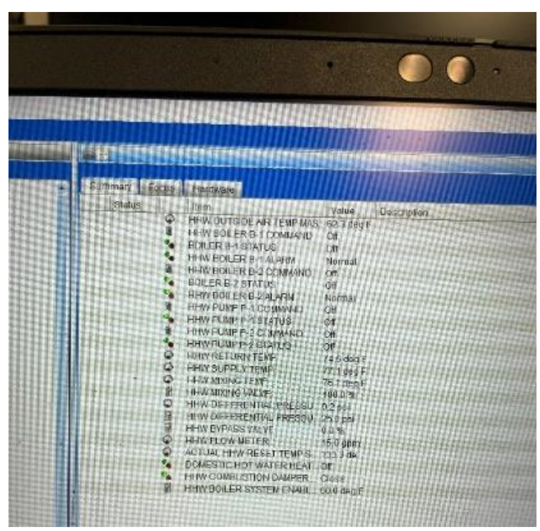
BAS Program





BAS Program





BAS Program

2.8 Domestic Hot Water

Domestic hot water in the old building is produced by an 80-gallon, 12.1 kW electric storage water heater with an accompanying 119-gallon unconditioned storage tank. The new building has an 80-gallon, 18 kW condensing electric storage water heater. Small fractional power domestic hot water circulation pumps circulate water to end uses.

The domestic hot water pipes are partially insulated, and the insulation is in generally good condition.

Old Building DHW Heater

Storage Tank

Circulation Pump

DHW Heater

DHW Circulation Pump

2.9 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, and an electric stove top. Bulk prepared foods are held in electric holding cabinets. Only the Vulcan half-size oven is high efficiency, and most equipment is in good condition.

The dishwasher is an ENERGY STAR high temperature rack type unit that comes with a 3-gallon, 70°Frinse booster heater.

Our analysis determined that the building's food service equipment accounts for a relatively high proportion of overall energy use. While cost effective opportunities to replace equipment are limited at this time, we recommend that you work with your food service equipment suppliers to maintain the equipment in a way that minimizes energy use. This may include cleaning air intakes and exhausts or other methods of keeping your existing equipment operating in top shape. When food service equipment is eventually replaced, consider installing high efficiency or ENERGY STAR labeled equipment.

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

Electric Stove

Half Oven

Full Oven

Insulated Food Holding Cabinet

Dishwasher

2.10 Refrigeration

The kitchen has a walk-in refrigerator and walk-in freezer. The walk-in refrigerator has a 0.58-ton compressor located in the mechanical room above the kitchen and a one-fan, 49.7-Watt evaporator. The walk-in medium temperature freezer has an estimated 0.60-ton compressor and a two-fan, 99.5-Watt evaporator. There is a freezer chest for ice cream and refrigerator chest for beverages. All equipment is standard efficiency and in good condition.

Our analysis determined that this building's refrigeration equipment accounts for a relatively high proportion of overall energy use. While cost effective opportunities to replace equipment are limited at this time, we recommend that you work with your refrigeration suppliers to maintain equipment in a way that minimizes energy use. When refrigeration equipment does need to be replaced consider installing high efficiency or ENERGY STAR labeled equipment.

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

Milk Cooler

Ice Cream Freezer

Walk-In Refrigerator

Walk- Freezer

Refrigerator Evaporator Fan

Freezer Evaporator Fan

Refrigerator Compressor

Freezer Compressor

2.11 Plug Load and Vending Machines

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

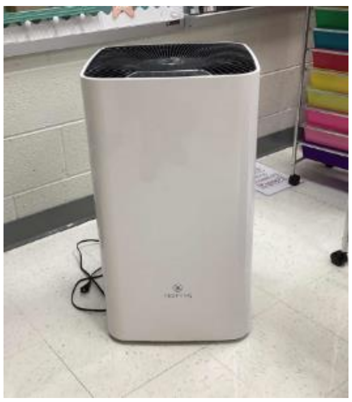
There are ten computer workstations throughout the facility. Plug loads include general cafe and office equipment. There are classroom typical loads such as smartboards, projectors, air purifiers, speakers, and fans. There are also two servers on site.

There are two residential-style refrigerators and two mini refrigerators throughout the building that are used to store employee lunches. These vary in condition and efficiency.

There is one refrigerated beverage vending machine that is not equipped with occupancy-based controls.

Desktop

Large Printer/Copier



Air Purifier

Paper Shredder

Server

Residential Refrigerator

Vending Machine

Water Cooler

2.12 Water-Using Systems

Water is provided by an on-site well. Potable water is used for drinking, cleaning, cooking, sanitary fixtures, and building conditioning. Water leaks were not observed on-site.

EPA WaterSense® has set maximum flow rates for sanitary fixtures. They are: 1.28 gallons per flush (gpf) for toilets, 0.5 gpf for urinals, 1.5 gallons per minute (gpm) for lavatory faucets, and 2.0 gpm for showerheads. There are several restrooms with toilets, urinals, and sinks and classrooms with sinks as well. The faucets all had aerators, and the flow rates were rated at 1.5 gpm.

Toilet

Sink

Urinals

2.13 Makeup Air Unit

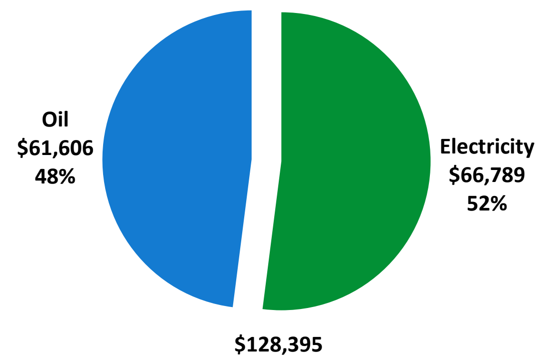
There are two make up air units that provide fresh air to the facility. Both MAU's are in the old building. There are two large 5 hp supply fans and two large 5 hp exhaust fans that are connected to the kitchen ventilation hoods. The air is exhausted through the roof. Additionally, there is a large MAU with a 2 hp supply fan and a 5 hp exhaust fan that serves the main office and room 121. Connected to this unit is a ½ hp supply fan that ventilates the boiler room. This unit doesn't provide heating or cooling to the spaces. Instead, it simply provides fresh air.

Kitchen MAU

3 Energy Use and Costs

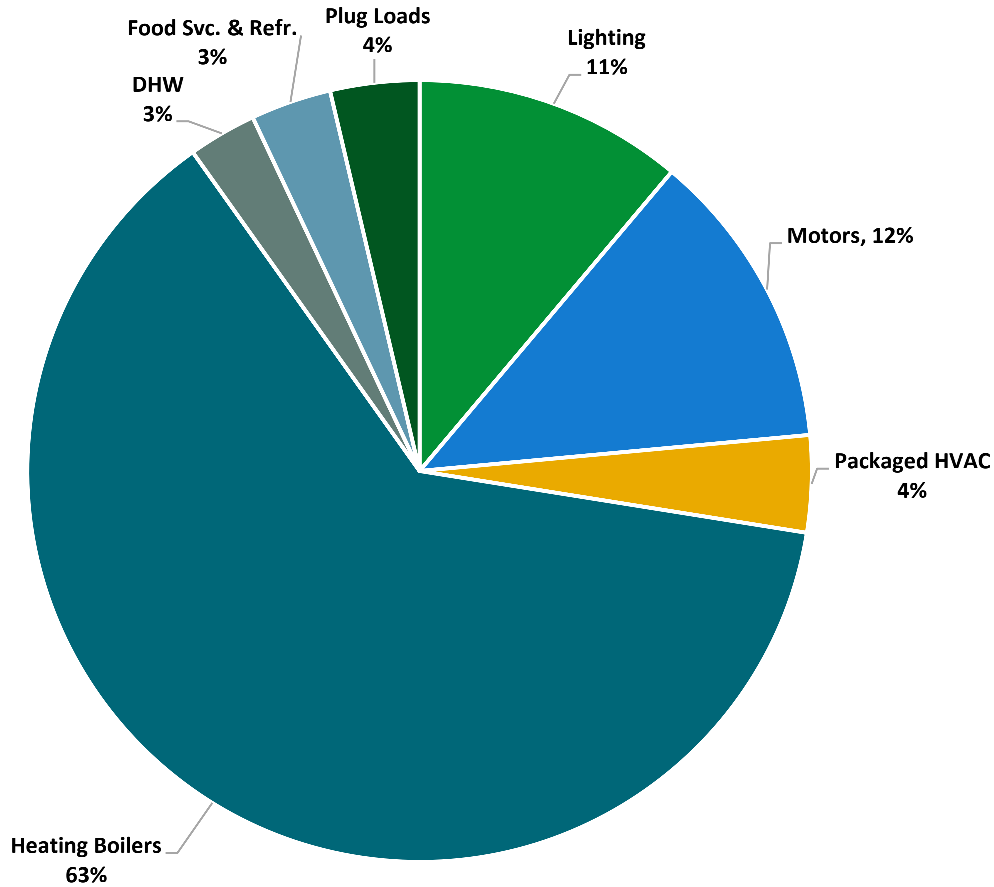
Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

Utility Summary		
Fuel	Usage	Cost
Electricity	498,560 kWh	$66,789
No. 2 fuel oil	20,182 Gallons	$61,606
Total		$128,395



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.

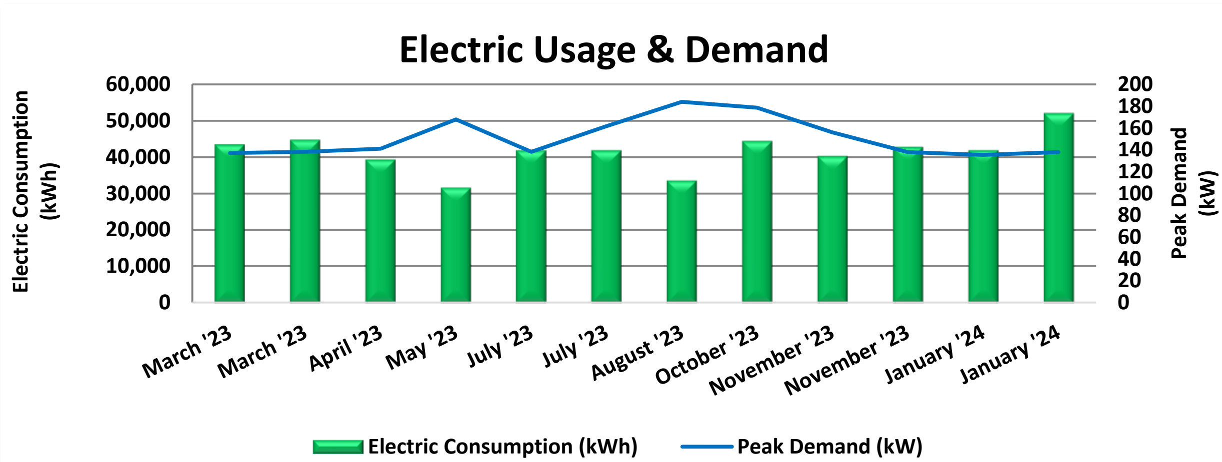
The energy auditor collects information regarding equipment operating hours, capacity, efficiency, and other operational parameters from facility staff, drawings, and on-site observations. This information is used as the inputs to calculate the existing conditions energy use for the site. The calculated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



Energy Balance by System

3.1 Electricity

JCP&L delivers electricity under rate class General Service Secondary 3 Phase JC_GS3_01D, with electric production provided by Direct Energy, a third-party supplier.



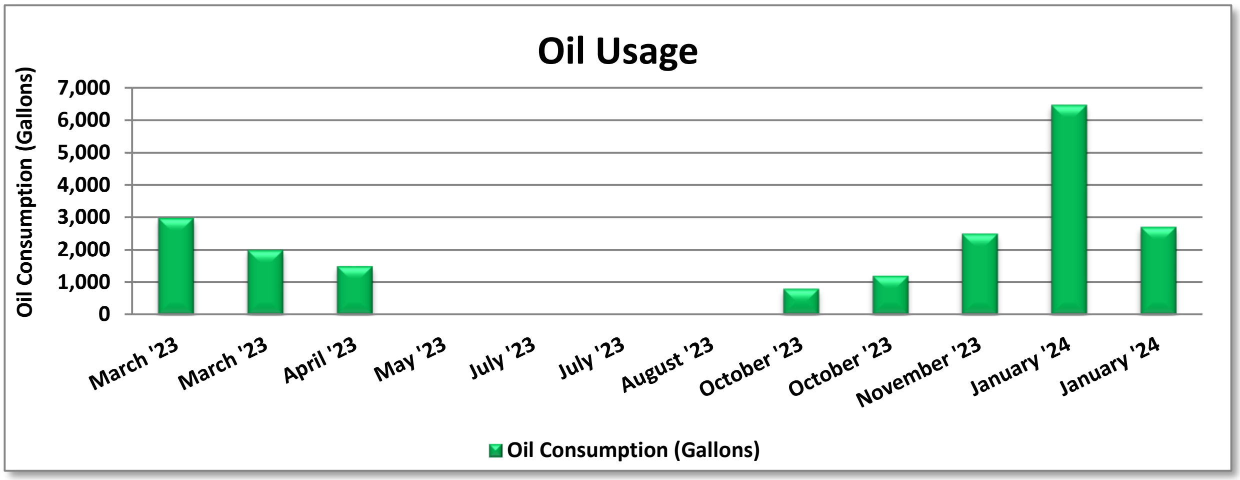
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
3/16/23	29	43,520	137	$937	$5,638
4/14/23	29	44,800	138	$946	$5,820
5/15/23	31	39,360	141	$973	$5,251
6/14/23	30	31,680	168	$1,251	$4,721
7/17/23	33	41,920	138	$1,015	$5,675
8/15/23	29	41,920	162	$1,201	$5,675
9/15/23	31	33,600	184	$1, 378.08	$5,054
10/16/23	31	44,480	179	$1,244	$6,031
11/16/23	31	40,320	156	$1,079	$5,384
12/15/23	29	42,880	138	$944	$5,517
1/17/24	33	41,920	135	$925	$5,436
2/15/24	29	52,160	138	$944	$6,587
Totals	**365**	**498,560**	**184**	**$11,460**	**$66,789**
Annual	**365**	**498,560**	**184**	**$11,460**	**$66,789**

Notes:

- Peak demand of 184 kW occurred in August '23.
- Average demand over the past 12 months was 151 kW.
- The average electric cost over the past 12 months was $0.134/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 No. 2 Fuel Oil

Griffith-Allied Trucking delivers No. 2 fuel oil to the project site.



No. 2 fuel oil Billing Data			
Period Ending	**Days in Period**	**Oil Usage (Gallons)**	**Fuel Cost**
3/16/23	29	2,994	$9,477
4/14/23	29	2,000	$6,064
5/15/23	31	1,500	$3,908
6/14/23	30	0	$0
7/17/23	33	0	$0
8/15/23	29	0	$0
9/15/23	31	0	$0
10/16/23	31	800	$2,709
11/1/23	16	1,200	$4,064
12/15/23	44	2,500	$7,676
1/17/24	33	6,478	$19,339
2/15/24	29	2,709	$8,368
Totals	**365**	**20,182**	**$61,606**
Annual	**365**	**20,182**	**$61,606**

Notes:

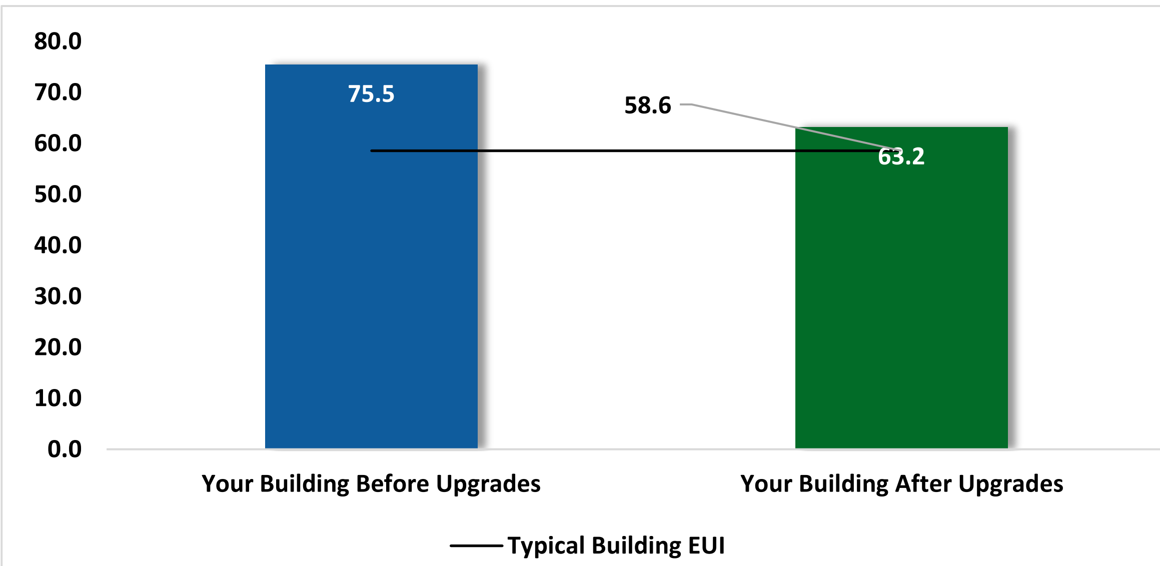
- The average No. 2 fuel oil cost for the past 12 months is $3.052/Gallon, which is the blended rate used throughout the analysis.
- Fuel deliveries do not necessarily correspond to periods of use.

