Local Government Energy Audit Report

Birches Elementary School

September 4, 2024

Prepared for:
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Disclaimer

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

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

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

Incentive values provided in this report are estimated based 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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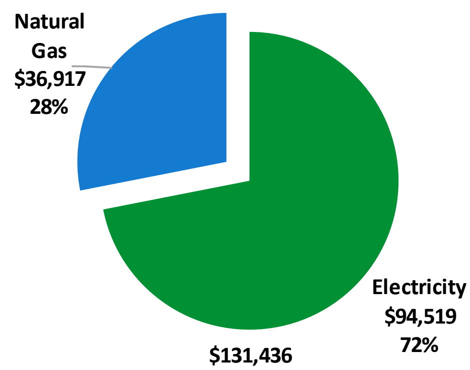
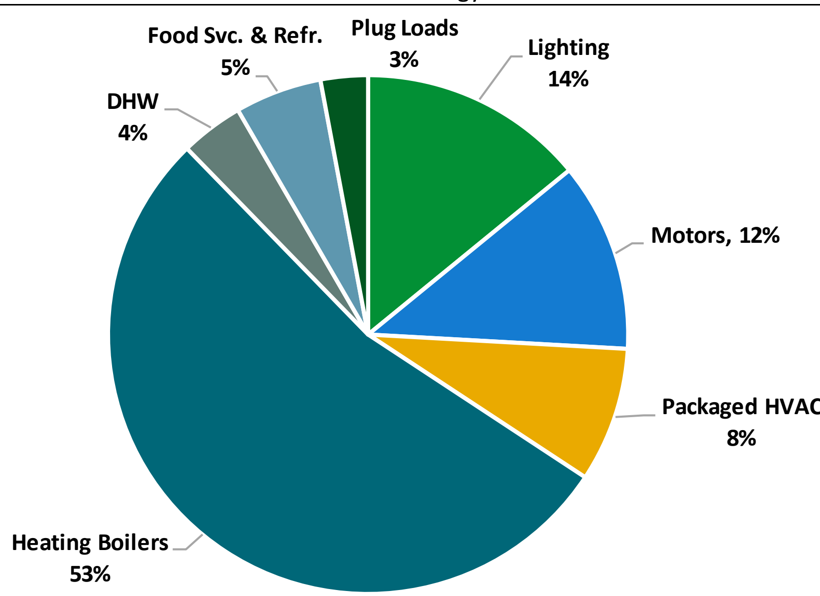
1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Washington Township Board of Education. 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: $131,436 Electricity: 485,480 kWh Natural Gas: 22,389 Therms Water: 136,333 Gallons	
ENERGY STAR® Benchmarking Score	68 *(1-100 scale)*	Congratulations, your building performs better than the national average. This report has suggestions about how to keep your building running efficiently, further improve performance, and lower your energy bills even more.



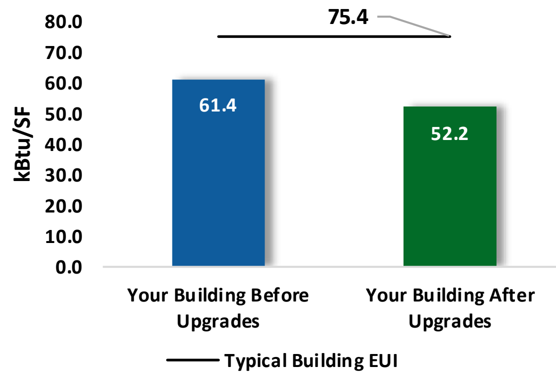
Energy Use by System

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.