3.3 Benchmarking

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

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

Benchmarking Score	23



Energy Use Intensity Comparison[4]

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

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.

[4] Based on all evaluated ECMs

Tracking your Energy Performance

Keeping track of your energy and water use on a monthly basis is one of the best ways to keep utility costs in check and keep your facility operating efficiently. 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.

3.4 Understanding Your Utility Bills

The State of New Jersey Department of the Public Advocate provides detailed information on how to read natural gas and electric bills. Your bills contain important information including account numbers, meter numbers, rate schedules, meter readings, and the supply and delivery charges. Gas and electric bills both provide comparisons of current energy consumption with prior usage.

Sample bills, with annotation, may be viewed at:
https://www.nj.gov/rpa/docs/Understanding_Electric_Bill.pdf
https://www.nj.gov/rpa/docs/Understanding_Gas_Bill.pdf

Why Utility Bills Vary

Utility bills vary from one month to another for many reasons. For this reason, assessing the effects of your energy savings efforts can be difficult.

Billing periods vary, typically ranging between 28 and 33 days. Electric bills provide the kilowatt-hours (kWh) used per month while gas bills provide therms (or hundreds of cubic feet - CCF) per month consumption information. Monthly consumption information can be helpful as a tool to assess your efforts to reduce energy, particularly when compared to monthly usage from a similar calendar period in a prior year.

Bills typically vary seasonally, often with more gas consumed in the winter for heating, and more electricity used in the summer when air conditioning is used. Facilities with electric heating may experience higher electricity use in the winter. Seasonal variance will be impacted by the type of heating and cooling systems used. Normal seasonal fluctuations are further impacted by the weather. Extremely cold or hot weathers causes HVAC equipment to run longer, increasing usage. Other monthly fluctuations in usage can be caused by changes in building occupancy. Utility bills provide a comparison of usage between the current period and comparable billing month period of the prior year. Year-to-year monthly use comparisons can point to trends with energy savings for measures/projects that were implemented within the timeframe, but these comparisons do not account for changing weather of occupancy patterns.

The price of fuel and purchased power used to produce and delivery electricity and gas fluctuates. Any increase or decrease in these costs will be reflected in your monthly bill. Additionally, billing rates occasionally change after justification and approval of the NJBPU. For this reason, it is more useful to review energy use rather than cost when assessing energy use trends or the impact of energy conservation measures implemented.

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)
Lighting Upgrades			**88,396**	**29.7**	**-37**	**$11,028**	**$63,760**	**$9,550**	**$54,210**	**4.9**	**82,966**
ECM 1	Install LED Fixtures	Yes	33,376	11.2	-14	$4,164	$25,780	$2,000	$23,780	5.7	31,326
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	6,027	2.0	-3	$752	$4,250	$500	$3,750	5.0	5,657
ECM 3	Retrofit Fixtures with LED Lamps	Yes	48,992	16.5	-20	$6,112	$33,730	$7,050	$26,680	4.4	45,983
Lighting Control Measures			**16,035**	**5.4**	**-7**	**$2,000**	**$35,170**	**$7,460**	**$27,710**	**13.9**	**15,050**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	14,401	4.8	-6	$1,797	$29,260	$3,580	$25,680	14.3	13,517
ECM 5	Install High/Low Lighting Controls	Yes	1,633	0.5	-1	$204	$5,910	$3,880	$2,030	10.0	1,533
Variable Frequency Drive (VFD) Measures			**27,127**	**7.5**	**0**	**$3,634**	**$41,500**	**$6,500**	**$35,000**	**9.6**	**27,317**
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	9,511	4.8	0	$1,274	$16,900	$2,700	$14,200	11.1	9,577
ECM 7	Install VFDs on Heating Water Pumps	Yes	17,616	2.7	0	$2,360	$24,600	$3,800	$20,800	8.8	17,739
Unitary HVAC Measures			**8,222**	**9.2**	**0**	**$1,102**	**$85,500**	**$5,200**	**$80,300**	**72.9**	**8,280**
ECM 8	Install High Efficiency Air Conditioning Units	No	8,222	9.2	0	$1,102	$85,500	$5,200	$80,300	72.9	8,280
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**165**	**$3,626**	**$146,000**	**$7,500**	**$138,500**	**38.2**	**26,936**
ECM 9	Install High Efficiency Hot Water Boilers	No	0	0.0	165	$3,626	$146,000	$7,500	$138,500	38.2	26,936
HVAC System Improvements			**955**	**0.0**	**0**	**$128**	**$120**	**$20**	**$100**	**0.8**	**961**
ECM 10	Install Pipe Insulation	Yes	955	0.0	0	$128	$120	$20	$100	0.8	961
Domestic Water Heating Upgrade			**2,453**	**0.0**	**0**	**$329**	**$250**	**$120**	**$130**	**0.4**	**2,470**
ECM 11	Install Low-Flow DHW Devices	Yes	2,453	0.0	0	$329	$250	$120	$130	0.4	2,470
Food Service & Refrigeration Measures			**13,271**	**1.4**	**0**	**$1,778**	**$16,950**	**$1,080**	**$15,870**	**8.9**	**13,364**
ECM 12	Dishwasher Replacement	Yes	9,072	1.0	0	$1,215	$10,800	$700	$10,100	8.3	9,136
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	786	0.1	0	$105	$1,120	$120	$1,000	9.5	792
ECM 14	Refrigeration Controls	No	1,801	0.0	0	$241	$4,760	$210	$4,550	18.9	1,814
ECM 15	Vending Machine Control	Yes	1,612	0.2	0	$216	$270	$50	$220	1.0	1,623
Custom Measures			**22,158**	**0.0**	**0**	**$2,968**	**$8,000**	**$0**	**$8,000**	**2.7**	**22,313**
ECM 16	Replace Electric Water Heater with Heat Pump Water Heater	Yes	22,158	0.0	0	$2,968	$8,000	$0	$8,000	2.7	22,313
TOTALS			**178,617**	**53.1**	**121**	**$26,592**	**$397,250**	**$37,430**	**$359,820**	**13.5**	**199,658**

* - 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).

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		**88,396**	**29.7**	**-37**	**$11,028**	**$63,760**	**$9,550**	**$54,210**	**4.9**	**82,966**
ECM 1	Install LED Fixtures	33,376	11.2	-14	$4,164	$25,780	$2,000	$23,780	5.7	31,326
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	6,027	2.0	-3	$752	$4,250	$500	$3,750	5.0	5,657
ECM 3	Retrofit Fixtures with LED Lamps	48,992	16.5	-20	$6,112	$33,730	$7,050	$26,680	4.4	45,983
Lighting Control Measures		**16,035**	**5.4**	**-7**	**$2,000**	**$35,170**	**$7,460**	**$27,710**	**13.9**	**15,050**
ECM 4	Install Occupancy Sensor Lighting Controls	14,401	4.8	-6	$1,797	$29,260	$3,580	$25,680	14.3	13,517
ECM 5	Install High/Low Lighting Controls	1,633	0.5	-1	$204	$5,910	$3,880	$2,030	10.0	1,533
Variable Frequency Drive (VFD) Measures		**27,127**	**7.5**	**0**	**$3,634**	**$41,500**	**$6,500**	**$35,000**	**9.6**	**27,317**
ECM 6	Install VFDs on Constant Volume (CV) Fans	9,511	4.8	0	$1,274	$16,900	$2,700	$14,200	11.1	9,577
ECM 7	Install VFDs on Heating Water Pumps	17,616	2.7	0	$2,360	$24,600	$3,800	$20,800	8.8	17,739
HVAC System Improvements		**955**	**0.0**	**0**	**$128**	**$120**	**$20**	**$100**	**0.8**	**961**
ECM 10	Install Pipe Insulation	955	0.0	0	$128	$120	$20	$100	0.8	961
Domestic Water Heating Upgrade		**2,453**	**0.0**	**0**	**$329**	**$250**	**$120**	**$130**	**0.4**	**2,470**
ECM 11	Install Low-Flow DHW Devices	2,453	0.0	0	$329	$250	$120	$130	0.4	2,470
Food Service & Refrigeration Measures		**11,470**	**1.3**	**0**	**$1,537**	**$12,190**	**$870**	**$11,320**	**7.4**	**11,551**
ECM 12	Dishwasher Replacement	9,072	1.0	0	$1,215	$10,800	$700	$10,100	8.3	9,136
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors	786	0.1	0	$105	$1,120	$120	$1,000	9.5	792
ECM 15	Vending Machine Control	1,612	0.2	0	$216	$270	$50	$220	1.0	1,623
Custom Measures		**22,158**	**0.0**	**0**	**$2,968**	**$8,000**	**$0**	**$8,000**	**2.7**	**22,313**
ECM 16	Replace Electric Water Heater with Heat Pump Water Heater	22,158	0.0	0	$2,968	$8,000	$0	$8,000	2.7	22,313
TOTALS		**168,594**	**43.9**	**-44**	**$21,623**	**$160,990**	**$24,520**	**$136,470**	**6.3**	**162,628**

* - 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).

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		**88,396**	**29.7**	**-37**	**$11,028**	**$63,760**	**$9,550**	**$54,210**	**4.9**	**82,966**
ECM 1	Install LED Fixtures	33,376	11.2	-14	$4,164	$25,780	$2,000	$23,780	5.7	31,326
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	6,027	2.0	-3	$752	$4,250	$500	$3,750	5.0	5,657
ECM 3	Retrofit Fixtures with LED Lamps	48,992	16.5	-20	$6,112	$33,730	$7,050	$26,680	4.4	45,983

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.

<u>ECM 1: Install LED Fixtures</u>

Replace existing fixtures containing fluorescent lamps with new LED light fixtures. This measure saves energy by installing LEDs, which use less power than other technologies with a comparable light output.

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

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

Affected Building Areas: gymnasium metal halide

<u>ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers</u>

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

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

Affected Building Areas: dining area, faculty lounge, and corridors

<u>ECM 3: Retrofit Fixtures with LED Lamps</u>

Replace fluorescent 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: corridor, faculty lounge, boiler room, lobby, offices, restrooms, classroom, mechanical rooms, storage for classrooms and gymnasium

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		**16,035**	**5.4**	**-7**	**$2,000**	**$35,170**	**$7,460**	**$27,710**	**13.9**	**15,050**
ECM 4	Install Occupancy Sensor Lighting Controls	14,401	4.8	-6	$1,797	$29,260	$3,580	$25,680	14.3	13,517
ECM 5	Install High/Low Lighting Controls	1,633	0.5	-1	$204	$5,910	$3,880	$2,030	10.0	1,533

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 4: Install Occupancy Sensor Lighting Controls

Install occupancy sensors to control lighting fixtures in areas that are frequently unoccupied, even for short periods. For most spaces, we recommend that lighting controls use dual technology sensors, which reduces 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: boiler room, dining area, kitchen, mechanical room, offices, conference rooms, classrooms, gymnasium, library, restrooms, and storage rooms

ECM 5: Install High/Low Lighting Controls

Install occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons.

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

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

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage must be provided to ensure that lights turn on in each area as occupants approach the area. This measure provides energy savings by reducing the light fixture power draw when reduced light output is appropriate.

Affected Building Areas: hallways

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		**27,127**	**7.5**	**0**	**$3,634**	**$41,500**	**$6,500**	**$35,000**	**9.6**	**27,317**
ECM 6	Install VFDs on Constant Volume (CV) Fans	9,511	4.8	0	$1,274	$16,900	$2,700	$14,200	11.1	9,577
ECM 7	Install VFDs on Heating Water Pumps	17,616	2.7	0	$2,360	$24,600	$3,800	$20,800	8.8	17,739

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

ECM 6: Install 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. Energy savings result from reducing the fan speed (and power) when conditions allow for reduced air flow.

Affected Air Handlers: make up air unit in mechanical room 100

ECM 7: Install VFDs on Heating Water Pumps

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

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

Affected Pumps: mechanical room 132 heating hot water pumps, boiler room 100 heating hot water pumps

4.4 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**8,222**	**9.2**	**0**	**$1,102**	**$85,500**	**$5,200**	**$80,300**	**72.9**	**8,280**
ECM 8	Install High Efficiency Air Conditioning Units	8,222	9.2	0	$1,102	$85,500	$5,200	$80,300	72.9	8,280

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 split systems and cooling only rooftop units is eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 8: Install High Efficiency Air Conditioning Units

We evaluated replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling and heating load, and the estimated annual operating hours.

Affected Units: Carrier rooftop units and Airedale split system

4.5 No. 2 Oil-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**165**	**$3,626**	**$146,000**	**$7,500**	**$138,500**	**38.2**	**26,936**
ECM 9	Install High Efficiency Hot Water Boilers	0	0.0	165	$3,626	$146,000	$7,500	$138,500	38.2	26,936

ECM 9: Install High Efficiency Hot Water Boilers

We evaluated replacing older inefficient hot water boilers with high efficiency hot water boilers. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

For the purposes of this analysis, we evaluated the replacement of boilers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load. In many cases installing multiple modular boilers, rather than one or two large boilers, will result in higher overall plant efficiency while providing additional system redundancy.

4.6 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		**955**	**0.0**	**0**	**$128**	**$120**	**$20**	**$100**	**0.8**	**961**
ECM 10	Install Pipe Insulation	955	0.0	0	$128	$120	$20	$100	0.8	961

ECM 10: Install Pipe Insulation

Install insulation on domestic hot water system piping. Distribution system thermal losses are dependent on system fluid temperature, the size of the distribution system, and the extent and condition of piping insulation. When the insulation has been damaged due to exposure to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated, system thermal efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Affected Systems: domestic hot water piping

4.7 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		**2,453**	**0.0**	**0**	**$329**	**$250**	**$120**	**$130**	**0.4**	**2,470**
ECM 11	Install Low-Flow DHW Devices	2,453	0.0	0	$329	$250	$120	$130	0.4	2,470

ECM 11: 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.

4.8 Food Service and 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		**13,271**	**1.4**	**0**	**$1,778**	**$16,950**	**$1,080**	**$15,870**	**8.9**	**13,364**
ECM 12	Dishwasher Replacement	9,072	1.0	0	$1,215	$10,800	$700	$10,100	8.3	9,136
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors	786	0.1	0	$105	$1,120	$120	$1,000	9.5	792
ECM 14	Refrigeration Controls	1,801	0.0	0	$241	$4,760	$210	$4,550	18.9	1,814
ECM 15	Vending Machine Control	1,612	0.2	0	$216	$270	$50	$220	1.0	1,623

ECM 12: Dishwasher Replacement

Replace existing dishwashers with new energy-efficient door type dishwashers. New high efficiency models often use an average of 40% less energy and water, compared to current standard efficiency equipment.

ECM 13: Refrigerator/Freezer Case Electrically Commutated Motors

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

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

ECM 14: Refrigeration Controls

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

Many walk-in coolers and freezers have continuously operating electric heaters on the doors to prevent condensation formation. This measure adds a control system feature to shut off the door heaters when the humidity level is low enough that condensation will not occur if the heaters are off. This is done by measuring the ambient humidity and temperature of the store, comparing that to the dewpoint, and using pulse width modulation to control the anti-sweat door heaters.

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

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

Novelty coolers often run continuously. This measure adds a control system feature to automatically shut off novelty coolers based on pre-set store operating hours. Based on programmed hours, the control mechanism shuts off the cooler at the end of business and then begins operation on reduced cycles. Regular compressor operation begins the following day an hour before the start of business.

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

ECM 15: Vending Machine Control

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

4.9 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		**22,158**	**0.0**	**0**	**$2,968**	**$8,000**	**$0**	**$8,000**	**2.7**	**22,313**
ECM 16	Replace Electric Water Heater with Heat Pump Water Heater	22,158	0.0	0	$2,968	$8,000	$0	$8,000	2.7	22,313

ECM 16: Replace Electric Water Heater with Heat Pump Water Heater

Replace the existing electric water heaters with a heat pump water heater (HPWH).

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 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.[5] 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 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: both electric domestic hot water heaters

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

4.10 Measures for Future Consideration

There are additional opportunities for improvement that Thomas B. Conley Elementary School 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.

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

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

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

Upgrade/Replace Building Automation System

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

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

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

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

Replace Fuel Oil Fired Equipment with Natural Gas Equipment

Start by contacting your local gas utility to determine the cost of providing natural gas on site, or to expand your service to accommodate an added load. If the decision is made to replace the space heating boilers, we recommend that the district work with their mechanical design team to select boilers that are sized appropriately for the heating load. In many cases, installing multiple modular boilers, rather than one or two large boilers, will result in higher overall plant efficiency while providing additional system redundancy.

Switching from fuel oil to natural gas for space heating and domestic hot water equipment will reduce energy costs and reduce CO2 and other greenhouse gas emissions. From the U.S. Energy Information Administration, the pounds of CO2 emitted per MMBtu of fuel burned are 161.3 for fuel oil and 117.0 for natural gas.

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 works 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.

An electric furnace or boiler has no flue loss through a chimney. The AFUE rating for an all-electric furnace or boiler is between 95% and 100%. The lower values are for units installed outdoors because they have greater jacket heat loss. However, despite their high efficiency, the higher cost of electricity in most parts of the country makes all-electric furnaces or boilers an uneconomic choice. If you are interested in electric heating, consider installing a heat pump system.

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 a heat pump 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.

VRF Systems

Consider variable refrigerant flow (VRF) systems as part of a comprehensive package unit upgrade project. (VRF systems use direct expansion (DX) heat pumps to transport heat between an outdoor condensing unit and a network of indoor evaporators, located near or within the conditioned space, through refrigerant piping installed in the building. Attributes that distinguish VRF from other DX system types are:

- Multiple indoor units connected to a common outdoor unit
- Scalability
- Variable capacity
- Distributed control
- Simultaneous heating and cooling capability

VRF provides flexibility by allowing for many different indoor units (with different capacities and configurations), individual zone control, the unique ability to offer simultaneous heating and cooling in separate zones on a common refrigerant circuit, and heat recovery from one zone to another. VRF systems are equipped with at least one variable-speed and/or variable-capacity compressor.

To match the building's load profiles, energy is transferred from one indoor space to another through the refrigerant line, and only one energy source is necessary to provide both heating and cooling. VRF systems also operate efficiently at part load because of the compressor's variable capacity control. VRF systems are ideal for applications with varying loads or where zoning is required. Some other advantages of VRF systems include consistent comfort, quiet operation, energy efficiency, installation flexibility, zoned heating and cooling, state-of-the-art controls, and reliability.

VRF systems are more expensive than conventional heat pump systems; however, the higher initial cost can be offset by improved cooling efficiency during part load operation—a SEER (cooling) rating of 18.0 is not uncommon for small packaged VRF-equipped heat pumps.

When you are replacing packaged HVAC equipment, we recommend a comprehensive approach. Work with your contractor or design engineer to make sure your systems are sized and zoned according to current space configurations and occupancy. Select high efficiency equipment and controls that match your heating and cooling needs. Commission the system and controls to ensure proper operation, comfort, ventilation, and energy use.

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

Weatherization

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

Doors and Windows

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

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.

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

Motor Controls

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

Motor Short Cycling Reduction

Frequent stopping and starting of motors places substantial stress on rotors and other parts. This leads to wear and tear, lower efficiency, and higher maintenance costs. Adjust the load on the motor to limit the amount of unnecessary stopping and starting to improve motor performance.

Motor Maintenance

Motors have many moving parts. As these parts degrade over time, the efficiency of the motor is reduced. Routine maintenance prevents damage to motor components. Routine maintenance should include cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Fans to Reduce Cooling Load

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

Thermostat Schedules and Temperature Resets

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

Economizer Maintenance

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

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

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

Ductwork Maintenance

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

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

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

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

Boiler Maintenance

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

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.

Optimize HVAC Equipment Schedules

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

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

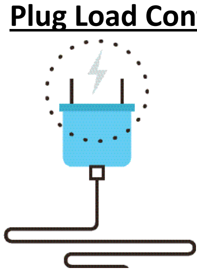
Water Heater Maintenance

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

Also, preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. At least once a year, follow manufacturer instructions to drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Annual checks should include checks for:

- Leaks or heavy corrosion on the pipes and valves.
- Corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot, or charred metal, this is a sign you may be having combustion issues, and you should have the unit serviced by a professional.
- For electric water heaters, look for signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank.
- For water heaters more than three years old, have a technician inspect the sacrificial anode annually.

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips[7]. Your local utility may offer incentives or rebates for this equipment.

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[7] For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Procurement Strategies

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

6 Water Best Practices

Getting Started

The commercial and institutional sector is the second largest consumer of publicly supplied water in the United States, accounting for 17% of the withdrawals from public water supplies[8]. In New Jersey, excluding water used for power generation, approximately 80% of total water use was attributed to potable supply during the period of 2009 to 2018. Water withdrawals for potable supply have not changed noticeably during the period from 1990 to 2018[9].

Water management planning serves as the foundation for any successful water reduction effort. It is the first step a commercial or institutional facility owner or manager should take to achieve and sustain long-term water savings. Understanding how water is used within a facility is critical for the water management planning process. A water assessment provides a comprehensive account of all known water uses at the facility. It allows the water management team to establish a baseline from which progress and program success can be measured. It also enables the water management team to set achievable goals and identify and prioritize specific projects based on the relative savings opportunities and project cost-effectiveness.

Water conservation devices may significantly reduce your water and sewer usage costs. Any reduction in water use reduces grid-level electricity use since a significant amount of electricity is used to treat and deliver water from reservoirs to end users.

For more information regarding water conservation or additional details regarding the practices shown below go to the EPA's WaterSense website[10] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[11] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Leak Detection and Repair

Identifying and repairing leaks and other water use anomalies within a facility's water distribution system or from processes or equipment can keep a facility from wasting significant quantities of water. Examples of common leaks include leaking toilets and faucets, drip irrigation malfunctions, stuck float valves, and broken distribution lines. Reading meters, installing failure abatement technologies, and conducting visual and auditory inspections are important best practices to detect leaks. Train building occupants, employees, and visitors to report any leaks that they detect. To reduce unnecessary water loss, detected leaks should be repaired quickly. Repairing leaks in water distribution that is pressurized by on-site pumps or in heated or chilled water piping will also reduce energy use.

Toilets and Urinals

Toilets and urinals are considered sanitary fixtures and are found in most facilities. High efficiency fixtures are at least 20% more efficient than available standard products. Leaking or damaged equipment is a substantial source of water waste. Train users to report continuously flushing, leaking, or otherwise improperly operating equipment to the appropriate personnel. Depending on the age of the equipment

[8] Estimated from analyzing data in: Solley, Wayne B,. et al, "Estimated Use of Water in the United States in 1995", U.S Geological Suvey Circular 1200, (1998)

[9] https://dep.nj.gov/wp-content/uploads/dsr/trends-water-supply.pdf

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

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

and the frequency of use, it may be cost effective to replace older inefficient fixtures with current generation WaterSense labeled equipment.

Commercial facilities typically use tank toilets or wall-mount flushometers. Educate and inform users with restroom signage and other means to avoid flushing inappropriate objects. For tank toilets, periodically check to ensure fill valves are working properly and that water level is set correctly. Annually test toilets to ensure the flappers are not worn or allowing water to seep from the tank into the bowl and down the sewer. Control stops and piston valves on flushometer toilets should be checked at least annually.

Most urinals use water to flush liquid. These standard single-user fixtures are present in most facilities. Non-water urinals use a specially designed trap that allows liquid waste to drain out of the fixture through a trap seal, and into the drainage system. Flushing urinals should be inspected at least annually for proper valve and sensor operation. For non-water urinals, follow maintenance practices as directed by the manufacturer to ensure products perform as expected. Non-water urinals can be considered during urinal replacement, however, review the condition and design of the existing plumbing system and the expected usage patterns to ensure that these products will provide the anticipated performance.

Faucets and Showerheads

Faucets and showerheads are sanitary fixtures that generally dispense heated water. Reducing water use by these fixtures translates into a reduction of site fuel or electric use depending on how water is heated. High efficiency fixtures are at least 20% more efficient than available standard products. Leaking or damaged equipment is a substantial source of water waste. Train users to report continuously dripping, leaking, or otherwise improperly operating equipment to the appropriate personnel. Depending on the age of the equipment and the frequency of use, it may be cost effective to replace older fixtures with current generation WaterSense labeled equipment.

Faucets are used for a variety of purposes, and standard flow rates are dictated by the intended use. Public use lavatory faucets and kitchen faucets are subject to maximum flow rates while service sinks are not. Periodically inspect faucet aerators for scale buildup to ensure flow is not being restricted. Clean or replace the aerator or other spout end device as needed. Check and adjust automatic sensors (where installed) to ensure they are operating properly to avoid faucets running longer than necessary. Post materials in restrooms and kitchens to ensure user awareness of the facility's water-efficiency goals. Remind users to turn off the tap when they are done and to consider turning the tap off during sanitation activities when it is not being used. Consider installing lavatory and kitchen faucet fixtures with reduced flow. Federal standards limit kitchen and restroom faucet flows to 2.2 gpm. To qualify for a WaterSense label a faucet cannot exceed 1.5 gpm.

Effective in 1992, the maximum allowable flow rate for all showerheads sold in the United States is 2.5 gpm. Since this standard was enacted, many showerheads have been designed to use even less water. WaterSense labeled equipment is designed to use 2.0 gpm, or less. For optimum showerhead efficiency, the system pressure should be tested to make sure that it is between 20 and 80 pounds per square inch (psi). Verify that plumbing lines are routed through a shower valve to prevent water pressure fluctuations. Periodically inspect showerheads for scale buildup to ensure flow is not being restricted. In general, replace showerheads with 2.5 gpm flow rates or higher with WaterSense labeled models. Note: Use of poor performing replacement reduced flow showerheads may result in increased use if the duration of use is increased to compensate for reduced performance. WaterSense labeled showerheads are independently certified to meet or exceed minimum performance requirements for spray coverage and force.

Commercial Kitchen Equipment

Commercial and institutional sectors, including hospitals, offices, and schools, have substantial kitchen water use. Water in food service is used for steam cooking, spray/flow cleaning, dish washing, and ice making. In most commercial kitchens, the commercial dishwasher and pre-rinse spray valve account for over two-thirds of the water use. Newer technologies and better practices are available that can significantly reduce commercial kitchen equipment water and energy use. For example, ENERGY STAR qualified dishwashers and steam cookers are at least 10% more water-efficient and 15% more energy-efficient than standard models. With some models saving significantly more.

Cooking equipment includes combination ovens, steam cookers, and steam kettles. For efficient steam cooking operation, fill vessels to capacity when possible, set temperatures optimally for the process, and keep doors and lids closed while cooking. Replace gaskets to ensure proper sealing and repair leaks. When replacing combination ovens, select connectionless equipment; replace steam cookers with ENERGY STAR rated steam cookers.

Spray/flow cleaning equipment includes dipper wells, pre-rinse spray valves, food disposals, and wash down sprayers. Turn off water when service periods are slow and keep flow rates to minimum level. Train users to scrape food rather than rely on water pressure. Inspect for leaks and scaling. Test system pressure to ensure it is between 20 and 80 pounds per square inch (psi) for optimum flow and performance of spray equipment. For dipper wells, consider installing in-line flow restrictors to reduce flow. Pre-rinse spray valves can be replaced with new assemblies which use 1.3 gpm or less. Washdown sprayers can be equipped with self-closing nozzles or consider mopping/sweeping as an alternative.

Dishwashers range in type and include undercounter, stationary/hood, conveyor, and flight-type models. Only run dishwashers when they are full, and fill racks to maximum capacity. Be sure to replace damaged dishwasher racks. Educate staff to scrape dishes prior to loading. Ensure that final rinse pressure and water temperature are within the manufacturer's recommendations. Operate the dishwasher close to or at the minimum flow rate and set rinse cycle time to the manufacturer's minimum recommended settings. Make sure that manual fill valves close completely after the wash tank is filled. Find and repair any leaks. Inspect valves and rinse nozzles for proper operation and repair worn nozzles. Look for ENERGY STAR qualified models when purchasing or leasing a new commercial dishwasher or replacing an existing unit. Consider your kitchen throughput to select an appropriately sized commercial dishwasher since an oversized dishwasher will waste water if the machine is not loaded to capacity.

7 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.

7.1 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.

An additional study for solar photovoltaic for the Thomas B Conley Elementary School is provided below.

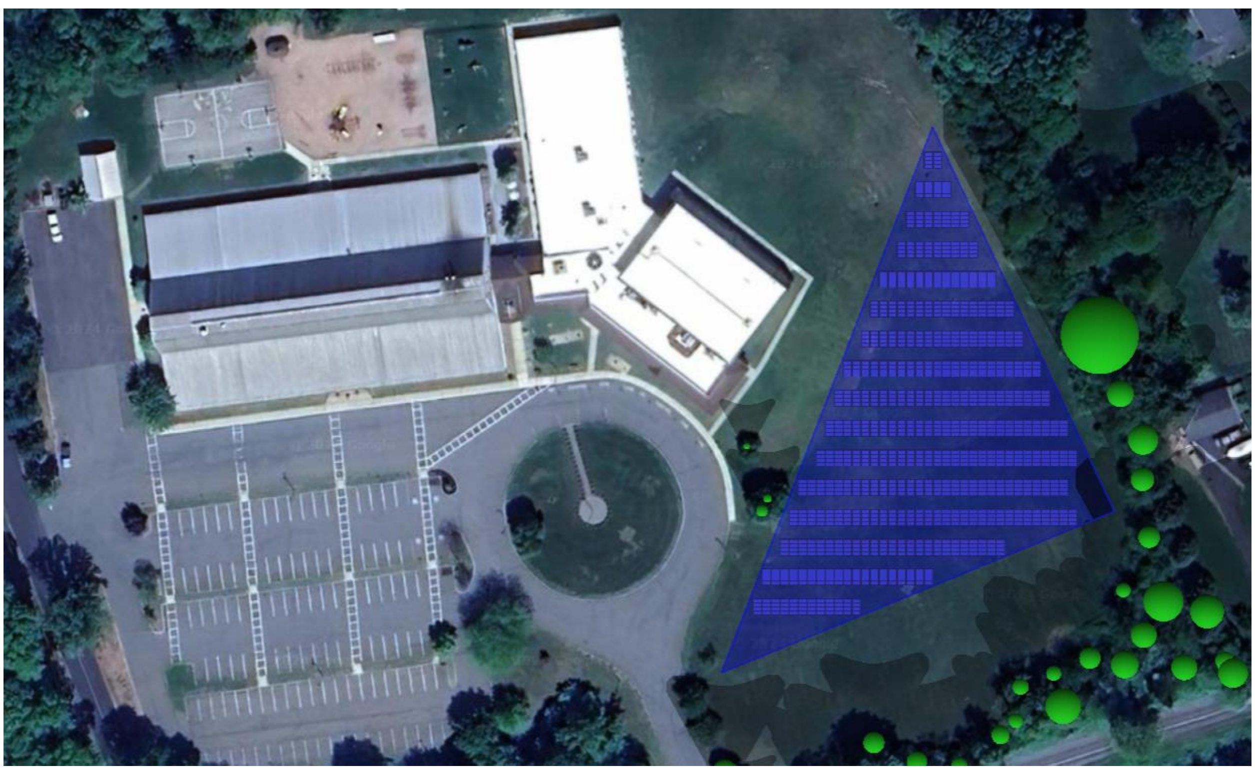
Executive Summary

This section summarizes projected energy and cost impacts, as well as design considerations, for a proposed 370 kW-DC ground mount solar photovoltaic (PV) system for the Thomas B Conley Elementary School site located at 940 Iron Bridge Road, Asbury, NJ 08802. Please note this is a feasibility stage memo, and all cost/savings values are solely estimates and not for design level application.