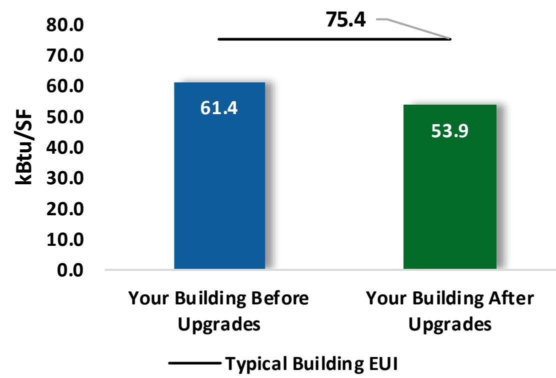
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$486,300
Potential Rebates & Incentives[1]	$36,260
Annual Cost Savings	$33,361
Annual Energy Savings	Electricity: 170,926 kWh Natural Gas: 50 Therms
Greenhouse Gas Emission Savings	86 Tons
Simple Payback	13.5 Years
Site Energy Savings (All Utilities)	15%



Scenario 2: Cost Effective Package[2]

Installation Cost	$152,500
Potential Rebates & Incentives	$19,460
Annual Cost Savings	$27,710
Annual Energy Savings	Electricity: 143,212 kWh Natural Gas: -105 Therms
Greenhouse Gas Emission Savings	71 Tons
Simple Payback	4.8 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			**88,175**	**22.4**	**-16**	**$16,899**	**$60,670**	**$10,740**	**$49,930**	**3.0**	**86,888**
ECM 1	Install LED Fixtures	Yes	9,246	0.0	0	$1,800	$7,080	$1,100	$5,980	3.3	9,311
ECM 2	Retrofit Fixtures with LED Lamps	Yes	78,929	22.4	-16	$15,099	$53,590	$9,640	$43,950	2.9	77,577
Lighting Control Measures			**24,478**	**7.0**	**-5**	**$4,681**	**$30,740**	**$6,500**	**$24,240**	**5.2**	**24,050**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	21,793	6.2	-5	$4,168	$25,670	$2,990	$22,680	5.4	21,412
ECM 4	Install High/Low Lighting Controls	Yes	2,684	0.7	-1	$513	$5,070	$3,510	$1,560	3.0	2,637
Variable Frequency Drive (VFD) Measures			**29,060**	**9.1**	**0**	**$5,658**	**$58,200**	**$2,000**	**$56,200**	**9.9**	**29,263**
ECM 5	Install VFDs on Constant Volume (CV) Fans	Yes	29,060	9.1	0	$5,658	$58,200	$2,000	$56,200	9.9	29,263
Unitary HVAC Measures			**26,879**	**34.1**	**0**	**$5,233**	**$322,100**	**$16,800**	**$305,300**	**58.3**	**27,067**
ECM 6	Install High Efficiency Air Conditioning Units	No	26,879	34.1	0	$5,233	$322,100	$16,800	$305,300	58.3	27,067
HVAC System Improvements			**835**	**0.0**	**16**	**$418**	**$11,700**	**$0**	**$11,700**	**28.0**	**2,656**
ECM 7	Implement Demand Control Ventilation (DCV)	No	835	0.0	16	$418	$11,700	$0	$11,700	28.0	2,656
Domestic Water Heating Upgrade			**0**	**0.0**	**11**	**$180**	**$190**	**$90**	**$100**	**0.6**	**1,278**
ECM 8	Install Low-Flow DHW Devices	Yes	0	0.0	11	$180	$190	$90	$100	0.6	1,278
Food Service & Refrigeration Measures			**1,499**	**0.0**	**0**	**$292**	**$2,700**	**$130**	**$2,570**	**8.8**	**1,509**
ECM 9	Refrigeration Controls	Yes	1,499	0.0	0	$292	$2,700	$130	$2,570	8.8	1,509
TOTALS (COST EFFECTIVE MEASURES)			**143,212**	**38.5**	**-10**	**$27,710**	**$152,500**	**$19,460**	**$133,040**	**4.8**	**142,988**
TOTALS (ALL MEASURES)			**170,926**	**72.6**	**5**	**$33,361**	**$486,300**	**$36,260**	**$450,040**	**13.5**	**172,711**

* - 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 Washington Township Board of Education. 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 January 16, 2024, TRC performed an energy audit at Birches Elementary School located in Turnersville, New Jersey. TRC met with Bob Schoenfeldt to review the facility operations and help focus our investigation on specific energy-using systems.

Birches Elementary School is a one-story, 63,411 square foot building built in 1968. The facility is comprised of the main school building and storage building utilized by the maintenance workers. The main school building consists of the original southern-facing academic wing and a newer northern-facing academic wing attached via vestibules. Spaces include classrooms, gymnasium, offices, multipurpose-cafeteria area, corridors, commercial kitchen, and mechanical space. All areas at this site are served by a single electric and gas meter. A natural gas generator is operated in case of a power emergency.