Here are the system details:

> 370 kW ground mount Solar PV System: The ground mount solar panels are strategically positioned to make the most efficient use of the open area in front of school, maximizing coverage of the solar energy generation. The projected solar PV system is expected to generate a total energy output of 502,600 kWh, accounting for 100% of the site's total electricity consumption for the year 2023.

Please note that we strategically chose the open field to the left of the school for ground mount solar, as it is closer to the main electric meter.



Solar PV Layout Figure – HelioScope Design

Equipment	Estimated Max Demand Savings (kW)	Estimated Annual Energy Generation (kWh)	Estimated Annual GHG Reduction ($MT\text{-}CO_2e$)	Estimated Annual Cost Savings ($)	Estimated Gross Project Cost ($)	Total Incentives ($)	Net Project Cost ($)	Simple Payback Period[12] (yr.)
370 kW Solar PV	38	502,608	100	$40,272	$2,276,000	$1,251,800	$1,024,200	25.4

Project Summary Table

Rebates and Incentives

Equipment	Estimated Gross Project Cost ($)	ITC Rebate (1)	MACRS Rebate (2)	Net Project Cost
370 kW Solar PV	$2,276,000	$682,800	$569,000	$1,024,200

Incentive Summary Table

Multiple incentives are available to reduce the project cost.

1. Federal Income Tax Credit (ITC): As of the passage of the 2022 Inflation Reduction Act, the ITC refund can be claimed by non-taxable entities as a cash rebate. The ITC is equal to 30% of the system cost and is scheduled to persist until 2033.

2. Modified Accelerated Cost Recovery System (MACRS): As of the passage of the 2022 Inflation Reduction Act, the MACRS refund can be claimed by non-taxable entities as a cash rebate. This rebate allows 85% of the system cost to be claimed as equipment depreciation at Year 1, approximately equivalent to 25% of the system cost.

Ownership Models

This report explores two ownership models: Cash Purchase and Power Purchase Agreement (PPA).

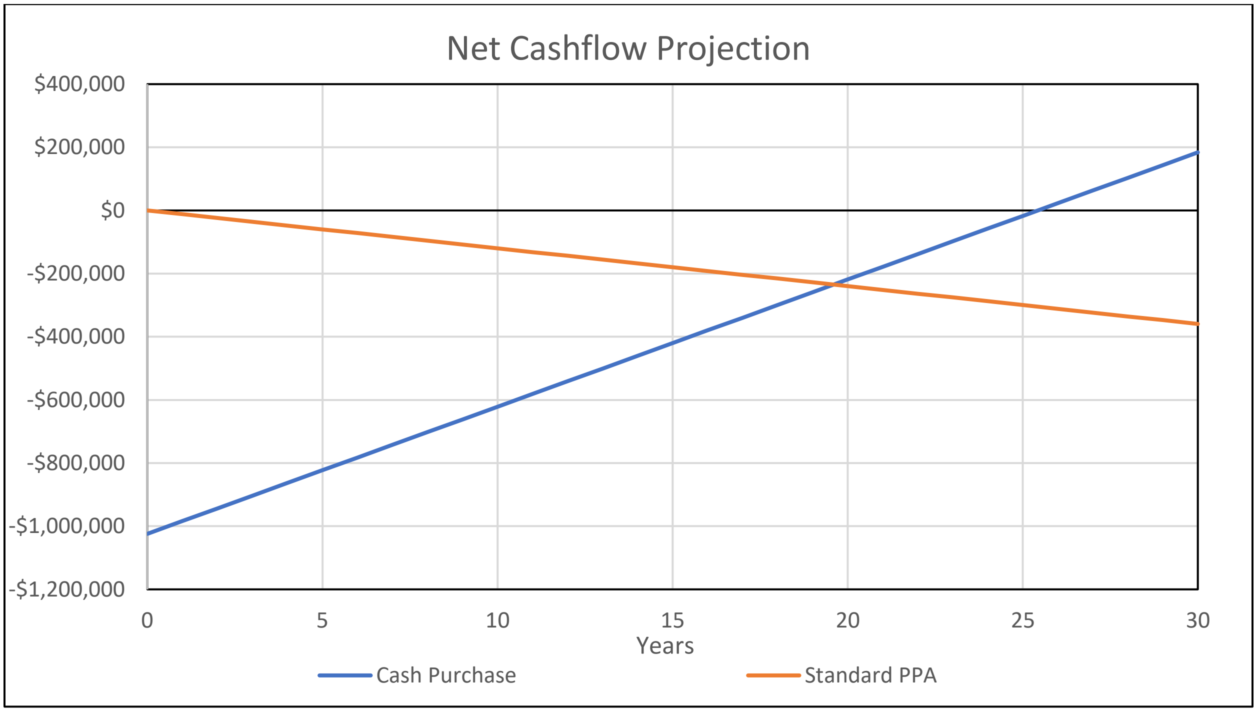
- Cash Purchase: In this case, the entire system is purchased upfront by the customer.
- Standard Power Purchase Agreement: In this scenario, a third party installs and owns the system, and sells electricity to the customer at a reduced rate. Calculations assume the owner charges a 3% interest rate on the system. In the table below, the interest rate is factored in as an offset to the "Annual Savings ($)". Return on Investment (ROI) is null because there is no cost to the customer.

[12] Simple payback is computed as the "Net Project Cost" divided by the "Estimated Annual Cost Savings".

Ownership Plan	Upfront Gross Project Cost ($)	Year 1 Cost After Rebates ($)	Annual Savings ($)	Lifetime 30-Year Cost Savings ($)	30-Year ROI
Cash Purchase	$2,276,000	$1,024,200	$40,272	$1,208,161	118%
PPA	$0	$0	($11,982)	($359,457)	-

Ownership Model Table

Analysis clearly shows that opting for a cash purchase is more advantageous than choosing a Power Purchase Agreement (PPA). This conclusion is based on the consideration of existing available incentives (i.e., ITC & MACRS).



Ownership Model Life Cycle Comparison

PV System Sizing

TRC modeled the proposed solar PV system using HelioScope, a meteorologically and location-dependent solar resource, to estimate its available size and component quantities. The software accounts for building shading, tree shading, tilt angles, and appropriate spacing. The PV system is sized to achieve Net Zero Energy.. Note that although the system is sized to produce the total amount consumed by the school on an annual basis, there will be periods where production will lag behind building electrical consumption needs and the site will be grid dependent at those times.

Energy Generation and Management

A HelioScope model was developed to establish approximate PV system sizing. The output was entered into Energy Toolbase® (ETB), a utility cost analysis tool that compares the generation profile vs the building's monthly consumption data.

Cost savings were finalized by applying an 0.5% annual maintenance cost penalty to the solar PV system; the "Estimated Annual Cost Savings" in the Project Summary Table offsets the utility savings accordingly. The ETB analysis was used to simulate PV operation throughout the year and to calculate utility cost savings with hourly utility rate sensitivity.

Project Cost

Project cost estimates were calculated using RS Means 2022 Construction Cost Catalogue, along with vendor quotes and guidelines available from the modeling software. Construction costs have been escalated by 10% to account for inflation. Costs include contingencies and markups for all potential project tasks, including design, permitting, taxes, and a 30% contingency for infrastructure upgrades. A line-by-line breakdown of the costs considered is provided in Appendix C.

At a high level, average system costs are $6.15/Watt solar PV, based on the gross project cost. Please note that while detailed, cost estimates are still at the feasibility stage. Costs may vary by 30% relative to engineering assessments of the electrical and structural infrastructure.

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**: https://www.njcleanenergy.com/renewable-energy/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

7.2 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.

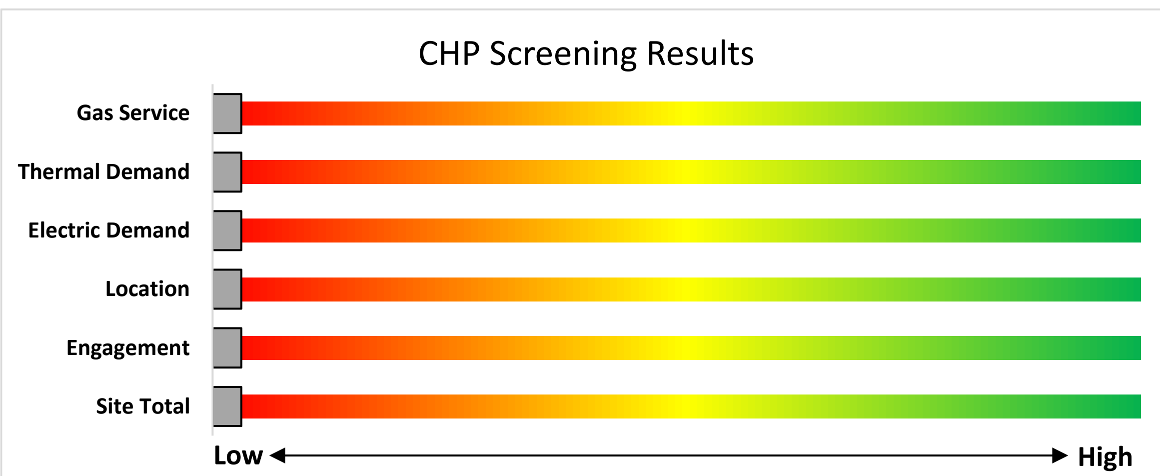
CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be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



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/

8 Electric Vehicles

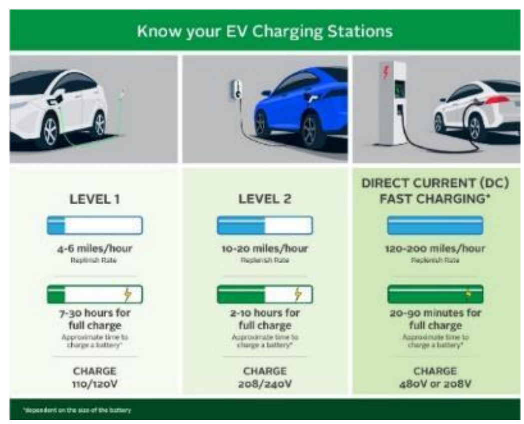
All electric vehicles (EVs) have an electric motor instead of an internal combustion engine. EVs function by plugging into a charge point, taking electricity from the grid, and then storing it in rechargeable batteries. Although electricity production may contribute to air pollution, the U.S. EPA categorizes 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

8.1 EV 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 high potential for adding EV chargers to the facility's parking, based on potential costs of installation and other site factors.

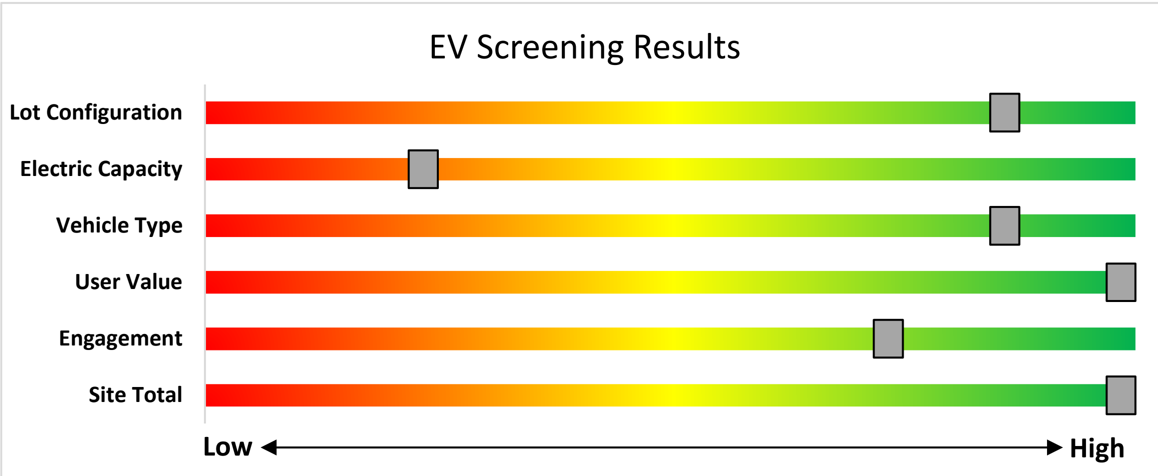
The primary costs associated with installing EV charging are the charger hardware and the cost to extend power from the facility to parking spaces. This may include upgrades to electric panels to serve increased loads.

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.



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), Public Service Electric and Gas Company (PSE&G) or Jersey Central Power and Light (JCP&L), 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, PSE&G or JCP&L, up to 90% of the combined charger purchase and installation costs. Please check ACE, PSE&G or JCP&L program eligibility requirements before purchasing EV charging equipment, as additional conditions on types of eligible chargers may apply for utility incentives.

EV Charging incentive information is available from Atlantic City Electric, PSE&G and JCP&L.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

9 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 New Jersey.

NJBPU and NJCEP Administered Programs

- New Construction (residential, commercial, industrial, government)
- Large Energy Users
- Energy Savings Improvement Program (financing)
- State Facilities Initiative*
- Local Government Energy Audits
- Combined Heat & Power & Fuel Cells

*State facilities are also eligible for utility programs

Utility Administered Programs

- Existing buildings (residential, commercial, industrial, government)
- Efficient Products
  - Lighting & Marketplace
  - HVAC
  - Appliance Rebates
  - Appliance Recycling

9.1 New Jersey's Clean Energy Program

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. To qualify entities must have incurred at least $5 million in total 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 http://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[13]

Eligible Technology	Size (Installed Rated Capacity)	Incentive ($/Watt)[5]	% of Total Cost Cap per Project	$ Cap per Project
CHPs powered by non-renewable or renewable fuel source, or a combination:[4] - Gas Internal Combustion Engine - Gas Combustion Turbine - Microturbine	≤500 kW[1]	$2.00	30-40%[2]	$2 million
	>500 kW - 1 MW[1]	$1.00		
	> 1 MW - 3 MW[1]	$0.55	30%	$3 million
Fuel Cells ≥60%	>3 MW[1]	$0.35		
Fuel Cells ≥40%	Same as above[1]	Applicable amount above	30%	$1 million
Waste Heat to Power (WHP)[3] Powered by non-renewable fuel source. Heat recovery or other mechanical recovery from existing equipment utilizing new electric generation equipment (e.g. steam turbine)	≤1MW[1]	$1.00	30%	$2 million
	> 1MW[1]	$.50	30%	$3 million

13

[1] Incentives are tiered, which means the incentive levels vary based upon the installed rated capacity, as listed in the chart above. For example, a 4 MW CHP system would receive $2.00/watt for the first 500 kW, $1.00/watt for the second 500 kW, $0.55/watt for the next 2 MW and $0.35/watt for the last 1 MW (up to the caps listed).

[2] The maximum incentive will be limited to 30% of total project. For CHP projects up to 1 MW, this cap will be increased to 40% where a cooling application is used or included with the CHP system (e.g. absorption chiller).

[3] Projects will be eligible for incentives shown above, not to exceed the lesser of % of total project cost per project cap or maximum $ per project cap. Projects installing CHP or FC with WHP will be eligible for incentive shown above, not to exceed the lesser caps of the CHP or FC incentive. Minimum efficiency will be calculated based on annual total electricity generated, utilized waste heat at the host site (i.e. not lost/rejected), and energy input.

[4] Systems fueled by a Class 1 Renewable Fuel Source, as defined by N.J.A.C. 14:8-2.5, are eligible for a 30% incentive bonus. If the fuel is mixed, the bonus will be prorated accordingly. For example, if the mix is 60/40 (60% being a Class 1 renewable), the bonus will be 18%. This bonus will be included in the final performance incentive payment, based on system performance and fuel mix consumption data. Total incentive, inclusive of bonus, shall not exceed above stipulated caps.

[5] CHP-FC systems located at Critical Facility and incorporating blackstart and islanding technology are eligible for a 25% incentive bonus. This bonus incentive will be paid with the second/Installation incentive payment. Total incentive, inclusive of bonus, shall not exceed above stipulated caps.

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 http://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 (CSI) Program

The CSI Program opened on April 15, 2023, and will serve as the permanent program within the SuSI Program providing incentives to larger solar facilities. The CSI Program is open to qualifying grid supply solar facilities, non-residential net metered solar installations with a capacity greater than five (5) megawatts ("MW"), and to eligible grid supply solar facilities installed in combination with energy storage.

CSI eligible facilities will only be allowed to register in the CSI program upon award of a bid pursuant to N.J.A.C. 14:8-11.10.

The CSI program structure has separate categories, or tranches, to ensure that a range of solar project types, including those on preferred sites, are able to participate despite potentially different project cost profiles. The Board has approved four tranches for grid supply and large net metered solar and an additional fifth tranche for storage in combination with grid supply solar. The following table lists procurement targets for the first solicitation:

Tranche	Project Type	MW (dc) Targets
Tranche 1.	Basic Grid Supply	140
Tranche 2.	Grid Supply on the Built Environment	80
Tranche 3.	Grid Supply on Contaminated Sites and Landfills	40
Tranche 4.	Net Metered Non- Residential	40
Tranche 5.	*Storage Paired with Grid	160 MWh

*The storage tranche of 160 MWh corresponds to a 4-hour storage pairing of 40 MW of solar

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 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 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.

Demand Response (DR) Energy Aggregator

Demand Response Energy Aggregator is a program designed to reduce the electric load when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Grid operators call upon curtailment service providers and commercial facilities to reduce electric usage during times of peak demand, making the grid more reliable and reducing transmission costs for all ratepayers. Curtailment service providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary, and participants receive payments whether or not their facility is called upon to curtail its electric usage.

Typically, an electric customer must be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with greater capability to quickly curtail their demand during peak hours receive higher payments. Customers with back-up generators on site may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in DR programs often find it to be a valuable source of revenue for their facility, because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature setpoints on thermostats (so that air conditioning units run less frequently) or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a DR activity in most situations.

The first step toward participation in a DR program is to contact a curtailment service provider. A list of these providers is available on the website of the independent system operator, PJM, and it includes contact information for each company, as well as the states where they have active business[14]. PJM also posts training materials for program members interested in specific rules and requirements regarding DR activity along with a variety of other DR program information[15].

Curtailment service providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities, and they may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

[14] http://www.pjm.com/markets-and-operations/demand-response.aspx.

[15] http://www.pjm.com/training/training-events.aspx.

9.2 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.

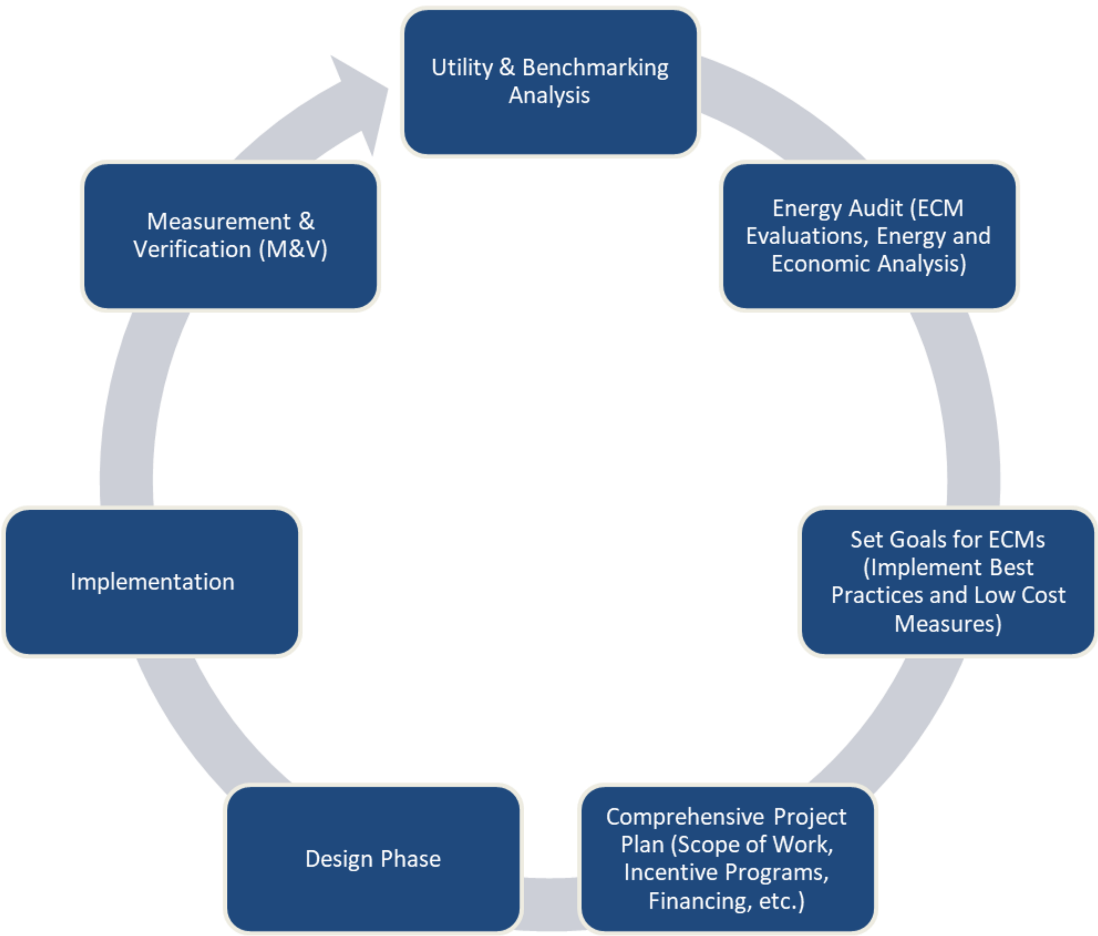
Engineered Solutions

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.

10 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.



Project Development Cycle

11 Energy Purchasing and Procurement Strategies

11.1 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[16].

11.2 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[17].

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

[17] 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
Boiler Room 100	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
Boiler Room 100	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	360	0	$45	$350	$60	6.5
Classroom 101	1	LED Lamps: (1) 7W A17 Screw-In Lamp	Wall Switch	S	7	1,950		None	No	1	LED Lamps: (1) 7W A17 Screw-In Lamp	Wall Switch	7	1,950	0.0	0	0	$0	$0	$0	0.0
Classroom 101	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.5	1,621	-1	$202	$1,570	$250	6.5
Classroom 102	1	LED Lamps: (1) 7W A17 Screw-In Lamp	Wall Switch	S	7	1,950		None	No	1	LED Lamps: (1) 7W A17 Screw-In Lamp	Wall Switch	7	1,950	0.0	0	0	$0	$0	$0	0.0
Classroom 102	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.5	1,621	-1	$202	$1,570	$250	6.5
Classroom 104	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.5	1,351	-1	$169	$1,090	$190	5.3
Classroom 106	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.5	1,351	-1	$169	$1,090	$190	5.3
Classroom 107	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.5	1,351	-1	$169	$1,090	$190	5.3
Classroom 109	1	LED Lamps: (1) 8W A19 Screw-In Lamp	Wall Switch	S	8	1,950		None	No	1	LED Lamps: (1) 8W A19 Screw-In Lamp	Wall Switch	8	1,950	0.0	0	0	$0	$0	$0	0.0
Classroom 109	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.5	1,351	-1	$169	$1,090	$190	5.3
Classroom 110	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.5	1,351	-1	$169	$1,090	$190	5.3
Classroom 113	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.6	1,891	-1	$236	$1,720	$280	6.1
Classroom 116	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.6	1,891	-1	$236	$1,720	$280	6.1
Classroom 117	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.6	1,891	-1	$236	$1,720	$280	6.1
Classroom 119	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.6	1,891	-1	$236	$1,720	$280	6.1
Corridor 110-	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 110-	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 5	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,346	0.5	1,621	-1	$202	$1,760	$810	4.7
Corridor 113 -	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 113 -	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 5	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,346	0.5	1,351	-1	$169	$1,610	$680	5.5
Corridor 113 - 110	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
Corridor 113 - 110	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 5	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,346	0.2	540	0	$67	$580	$270	4.6
Corridor 122	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 5	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,346	0.2	450	0	$56	$530	$230	5.3
Dining Area	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Dining Area	28	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Wall Switch	S	127	1,950	2, 4	Relamp & Reballast	Yes	28	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	2.0	5,825	-2	$727	$4,200	$490	5.1

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Entry Way Foyer	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
Entry Way Foyer	6	LED Lamps: (1) 17W A19 Screw-In Lamp	Wall Switch	S	17	1,950		None	No	6	LED Lamps: (1) 17W A19 Screw-In Lamp	Wall Switch	17	1,950	0.0	0	0	$0	$0	$0	0.0
Exterior	20	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell		35	4,380		None	No	20	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	35	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior	3	LED - Fixtures: Wall Sconces	Photocell		60	4,380		None	No	3	LED - Fixtures: Wall Sconces	Photocell	60	4,380	0.0	0	0	$0	$0	$0	0.0
Faculty Lounge 118	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	1,950	2, 5	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,346	0.0	146	0	$18	$90	$10	4.4
Faculty Lounge 118	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	270	0	$34	$300	$50	7.4
Kitchen	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.3	991	0	$124	$890	$150	6.0
Library	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
Library	22	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	22	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.7	1,982	-1	$247	$1,770	$290	6.0
Lobby Entry 2	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,950	0.0	71	0	$9	$50	$10	4.5
Lobby Entry 3	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,950	0.0	71	0	$9	$50	$10	4.5
Lobby Rear Entry	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,950	0.0	71	0	$9	$50	$10	4.5
Main Lobby	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Main Lobby	1	LED Lamps: (3) 9.5W A19 Screw-In Lamps	Wall Switch	S	29	1,950		None	No	1	LED Lamps: (3) 9.5W A19 Screw-In Lamps	Wall Switch	29	1,950	0.0	0	0	$0	$0	$0	0.0
Main Lobby	14	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	1,950	3, 5	Relamp	Yes	14	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	1,346	0.2	593	0	$74	$1,200	$560	8.6
Office 121	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.2	540	0	$67	$630	$100	7.9
Office 121	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	None		114	1,800	3, 4	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,242	0.6	1,758	-1	$219	$1,390	$280	5.1
Office 122	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	360	0	$45	$350	$60	6.5
Office 124	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,950	3, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,346	0.1	317	0	$40	$330	$60	6.8
Office 125 Nurse	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.3	811	0	$101	$790	$130	6.5
Office 126	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.2	630	0	$79	$680	$110	7.2
Restroom - Faculty Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,950	0.0	71	0	$9	$50	$10	4.5
Restroom - Faculty Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,950	0.0	71	0	$9	$50	$10	4.5
Restroom - Female 1	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	360	0	$45	$350	$60	6.5
Restroom - Female 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	360	0	$45	$350	$60	6.5

	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 - Male 1	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	360	0	$45	$350	$60	6.5
Restroom - Male 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	360	0	$45	$350	$60	6.5
Server Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	180	0	$22	$250	$40	9.3
Staff Lounge 120	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.6	1,891	-1	$236	$1,720	$280	6.1
Storage 111	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	360	0	$45	$350	$60	6.5
Storage Cafeteria	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	270	0	$34	$300	$50	7.4
Classroom 127	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.3	811	0	$101	$710	$130	5.7
Classroom 128	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.3	811	0	$101	$710	$130	5.7
Classroom 129	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 129	36	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	36	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	1.1	3,242	-1	$405	$2,810	$470	5.8
Classroom 133	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 133	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.5	1,351	-1	$169	$1,090	$190	5.3
Classroom 135	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 135	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,950	3, 4	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,346	0.8	2,380	-1	$297	$1,660	$340	4.4
Classroom 136	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.4	1,081	0	$135	$840	$160	5.0
Classroom 137	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 137	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.2	540	0	$67	$630	$100	7.9
Classroom 138	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.3	946	0	$118	$770	$150	5.3
Classroom 139	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.5	1,621	-1	$202	$1,090	$220	4.3
Classroom 140	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.6	1,756	-1	$219	$1,150	$240	4.2
Classroom 141	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.5	1,621	-1	$202	$1,090	$220	4.3
Classroom 142	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.5	1,621	-1	$202	$1,090	$220	4.3
Classroom 143	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.5	1,621	-1	$202	$1,090	$220	4.3
Corridor 131 - 135	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 131 - 135	13	LED - Fixtures: Cove Mount	Wall Switch	S	8	1,950	5	None	Yes	13	LED - Fixtures: Cove Mount	High/Low Control	8	1,346	0.0	69	0	$9	$560	$460	11.6

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Corridor 131 - 135	3	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	1,950	2, 5	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,346	0.1	438	0	$55	$550	$140	7.5
Corridor 131 - 135	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 5	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,346	0.3	811	0	$101	$1,020	$410	6.0
Corridor 142-129	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 142-129	11	LED - Fixtures: Cove Mount	Wall Switch	S	8	1,950	5	None	Yes	11	LED - Fixtures: Cove Mount	High/Low Control	8	1,346	0.0	59	0	$7	$560	$390	23.3
Corridor 142-129	4	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	1,950	2, 5	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,346	0.2	583	0	$73	$630	$180	6.2
Corridor 142-129	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 5	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,346	0.4	1,081	0	$135	$1,170	$540	4.7
Electrical Room 132	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
Electrical Room 132	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	180	0	$22	$250	$40	9.3
Exterior	32	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell		55	4,380		None	No	32	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	55	4,380	0.0	0	0	$0	$0	$0	0.0
Gymnasium 134	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 134	40	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	1,950	1, 4	Fixture Replacement	Yes	40	LED - Fixtures: High-Bay	Occupancy Sensor	69	1,346	11.8	35,211	-15	$4,393	$36,560	$3,400	7.5
Mechanical 132	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.3	901	0	$112	$840	$140	6.2
New Building Atrium	16	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,950	3	Relamp	No	16	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,950	0.2	601	0	$75	$400	$80	4.3
Office 1 Classroom 137	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.1	270	0	$34	$280	$50	6.8
Office 131	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.2	676	0	$84	$650	$120	6.3
Office 2 Classroom 137	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.1	270	0	$34	$280	$50	6.8
Office 3 Classroom 137	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.1	270	0	$34	$280	$50	6.8
Office 4 Classroom 137	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.1	270	0	$34	$280	$50	6.8
Parking Lot	4	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	S	75	4,380		None	No	4	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	75	4,380	0.0	0	0	$0	$0	$0	0.0
Parking Lot	6	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	S	75	4,380		None	No	6	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Photocell	75	4,380	0.0	0	0	$0	$0	$0	0.0
Restroom - Female	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	360	0	$45	$350	$60	6.5
Restroom - Male	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	360	0	$45	$350	$60	6.5
Restroom Classroom 136	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,950	0.0	106	0	$13	$60	$20	3.0
Restroom Classroom 140	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,950	0.0	106	0	$13	$60	$20	3.0
Storage Classroom 130	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.1	270	0	$34	$300	$50	7.4

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Storage Classroom 133	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.1	270	0	$34	$280	$50	6.8
Storage Classroom 133 Art	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.1	270	0	$34	$280	$50	6.8
Storage Classroom 135	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,346	0.1	270	0	$34	$280	$50	6.8
Storage Classroom 141	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,950	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,950	0.0	106	0	$13	$60	$20	3.0
Storage cross 129	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,950	0.0	71	0	$9	$50	$10	4.5
Storage Gymnasium 134	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,950	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,346	0.2	540	0	$67	$630	$100	7.9