Lighting systems generally consist of combination of linear fluorescent lamps and LED sources. The buildings are 100% heated and cooled by five condensing hot water boilers and several rooftop package air conditioner units.

Recent Improvements and Facility Concerns

No recent improvements to the facility were noted during the energy audit.

During the energy audit, it was found that the majority of the rooftop package units were operating beyond their useful life span or in poor condition.

Facility staff were additionally interested in upgrading the existing metal halide exterior wall packs and replacing other recessed exterior lighting with new LED fixtures. Interior lamps are in the process of being replaced with new LED lamps as the existing linear fluorescent tubes failed.

2.2 Building Occupancy

Birches Elementary is fully occupied for 11 months of the year. Typical weekday occupancy is 103 staff and 609 students. After normal school hours, the facility is operated until approximately 10:00 PM for maintenance. Due to the lack of summer schooling at this facility, summer occupancy includes only continuing maintenance activities. There are no weekend activities.

It should be noted that the energy and economic analysis for the facilities is based on the use of the building during the utility billing period, and that results will vary based on changes to the building.

Building Name	Weekday/Weekend	Operating Schedule
Birches Elementary - General Operating Hours	Weekday	6:00 AM - 10:00 PM
	Weekend	Closed
Birches Elementary - Class Hours	Weekday	7:55 AM - 2:30 PM
	Weekend	Closed

Building Occupancy Schedule

2.3 Building Envelope

Building walls are made of concrete masonry units (CMUs) with a brick veneer facade on the original wing of the building and painted CMUs on the new wing. Interior walls are a mix of painted CMU interior finish and finished sheetrock with steel framing. The level of exterior wall insulation is unknown. Steel trusses support a flat roof over the majority of the building. The facility's gymnasium and cafeteria have pitched roofs that are constructed in the same style as the flat sections. Both the flat and pitched roof sections have a black EDPM covering that is in good condition.

Most of the windows are double glazed and have aluminum frames with a thermal break. Windows installed in exterior doors are original single-pane glass. The glass-to-frame seals are in good condition. The operable window weather seals are in fair condition, showing little evidence of excessive wear. Exterior doors have aluminum frames and are in fair condition with undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration.

Building Walls

Flat Rooftop

Main Entrance *Exit Doors*

Typical Windows

Storage Shed

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. Linear fixture types include 1-lamp, 2-lamp, or 4-lamp, 2-foot or 4-foot-long recessed and surface mounted fixtures and 2-foot fixtures with U-bend tube lamps. Typically, T8 fluorescent lamps use electronic ballasts.

The facility's gymnasium and multipurpose-cafeteria lighting has been updated to replace linear fixtures with new LED high bay light fixtures in the gymnasium and LED light panels in the multipurpose room. Additionally, there are some compact fluorescent lamps (CFL), incandescent, and LED general purpose lamps. Linear fixtures and screw-based lamps in the boiler room and most storage areas have been replaced with LED equivalents. CFLs and incandescent lamps are found in the storage and maintenance areas.

Most fixtures are in good condition. Interior lighting levels were generally sufficient. All exit signs are LED. Light fixtures in spaces are either controlled by occupancy sensors or manual wall switches. The occupancy sensors are either wall or ceiling mounted.

Exterior illumination is provided by a mix of wall packs and canopy lights with CFLs, high-pressure sodium (HPS), and metal halide (MH) lamps that are controlled by photocell.