Motor Inventory & Recommendations

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Old Building - Boiler Room 100	Boiler 1	1	Combustion Air Fan	0.75	70.0%	No	A.O. Smith	48A63A01	B	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Boiler Room 100	Boiler 2	1	Combustion Air Fan	0.75	70.0%	No	Marathon Motors	UPK5C34D	B	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Mechanical 111	Kitchen MAU	2	Exhaust Fan	5.00	85.0%	No	AJAX		W	1,750	6	No	89.5%	Yes	2	3.2	6,281	0	$841	$11,300	$1,800	11.3
Old Building - Mechanical 111	Mechanical Room Exhaust	1	Exhaust Fan	0.07	65.0%	No	Fasco		W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Mechanical 111	ERW 1 & ERW 2	2	Exhaust Fan	0.33	70.0%	No	GE	5KC36LN83	W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Boiler Room 100	HHW System - Old Building	1	Heating Hot Water Pump	5.00	85.5%	No	Dayton	3N659A	W	2,000	7	No	89.5%	Yes	1	0.6	3,535	0	$474	$5,600	$900	9.9
Old Building - Boiler Room 100	HHW System - Old Building	1	Heating Hot Water Pump	5.00	85.5%	No	Dayton	3N659A	W	2,000	7	No	89.5%	Yes	1	0.6	3,535	0	$474	$5,600	$900	9.9
Old Building - Boiler Room 100	DHW Loop	1	DHW Circulation Pump	0.05	65.0%	No	Taco		W	2,200		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Boiler Room 100	Fuel Oil Pump	1	Process Pump	0.33	65.0%	No	Dayton	5K261K	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Boiler Room 100	Fuel Oil Pump	1	Process Pump	0.33	65.0%	No	AJAX	VFD6C17F	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Mechanical 111	Supply Fan 4	1	Supply Fan	0.75	70.0%	No	Dayton	2N104N	B	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Mechanical 111	MAU	2	Supply Fan	5.00	85.5%	No	AJAX		W	1,750		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Office 122	Office 122	1	Supply Fan	0.25	65.0%	No	Dunham-Bush		W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Classroom 102	Classroom 102	1	Supply Fan	0.08	70.0%	No	Trane		W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Classroom 104	Classroom 104	1	Supply Fan	0.08	70.0%	No	Trane		W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Classroom 106	Classroom 106	1	Supply Fan	0.08	70.0%	No	Trane		W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Classroom 107	Classroom 107	1	Supply Fan	0.08	70.0%	No	Trane		W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Classroom 109	Classroom 109	1	Supply Fan	0.08	70.0%	No	Trane		W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Classroom 110	Classroom 110	1	Supply Fan	0.08	70.0%	No	Trane		W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Classroom 113	Classroom 113	1	Supply Fan	0.08	70.0%	No	Trane		W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Old Building - Classroom 116	Classroom 116	1	Supply Fan	0.08	70.0%	No	Trane		W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Classroom 117	Classroom 117	1	Supply Fan	0.08	70.0%	No	Trane		W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Classroom 119	Classroom 119	1	Supply Fan	0.08	70.0%	No	Trane		W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Office 121	Office 122	1	Supply Fan	0.08	70.0%	No	Trane		W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Mechanical Room 100	Office MAU	1	Exhaust Fan	5.00	85.0%	No	GE	5K184AL90	W	1,800	6	No	89.5%	Yes	1	1.6	3,230	0	$433	$5,600	$900	10.9
Old Building - Mechanical Room 100	Boiler Room	1	Exhaust Fan	0.50	65.0%	No	Dayton	5K110BB	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Mechanical Room 100	Office MAU	1	Supply Fan	2.00	84.0%	No	Dayton		W	1,800		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Restroom - Female 1	Restroom - Female 1	1	Supply Fan	0.08	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Restroom - Female 2	Restroom - Female 2	1	Supply Fan	0.08	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Restroom - Male 1	Restroom - Male 1	1	Supply Fan	0.08	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Restroom - Male 2	Restroom - Male 2	1	Supply Fan	0.08	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Old Building - Restroom - Male 2	Restroom - Male 2	1	Supply Fan	0.08	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Building - Mechanical 132	Boiler 1 & 2	2	Combustion Air Fan	0.50	65.0%	No	Marathon Motors	8VL59T34D	W	1,850		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Building - Roof	Restroom	2	Exhaust Fan	0.03	65.0%	No	Greenheck	G-060-DGEX	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Building - Roof	Gymnasium	2	Exhaust Fan	0.17	65.0%	No	Greenheck	GB-141	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Building - Roof	Restroom	1	Exhaust Fan	0.07	65.0%	No	Greenheck	GB-090-R3	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Building - Mechanical 132	HHW System - New Building	1	Heating Hot Water Pump	7.50	91.0%	No	Marathon Motors	VVE213TTD	W	2,200	7	No	91.0%	Yes	1	0.7	5,072	0	$680	$6,700	$1,000	8.4
New Building - Mechanical 132	HHW System - New Building	1	Heating Hot Water Pump	7.50	88.5%	No	US Motors		W	2,200	7	No	91.0%	Yes	1	0.8	5,474	0	$733	$6,700	$1,000	7.8
New Building - Gymnasium 134	Basketball Lift	3	Other	0.50	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
New Building - Mechanical 132	Oil Pump	1	Process Pump	0.25	65.0%	No	Marathon Motors	VPD48S172	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
New Building - Mechanical 132	Mechanical 133	1	Process Pump	7.50	95.0%	No	Baldor Reliance		W	2,200		No	95.0%	No		0.0	0	0	$0	$0	$0	0.0
New Building - Electrical Room 132	Electrical Room 133	1	Supply Fan	0.08	65.0%	No	Sterling		W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Building - Mechanical 132	Mechanical 133	1	Supply Fan	0.08	65.0%	No	Sterling		W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Building - Office 131	Office 132	1	Supply Fan	0.08	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Building - Storage Gymnasium 134	Storage Gymnasium 135	1	Supply Fan	0.08	65.0%	No	Sterling		W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Building - Mechanical 132	DHW Loop	1	DHW Circulation Pump	0.05	65.0%	No			W	2,000		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Airedale	Classroom 136	1	Supply Fan	2.00	80.0%	No			B	3,000		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
Airedale	Classroom 138	1	Supply Fan	2.00	80.0%	No			B	3,000		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
Airedale	Classroom 139	1	Supply Fan	2.00	80.0%	No			B	3,000		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
Airedale	Classroom 140	1	Supply Fan	2.00	80.0%	No			B	3,000		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
Airedale	Classroom 141	1	Supply Fan	2.00	80.0%	No			B	3,000		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
Airedale	Classroom 142	1	Supply Fan	2.00	80.0%	No			B	3,000		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
Airedale	Classroom 143	1	Supply Fan	2.00	80.0%	No			B	3,000		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-2	Stem Lab	1	Supply Fan	1.50	80.0%	No			W	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-2	Stem Lab	2	Exhaust Fan	0.50	80.0%	No			W	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-1	Child Study	1	Supply Fan	3.00	80.0%	No			W	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-1	Child Study	3	Exhaust Fan	0.50	80.0%	No			W	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-3	Classrooms Airedales	1	Supply Fan	1.00	80.0%	No			W	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-3	Classrooms Airedales	1	Exhaust Fan	0.50	80.0%	No			W	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-4	Art Room	1	Supply Fan	1.50	80.0%	No			W	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
RTU-4	Art Room	1	Exhaust Fan	0.50	80.0%	No			W	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-5	Music Room	1	Supply Fan	1.50	80.0%	No			W	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-5	Music Room	1	Exhaust Fan	0.50	80.0%	No			W	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-6	Gymnasium Front	1	Supply Fan	3.50	80.0%	No			B	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-6	Gymnasium Front	2	Exhaust Fan	0.33	80.0%	No			B	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-6	Gymnasium Front	1	Other	1.50	80.0%	No			B	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-7	Gymnasium Rear	1	Supply Fan	5.00	80.0%	No			B	2,200		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
RTU-7	Gymnasium Rear	3	Exhaust Fan	0.50	80.0%	No			B	2,200		No	80.0%	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
Old Building - Exterior	Main Office	1	Split-System	2.00		11.00		Payne	PA13NR024-J	B		No							0.0	0	0	$0	$0	$0	0.0
Old Building - Exterior	Classroom	1	Split-System	2.00		9.00		York	HBSE-F024SA	B		No							0.0	0	0	$0	$0	$0	0.0
Old Building - Exterior	Classroom	1	Split-System	3.50		9.00		Unitary Products Group	TCGD42S21S2A	B		No							0.0	0	0	$0	$0	$0	0.0
Old Building - Exterior	Classroom	1	Split-System	5.00		10.00		Johnson Controls	TCD60B1SA	B		No							0.0	0	0	$0	$0	$0	0.0
Old Building - Kitchen	Kitchen	1	Electric Resistance Heat		25.59		1 COP	Singer Electromode		W		No							0.0	0	0	$0	$0	$0	0.0
Old Building - Storage 111	Storage 112	1	Electric Resistance Heat		25.59		1 COP	Singer Electromode		W		No							0.0	0	0	$0	$0	$0	0.0
Old Building - Classroom 113	Classroom 113	1	Window AC	1.17		7.80		GE	APCA14YBMWW1	W		No							0.0	0	0	$0	$0	$0	0.0
Old Building - Classroom 116	Classroom 116	1	Window AC	1.17		7.80		GE	APCA14YBMWW1	W		No							0.0	0	0	$0	$0	$0	0.0
Old Building - Classroom 117	Classroom 117	1	Window AC	1.17		7.80		GE	APCA14YBMWW1	W		No							0.0	0	0	$0	$0	$0	0.0
Old Building - Server Room	Server Room	1	Window AC	1.17		7.80		GE	APCA14YBMWW1	W		No							0.0	0	0	$0	$0	$0	0.0
New Building - Roof	Restrooms	1	Split-System	1.50		9.50		Airedale		B	8	Yes	1	Split-System	1.50		16.00		0.4	303	0	$41	$4,100	$200	96.0
New Building - Roof	Stem Lab - RTU-2 . New Unit	1	Package Unit	8.50		15.20		Carrier	50FC-M08F2A5A6	W		No							0.0	0	0	$0	$0	$0	0.0
New Building - Roof	Child Study - RTU-1 New Unit	1	Package Unit	15.00		14.50		Carrier	50GC-M14F3A5A6	W		No							0.0	0	0	$0	$0	$0	0.0
New Building - Roof	127 & 128 - RTU-3 New Unit	1	Package Unit	7.50		15.20		Carrier	50FC-M07F2A5A6	W		No							0.0	0	0	$0	$0	$0	0.0
New Building - Roof	Art Room - RTU-4 New Unit	1	Package Unit	7.50		15.20		Carrier	50FC-M07F2A5A6	W		No							0.0	0	0	$0	$0	$0	0.0
New Building - Roof	Music Room - RTU-5 New Unit	1	Package Unit	7.50		15.20		Carrier	50FC-M07F2A5A7	W		No							0.0	0	0	$0	$0	$0	0.0
New Building - Roof	Stem Lab - RTU-2 Old Unit	1	Package Unit	6.00		11.00		Carrier	50HJ-007-M-531CA	B	8	Yes	1	Package Unit	6.00		14.00		0.7	631	0	$85	$9,400	$500	105.3
New Building - Roof	Child Study - RTU-1 Old Unit	1	Package Unit	6.00		11.00		Carrier	50HJ-007-M-531CA	B	8	Yes	1	Package Unit	6.00		14.00		0.7	631	0	$85	$9,400	$500	105.3
New Building - Roof	127 & 128 - RTU-3 Old Unit	1	Package Unit	6.00		11.00		Carrier	50HJ-007-M-531CA	B	8	Yes	1	Package Unit	6.00		14.00		0.7	631	0	$85	$9,400	$500	105.3
New Building - Roof	Front of Gymnasium - RTU-6 Old Unit	1	Package Unit	12.50		9.70		Carrier	50HJ-014--551CA	B	8	Yes	1	Package Unit	12.50		14.00		2.4	2,137	0	$286	$16,200	$1,100	52.7

		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
New Building - Roof	Rear of Gymnasium - RTU-7 Old Unit	1	Package Unit	13.00		9.70		Carrier	50HJ-017--531CA	B	8	Yes	1	Package Unit	13.00		14.00		2.5	2,223	0	$298	$16,400	$1,200	51.0
New Building - Roof	Art Room - RTU-4 Old Unit	1	Package Unit	7.00		10.70		Carrier	50HJ-008--531CA	B	8	Yes	1	Package Unit	7.00		14.00		0.9	833	0	$112	$10,300	$600	87.0
New Building - Roof	Music Room - RTU-5 Old Unit	1	Package Unit	7.00		10.70		Carrier	50HJ-008--531CA	B	8	Yes	1	Package Unit	7.00		14.00		0.9	833	0	$112	$10,300	$600	87.0

Space Heating Boiler Inventory & Recommendations

		Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Old Building - Boiler Room 100	Old Building	2	Non-Condensing Hot Water Boiler	1,139	HB Smith	Series 28	B	9	Yes	2	Non-Condensing Hot Water Boiler	1,139	85.00%	Et	0.0	0	87	$1,918	$76,200	$4,000	37.6
New Building - Mechanical Room 132	New Building	2	Non-Condensing Hot Water Boiler	1,014	Smith Cast Iron Boilers	Series 28A-5	B	9	Yes	2	Non-Condensing Hot Water Boiler	1,014	85.00%	Et	0.0	0	78	$1,708	$69,800	$3,500	38.8

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room 100	DHW Pipes	10	4	1.00	0.0	424	0	$57	$50	$10	0.7
Mechanical Room 132	DHW Pipes	10	5	1.00	0.0	530	0	$71	$70	$10	0.8

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Old- Building - Boiler Room 100	Old Building	1	Storage Tank Water Heater (> 50 Gal)	Rheem	ELD80-FTB	W		No						0.0	0	0	$0	$0	$0	0.0
New Building - Mechanical Room 132	New Building	1	Storage Tank Water Heater (> 50 Gal)	A.O. Smith	DSE80	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms - New Building	11	10	Faucet Aerator (Lavatory)	1.50	0.50	0.0	818	0	$110	$80	$40	0.4
Restrooms - Old Building	11	20	Faucet Aerator (Lavatory)	1.50	0.50	0.0	1,635	0	$219	$170	$80	0.4

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions				Proposed Conditions				Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Manufacturer	Model	ECM #	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Cooler (35F to 55F)	Trenton	TPLP107MAS1BR6	13, 14	Yes	No	Yes	0.0	698	0	$94	$2,430	$120	24.7
Kitchen	1	Medium Temp Freezer (0F to 30F)	Bohn	LET721A	13, 14	Yes	Yes	Yes	0.1	1,889	0	$253	$3,450	$210	12.8

Novelty Cooler Inventory & Recommendations

	Existing Conditions				Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Cooler Description	Manufacturer	Model	ECM #	Install Automatic Shutoff Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Dining Area	1	Milk Cooler	TRUE	TMC-34-HC		No	0.00	0	0	$0	$0	$0	0.0
Dining Area	2	Ice Cream Freezer	Qingdao Essin Electric	SD451S		No	0.00	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	Electric Convection Oven (Full Size)	SunFire	ICO-E-10-M	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Electric Griddle (3 Feet Width)	Imperial		No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (Full Size)	Metro	CSCME055	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Electric Convection Oven (Half Size)	Vulcan	C24EO3	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Electric Steamer	Duke	P33M	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Electric Steamer	Duke	EP303	No		No	0.0	0	0	$0	$0	$0	0.0

Dishwasher Inventory & Recommendations

	Existing Conditions							Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Manufacturer	Model	Water Heater Fuel Type	Booster Heater Fuel Type	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	Payback w/ Incentives in Years
Kitchen	1	Door Type (High Temp)	Jackson	Tempstar	Electric	None	Yes	12	Yes	1.0	9,072	0	$1,215	$10,800	$700	8.3

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Old Building	3	Coffee Machine	800	No		
Old Building	12	Air Purifier	480	No		
Old Building	8	Desktop	150	No		
Old Building	16	Fan (Portable)	50	No		
Old Building	4	Microwave	480	No		
Old Building	2	Paper Shredder	420	No		
Old Building	4	Printer (Medium/Small)	225	No		
Old Building	3	Printer/Copier (Large)	500	No		
Old Building	11	Projector	224	No		
Old Building	2	Refrigerator (Mini)	224	No		
Old Building	2	Refrigerator (Residential)	350	No		
Old Building	4	Smart Board	75	No		
Old Building	28	Speakers (Medium/Small)	30	No		
Old Building	1	Television	124	No		
Old Building	1	Toaster	350	No		
Old Building	6	Water Cooler	80	No		
Old Building	2	iPad Charging Dock	1,800	No		
Old Building	1	Server	1,000	No		
Old Building	1	Commercial Mixer	1,750	No		
New Building	8	Air Purifier	480	No		
New Building	1	Desktop	150	No		
New Building	8	Fan (Portable)	50	No		
New Building	1	Paper Shredder	420	No		
New Building	1	Printer (Medium/Small)	225	No		
New Building	13	Projector	224	No		
New Building	1	Refrigerator (Mini)	224	No		
New Building	12	Speakers (Medium/Small)	30	No		
New Building	3	Water Cooler	80	No		
New Building	6	iPad Charging Dock	1,800	No		
New Building	1	Server	1,000	No		

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Staff Lounge	1	Refrigerated	15	Yes	0.2	1,612	0	$216	$270	$50	1.0

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 or less than 30 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)	New Building	9,000	Electric	18.0	80	Heat Pump Water Heater	2.5	80	$3,322.98	0.00	11,079	0	$1,484	$4,000	$0	$0	$0	$4,000	2.70	2.70
Storage Tank Water Heater (>50 Gal)	Old Building	9,000	Electric	12.1	80	Heat Pump Water Heater	2.5	80	$3,322.98	0.00	11,079	0	$1,484	$4,000	$0	$0	$0	$4,000	2.70	2.70
			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.

LEARN MORE AT energystar.gov

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Thomas B. Conley Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 59,584
Built: 1972

For Year Ending: February 29, 2024
Date Generated: August 22, 2024

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
Thomas B. Conley Elementary School 940 Iron Bridge Road Asbury, New Jersey 08802	Bethlehem Township School District 940 Iron Bridge Road Asbury, NJ 08802 (908) 479-6336	Brian Latzke 940 Iron Bridge Road Asbury, NJ 08802 (908) 479-6336 blatzke@btschools.org

Property ID: 34537821

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
75.8 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	1,708,597 (38%)
Fuel Oil (No. 1) (kBtu)	2,805,298 (62%)

Source EUI
127.8 kBtu/ft²

National Median Comparison

National Median Site EUI (kBtu/ft²)	58.6
National Median Source EUI (kBtu/ft²)	99
% Diff from National Median Source EUI	29%

Annual Emissions

Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	360

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)

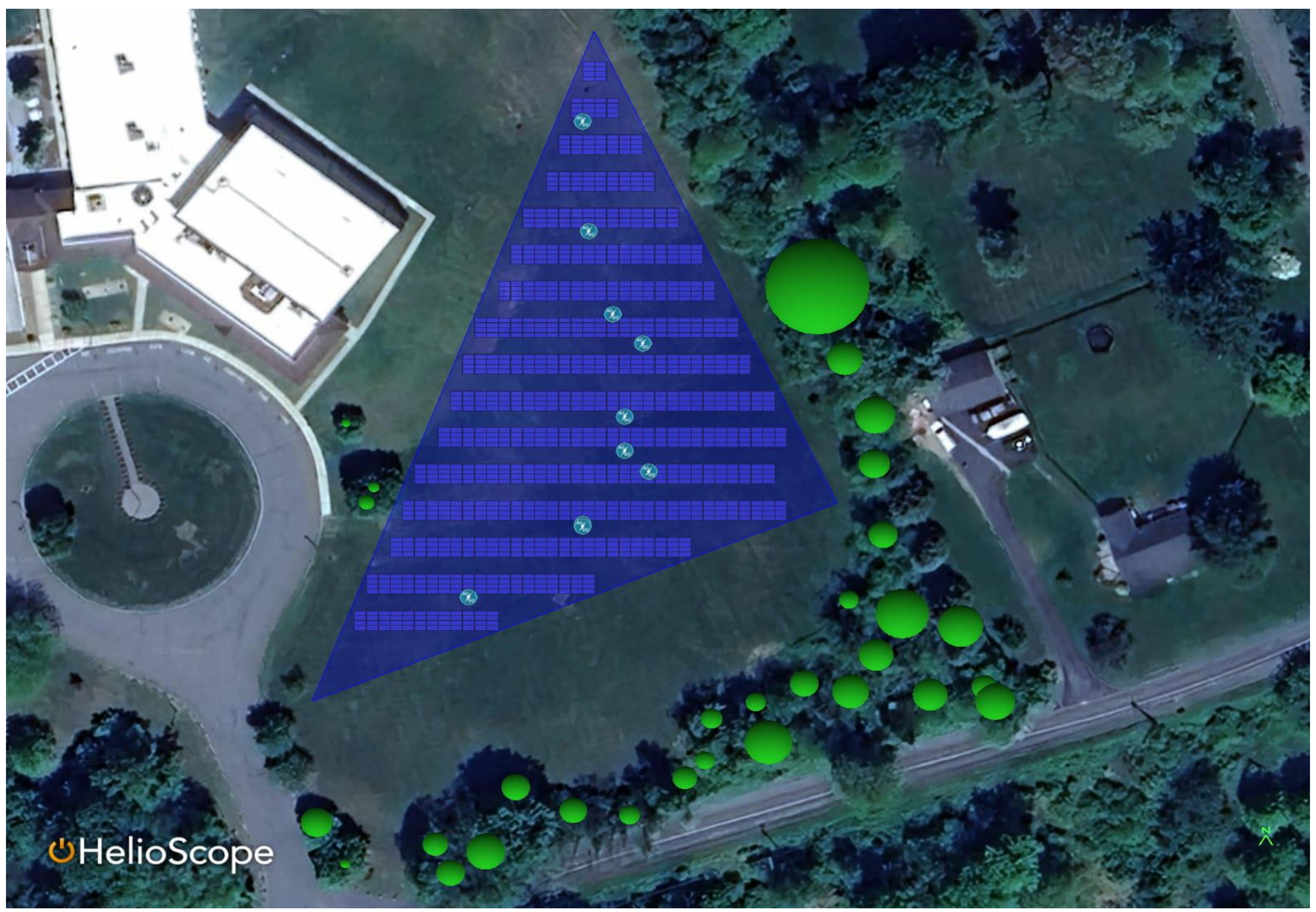
APPENDIX C: ADDITIONAL SCOPE

Summary

DER	Gross Project Cost ($)	Energy Generation (kWh)	Demand Reduction (kW)	GHG Reduction (MT CO2)	Total Annual Utility Cost Savings ($/yr)	New Maintenance Penalty ($/yr)	Net Annual Cost Savings ($/yr)	Incentives (ITC) ($)	Depreciation (MACRS) ($)	Net Project Cost ($)	Net Simple Payback (yr)
370 kW Solar PV	$2,276,000	502,608	38	100.0	$51,652	$11,380	$40,272	$682,800	$569,000	$1,024,200	25.4
Total	$2,276,000	502,608	38	100.0	$51,652	$11,380	$40,272	$682,800	$569,000	$1,024,200	25.4

PPA Alternative:	-$11,982	Annual Utility Savings

Baseline kWh	498,560
Saved kWh	502,608
% NZE	101%
NZE Solar Size kW	367



Equipment	Estimated Max Demand Savings (kW)	Estimated Annual Energy Generation (kWh)	Estimated Annual GHG Reduction ($MT\text{-}CO_2e$)	Estimated Annual Cost Savings ($)	Estimated Gross Project Cost ($)	Total Incentives ($)	Net Project Cost ($)	Simple Payback Period (yr)
370 kW Solar PV	38	502,608	100	$40,272	$2,276,000	$1,251,800	$1,024,200	25.4
Total	38	502,608	100	$40,272	$2,276,000	$1,251,800	$1,024,200	25.4

Ownership Plan	Upfront Cost	Year 1 Cost After Rebates	Annual Savings	Lifetime 30-Year Cost Savings ($)	30-Year ROI
Cash Purchase	$2,276,000	$1,024,200	$40,272	$1,208,161	118%
PPA	$0	$0	($11,982)	($359,457)	-

Equipment	Estimated Gross Project Cost ($)	ITC Rebate	MACRS Rebate	Net Project Cost
370 kW Solar PV	$2,276,000	$682,800	$569,000	$1,024,200

System Description	Quantity	Unit	Equipment Cost per Unit ($)	Labor Cost Per Unit ($)	Material Cost Per Unit ($)	Total Material Cost ($)	Total Equipment Cost ($)	Total Labor Cost ($)	Total Cost ($)	Source	Notes
Solar Array											
PV Modules (Trina Solar 320 W)	370,000	Watts DC			$0.45	$166,500	$0	$0	$166,500	PV size from ETB, cost from NREL report	https://www.nrel.gov/docs/fy22osti/83586.pdf
Inverter, 30 kW	13	Ea.		$400	$4,500	$58,500	$0	$20,821	$79,321	Inverter size from Helioscope - Cost from online quote Labor - 4 Hrs. Electrician per unit	https://www.solaris-shop.com/sma-sunny-tripower-x-30-us-50-stp-30-us-50-480vac-afci-dc-disconnect-sunspec-certified-rapid-shutdown-transmitter/
Ground Structure and Racking Cost/Labor/Installation	370,000	Watts DC		$1	$1	$370,000	$0	$448,107	$818,107	Energy ToolBase	Considered PV Mounting/Racking Cost
PV String Combiner Panels	9	Ea.		$100	$568	$4,974	$0	$1,752	$6,725	Online Quote Labor - 1 Hrs. Electrician per unit	https://www.solaris-shop.com/sma-cu1000-us-11-string-combiner-w-disconnect/ Each 1000V combiner box with disconnect switch can accommodate 8 strings total Project site has up to 70 strings
Electrical BOS Ground Mount	4,314	m^2	$0	$0	$50	$215,691	$0	$0	$215,691	assumed the same cost as the ground mounted https://www.nrel.gov/docs/fy22osti/83586.pdf	U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022
Installation rental equipment Ground Mount	4,314	m^2	$15	$0	$0	$0	$62,982	$0	$62,982	assumed the same cost as the ground mounted https://www.nrel.gov/docs/fy22osti/83586.pdf	U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022
Trenching/Site Prep and Wiring											
Schedule 80 PVC Piping 6" Diameter	100	LF	$0	$45	$53	$5,300	$0	$4,524	$9,824	RS means - 221113742560	
Trenching and Backfill 12" wide, 36" Deep	2	Day.	$425	$1,836	$0	$0	$850	$3,673	$4,523	Includes B-54 Crew - reference 312316142850	(2) Days of work (2) Laborers (1) 40 HP Chain Trencher (1) Light Equip Operator
Soil Excavation, Removal, loading, and hauling	2	L.C.Y	$7	$6	$0	$0	$14	$12	$26	Includes B-34D Crew - reference 312323204304	Includes (1) Truck Driver (1) Truck Tractor (1) Dump Trailer

Trenching/Site Prep and Wiring											
Backfill and Asphalt Paving 8" Thick	2	Day.	$3,428	$6,777	$30	$3,213	$6,856	$13,554	$23,623	Includes B-25 Crew - reference 32 11 26 13 0560	1 Day of Filling Trench and Repaving Asphalt Includes (1) Labor Foreman (7) Laborers (3) Equipment Operators (1) Asphalt Paver, 130 H.P. (1) Tandem Roller, 10 Ton (1) Roller, Pneum. Wheel, 12 Ton
Other Costs											
User Training	8	Hr.	$0	$150	$0.00	$0	$0	$1,200	$1,200		
Total						**$824,200**	**$70,700**	**$493,600**	**$1,388,521**		

Markup	Cost
System Cost	$1,388,521
NJ Sales Tax (6.625%)	$54,603
O&P Cost (10%)	$138,852
EPC Markup (10%)	$138,852
Contingency (30%)	$416,556
Escalation from 2022	$138,852
Total Cost	$2,276,000

Solar Cost	$2,274,033	
Electrical Upgrades, Permitting and Misc...	$1,967	
Solar Cost with Elec Upgrades	$2,276,000	$6.15

PPA Analysis

	Income			Net		
Year	Cash Purchase	Standard PPA	PPA with Year 10 Buyout	Cash Purchase	Standard PPA	PPA with Year 10 Buyout
0	-$1,024,200	$0	$0	-$1,024,200	$0	$0
1	$40,272	-$11,982	-$11,982	-$983,928	-$11,982	-$11,982
2	$40,272	-$11,982	-$11,982	-$943,656	-$23,964	-$23,964
3	$40,272	-$11,982	-$11,982	-$903,384	-$35,946	-$35,946
4	$40,272	-$11,982	-$11,982	-$863,112	-$47,928	-$47,928
5	$40,272	-$11,982	-$11,982	-$822,840	-$59,909	-$59,909
6	$40,272	-$11,982	-$11,982	-$782,568	-$71,891	-$71,891
7	$40,272	-$11,982	-$11,982	-$742,296	-$83,873	-$83,873
8	$40,272	-$11,982	-$11,982	-$702,024	-$95,855	-$95,855
9	$40,272	-$11,982	-$11,982	-$661,752	-$107,837	-$107,837
10	$40,272	-$11,982	-$11,982	-$621,480	-$119,819	-$119,819
11	$40,272	-$11,982	-$536,638	-$581,208	-$131,801	-$656,457
12	$40,272	-$11,982	$40,272	-$540,936	-$143,783	-$616,185
13	$40,272	-$11,982	$40,272	-$500,663	-$155,765	-$575,913
14	$40,272	-$11,982	$40,272	-$460,391	-$167,746	-$535,641
15	$40,272	-$11,982	$40,272	-$420,119	-$179,728	-$495,369
16	$40,272	-$11,982	$40,272	-$379,847	-$191,710	-$455,096
17	$40,272	-$11,982	$40,272	-$339,575	-$203,692	-$414,824
18	$40,272	-$11,982	$40,272	-$299,303	-$215,674	-$374,552
19	$40,272	-$11,982	$40,272	-$259,031	-$227,656	-$334,280
20	$40,272	-$11,982	$40,272	-$218,759	-$239,638	-$294,008
21	$40,272	-$11,982	$40,272	-$178,487	-$251,620	-$253,736
22	$40,272	-$11,982	$40,272	-$138,215	-$263,601	-$213,464
23	$40,272	-$11,982	$40,272	-$97,943	-$275,583	-$173,192
24	$40,272	-$11,982	$40,272	-$57,671	-$287,565	-$132,920
25	$40,272	-$11,982	$40,272	-$17,399	-$299,547	-$92,648
26	$40,272	-$11,982	$40,272	$22,873	-$311,529	-$52,376
27	$40,272	-$11,982	$40,272	$63,145	-$323,511	-$12,104
28	$40,272	-$11,982	$40,272	$103,417	-$335,493	$28,168
29	$40,272	-$11,982	$40,272	$143,689	-$347,475	$68,440
30	$40,272	-$11,982	$40,272	$183,961	-$359,457	$108,712

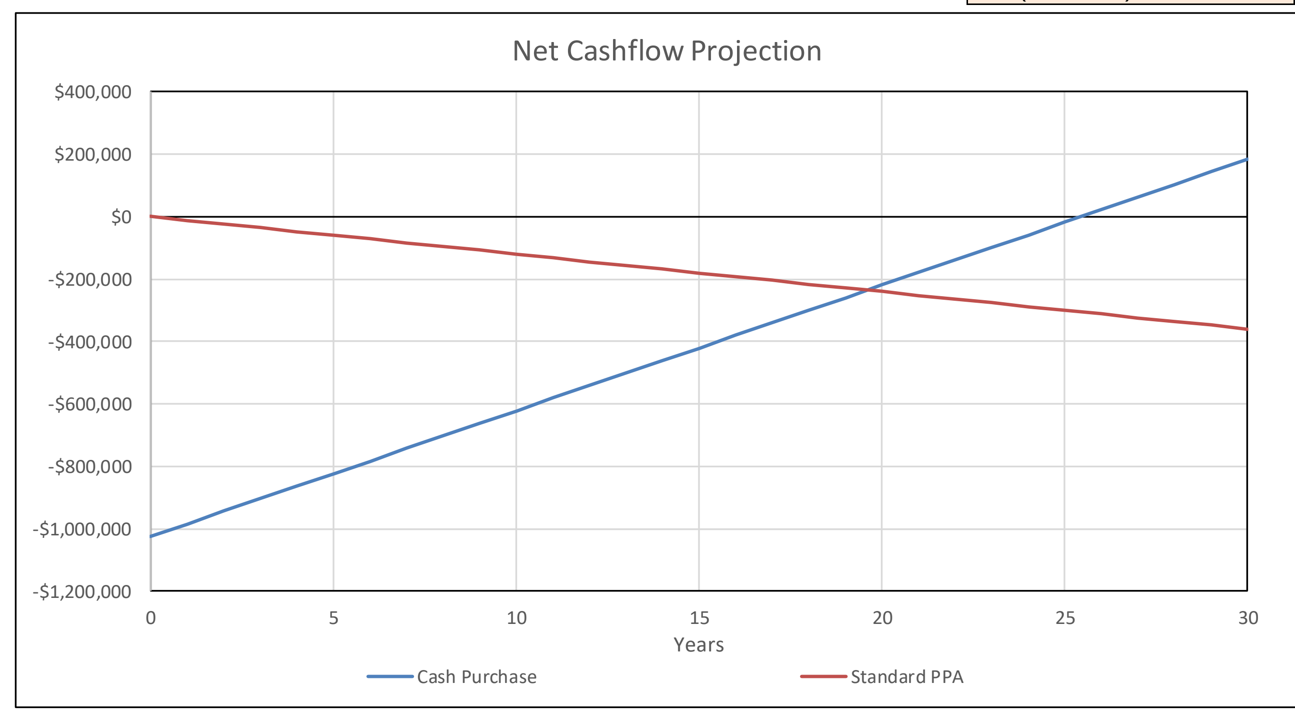
Cash Purchase	
Gross Project Cost	$2,276,000
Rebates	-$682,800
85% Depreciation	-$569,000
n/a	$0
Final Cost	$1,024,200
Utility Savings	$40,272
Payback	25.4
Financial Life (yr)	30
ROI (Over EUL)	118%

Battery Cost:	$0
Solar Cost:	$2,276,000

Standard PPA	
Gross Project Cost	$2,276,000
Rebates	-$682,800
85% Depreciation	-$569,000
n/a	$0
Final Cost	$1,024,200
Financial Life (yr)	30
Interest Rate	3.0%
Annual Income from Loan	$52,254
Utility Savings	$40,272
Annual Savings	-$11,982

Battery Cost:	$0
Solar Cost:	$2,276,000

PPA with Year 10 Buyout	
Gross Project Cost	$2,276,000
Rebates	-$682,800
85% Depreciation	-$569,000
n/a	$0
Final Cost	$1,024,200
Financial Life (yr)	30
Interest Rate	3.0%
Years 1-10	
Contractor's Income	$52,254
Utility Savings	$40,272
Customer Savings	-$11,982
Years 11-30	
Contractor O&P	15%
Buyout Cost	$576,910
Utility Savings	$40,272
Year 11-25 Payback	14.3
Lifetime Savings	$685,622
ROI (Over RUL)	119%



TRC

ETB Outputs

Bill Date Ranges			Energy Before PV/ESS (kWh)	Max Demand Before PV/ESS (kW)	Raw Utility Info Charges Before PV/ESS ($)				Cost Markup Charges Before PV/ESS ($)			
Start Date	End Date	Season	Total	NC / Max	Other	Energy	Demand	Total	Other	Energy	Demand	Total
1/15/2024	2/15/2024	W	52160	138	14.69	5613.85	944.64	6573.18	$ 14.69	$ 5,613.85	$ 944.64	$ 6,573.18
2/15/2023	3/15/2023	W	43520	137	14.69	4693.24	937.26	5645.19	$ 14.69	$ 4,693.24	$ 937.26	$ 5,645.19
3/15/2023	4/15/2023	W	44800	138	14.69	4829.62	944.64	5788.95	$ 14.69	$ 4,829.62	$ 944.64	$ 5,788.95
4/15/2023	5/15/2023	W	39360	142	14.69	4249.98	974.16	5238.83	$ 14.69	$ 4,249.98	$ 974.16	$ 5,238.83
5/15/2023	6/1/2023	W	31680	168	8.06	3431.66	639.44	4079.16	$ 8.06	$ 3,431.66	$ 639.44	$ 4,079.16
6/1/2023	6/15/2023	S	20960	138	6.63	2300.25	457.83	2764.71	$ 6.63	$ 2,300.25	$ 457.83	$ 2,764.71
6/15/2023	7/15/2023	S	20960	138	14.69	2300.25	1013.76	3328.7	$ 14.69	$ 2,300.25	$ 1,013.76	$ 3,328.70
7/15/2023	8/15/2023	S	41290	162	14.69	4472.14	1203.84	5690.67	$ 14.69	$ 4,472.14	$ 1,203.84	$ 5,690.67
8/15/2023	9/15/2023	S	33600	184	14.69	3650.61	1378.08	5043.38	$ 14.69	$ 3,650.61	$ 1,378.08	$ 5,043.38
9/15/2023	10/1/2023	S	44840	179	7.83	4851.4	713.86	5573.09	$ 7.83	$ 4,851.40	$ 713.86	$ 5,573.09
10/1/2023	10/15/2023	W	20160	156	6.86	2204.18	502.82	2713.86	$ 6.86	$ 2,204.18	$ 502.82	$ 2,713.86
10/15/2023	11/15/2023	W	20160	156	14.69	2204.18	1077.48	3296.35	$ 14.69	$ 2,204.18	$ 1,077.48	$ 3,296.35
11/15/2023	12/15/2023	W	42880	138	14.69	4625.04	944.64	5584.37	$ 14.69	$ 4,625.04	$ 944.64	$ 5,584.37
12/15/2023	1/15/2024	W	41920	135	14.69	4522.75	922.5	5459.94	$ 14.69	$ 4,522.75	$ 922.50	$ 5,459.94
Subtotal			498290		176.28	53949.15	12654.95	0	$ 176.28	$ 53,949.15	$12,654.95	$ -
Adjustments			0		0	0	0	0	$ -	$ -	$ -	$ -
Total			498290		176.28	53949.15	12654.95	66780.38	$ 176.28	$ 53,949.15	$12,654.95	$ 66,780.38

Bill Date Ranges			Energy After PV & Before ESS (kWh)	Max Demand After PV & Before ESS (kW)	Charges After PV & Before ESS ($)				Charges After PV & Before ESS ($)			
Start Date	End Date	Season	Total	NC / Max	Other	Energy	Demand	Total	Other	Energy	Demand	Total
1/15/2024	2/15/2024	W	20550	128	14.69	2245.74	870.84	3131.27	$ 14.69	$ 2,245.74	$ 870.84	$ 3,131.27
2/15/2023	3/15/2023	W	3874	119	14.69	468.88	804.42	1287.99	$ 14.69	$ 468.88	$ 804.42	$ 1,287.99
3/15/2023	4/15/2023	W	-2875	89	14.69	-362.43	583.02	235.28	$ 14.69	$ (362.43)	$ 583.02	$ 235.28
4/15/2023	5/15/2023	W	-13912	102	14.69	-1538.44	678.96	-844.79	$ 14.69	$ (1,538.44)	$ 678.96	$ (844.79)
5/15/2023	6/1/2023	W	7148	124	8.06	817.73	461.37	1287.15	$ 8.06	$ 817.73	$ 461.37	$ 1,287.15
6/1/2023	6/15/2023	S	-1227	95	6.63	-192.13	304.03	118.53	$ 6.63	$ (192.13)	$ 304.03	$ 118.53
6/15/2023	7/15/2023	S	-33561	59	14.69	-3646.44	388.08	-3243.67	$ 14.69	$ (3,646.44)	$ 388.08	$ (3,243.67)
7/15/2023	8/15/2023	S	-16621	88	14.69	-1836.71	617.76	-1204.26	$ 14.69	$ (1,836.71)	$ 617.76	$ (1,204.26)
8/15/2023	9/15/2023	S	-17353	143	14.69	-1914.91	1053.36	-846.86	$ 14.69	$ (1,914.91)	$ 1,053.36	$ (846.86)
9/15/2023	10/1/2023	S	23870	146	7.83	2611.13	574.46	3193.43	$ 7.83	$ 2,611.13	$ 574.46	$ 3,193.43
10/1/2023	10/15/2023	W	7113	93	6.86	814	285.85	1106.7	$ 6.86	$ 814.00	$ 285.85	$ 1,106.70
10/15/2023	11/15/2023	W	-19718	50	14.69	-2157.09	295.2	-1847.2	$ 14.69	$ (2,157.09)	$ 295.20	$ (1,847.20)
11/15/2023	12/15/2023	W	18597	128	14.69	2037.64	870.84	2923.17	$ 14.69	$ 2,037.64	$ 870.84	$ 2,923.17
12/15/2023	1/15/2024	W	19797	131	14.69	2165.5	892.98	3073.17	$ 14.69	$ 2,165.50	$ 892.98	$ 3,073.17
Subtotal			-4318		176.28	-487.54	8681.17	0	$ 176.28	$ (487.54)	$ 8,681.17	$ -
Adjustments			0		0	0	0	0	$ -	$ -	$ -	$ -
Total			-4318		176.28	6270.89	8681.17	15128.34	$ 176.28	$ 6,270.89	$ 8,681.17	$ 15,128.34

Bill Date Ranges			Energy After PV & Before ESS (kWh)	Max Demand After PV & Before ESS (kW)	Charges After PV & Before ESS ($)				Charges After PV/ESS ($)			
Start Date	End Date	Season	Total	NC / Max	Other	Energy	Demand	Total	Other	Energy	Demand	Total
1/15/2024	2/15/2024	W	20550	128	14.69	2245.74	870.84	3131.27	$ 14.69	$ 2,245.74	$ 870.84	$ 3,131.27
2/15/2023	3/15/2023	W	3874	119	14.69	468.88	804.42	1287.99	$ 14.69	$ 468.88	$ 804.42	$ 1,287.99
3/15/2023	4/15/2023	W	-2875	89	14.69	-362.43	583.02	235.28	$ 14.69	$ (362.43)	$ 583.02	$ 235.28
4/15/2023	5/15/2023	W	-13912	102	14.69	-1538.44	678.96	-844.79	$ 14.69	$ (1,538.44)	$ 678.96	$ (844.79)
5/15/2023	6/1/2023	W	7148	124	8.06	817.73	461.37	1287.15	$ 8.06	$ 817.73	$ 461.37	$ 1,287.15
6/1/2023	6/15/2023	S	-1227	95	6.63	-192.13	304.03	118.53	$ 6.63	$ (192.13)	$ 304.03	$ 118.53
6/15/2023	7/15/2023	S	-33561	59	14.69	-3646.44	388.08	-3243.67	$ 14.69	$ (3,646.44)	$ 388.08	$ (3,243.67)
7/15/2023	8/15/2023	S	-16621	88	14.69	-1836.71	617.76	-1204.26	$ 14.69	$ (1,836.71)	$ 617.76	$ (1,204.26)
8/15/2023	9/15/2023	S	-17353	143	14.69	-1914.91	1053.36	-846.86	$ 14.69	$ (1,914.91)	$ 1,053.36	$ (846.86)
9/15/2023	10/1/2023	S	23870	146	7.83	2611.13	574.46	3193.43	$ 7.83	$ 2,611.13	$ 574.46	$ 3,193.43
10/1/2023	10/15/2023	W	7113	93	6.86	814	285.85	1106.7	$ 6.86	$ 814.00	$ 285.85	$ 1,106.70
10/15/2023	11/15/2023	W	-19718	50	14.69	-2157.09	295.2	-1847.2	$ 14.69	$ (2,157.09)	$ 295.20	$ (1,847.20)
11/15/2023	12/15/2023	W	18597	128	14.69	2037.64	870.84	2923.17	$ 14.69	$ 2,037.64	$ 870.84	$ 2,923.17
12/15/2023	1/15/2024	W	19797	131	14.69	2165.5	892.98	3073.17	$ 14.69	$ 2,165.50	$ 892.98	$ 3,073.17
Subtotal			-4318		176.28	-487.54	8681.17	0	$ 176.28	$ (487.54)	$ 8,681.17	$ -
Adjustments			0		0	0	0	0	$ -	$ -	$ -	$ -
Total			-4318		176.28	6270.89	8681.17	15128.34	$ 176.28	$ 6,270.89	$ 8,681.17	$ 15,128.34

Energy Toolbase

PV SYSTEM DETAILS

GENERAL INFORMATION

Facility: Thomas B. Conley Elementary School

Address: 940 Iron Bridge Rd Asbury NJ 08802

SOLAR PV EQUIPMENT DESCRIPTION

Solar Panels: (1156) Trina Solar TSM-PD14 320

Inverters: (13) SMA Sunny Tripower 24000TL-US

SOLAR PV EQUIPMENT TYPICAL LIFESPAN

Solar Panels: Greater than 30 Years

Inverters: 15 Years

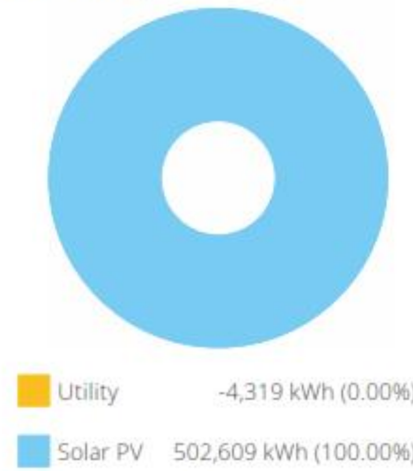
SOLAR PV SYSTEM RATING

Power Rating: 369,920 W-DC

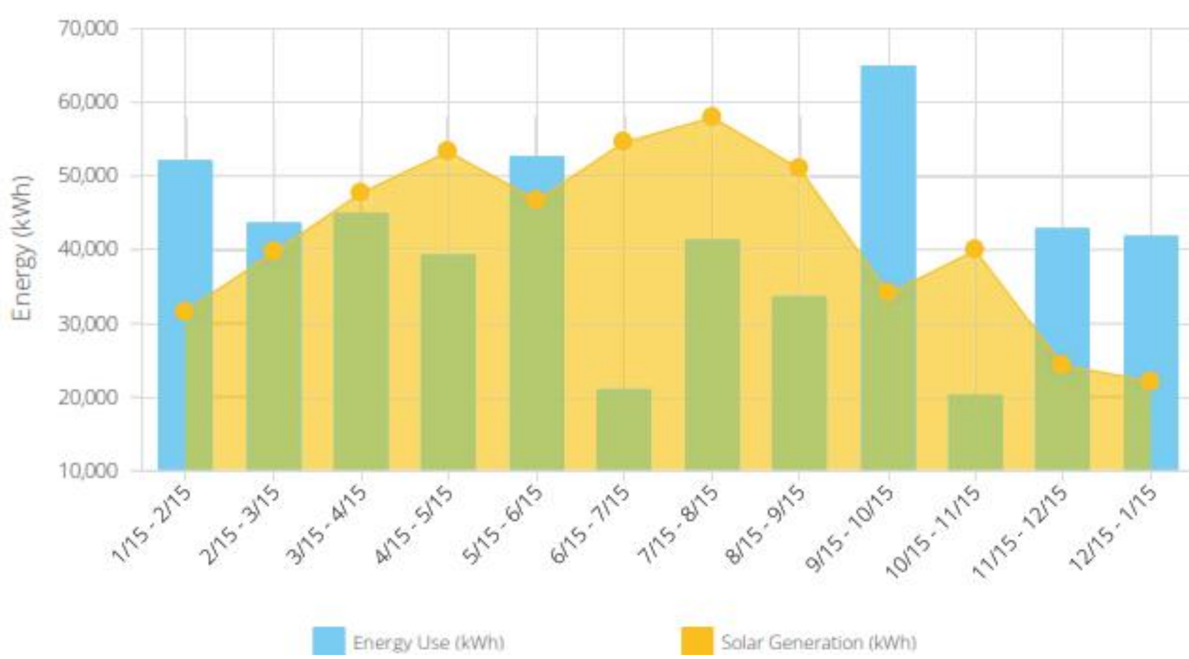
Power Rating: 315,579 W-AC-CEC

ENERGY CONSUMPTION MIX

Annual Energy Use: 498,290 kWh



MONTHLY ENERGY USE VS SOLAR GENERATION



ENVIRONMENTAL BENEFITS

OVER THE NEXT 30 YEARS, YOUR SYSTEM WILL DO MORE THAN JUST SAVE YOU MONEY. ACCORDING TO THE EPA'S GREENHOUSE GAS EQUIVALENCIES CALCULATOR, YOUR SOLAR PV SYSTEM WILL HAVE THE IMPACT OF REDUCING:

100	**247,525**	**100**
MT of CO2 Offset	Miles Driven By Cars	Trees Grown Over Full Lifetime (i.e. 40 yrs)

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APPENDIX D: 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, which 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 1/8th of an inch.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
therm	100,000 Btu. Typically used as a measure of natural gas consumption.
tons	A unit of cooling capacity equal to 12,000 Btu/hr.
Turnkey	Provision of a complete product or service that is ready for immediate use.
VAV	*Variable air volume*
VFD	*Variable frequency drive*: a controller used to vary the speed of an electric motor.
WaterSense®	The symbol for water efficiency. The WaterSense® program is managed by the EPA.
Watt (W)	Unit of power commonly used to measure electricity use.