Linear Fluorescent T8 and LED Fixtures

LED Fixture

T8 U-Bend Fixture

Ceiling Mounted Occupancy Sensor

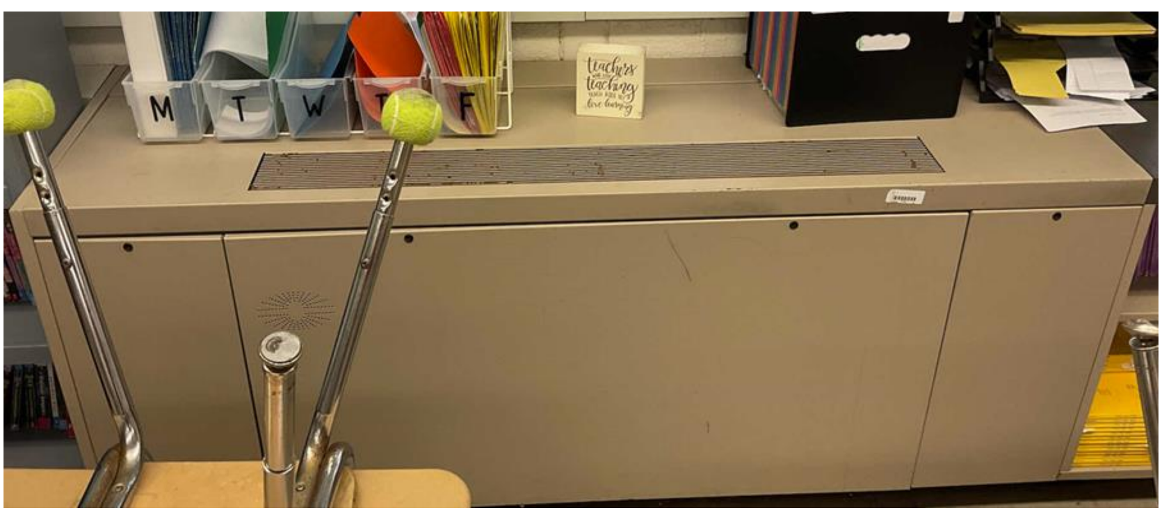
Exterior Screw-In Lighting

Metal Hallide Wall Packs

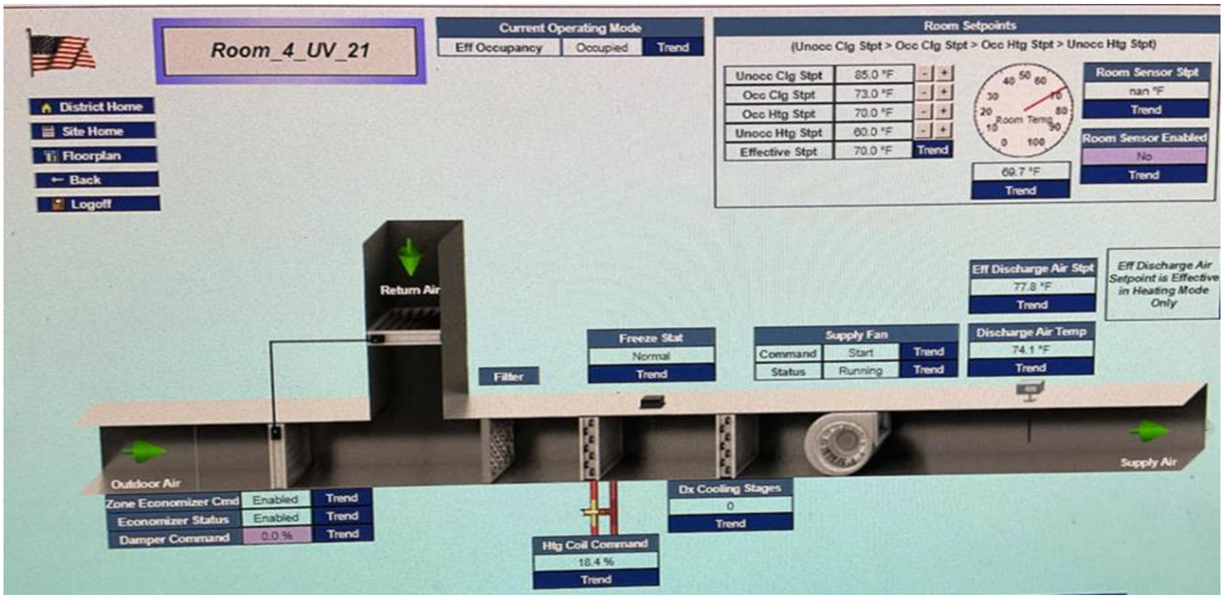
2.5 Air Handling Systems

Unit Ventilators

Unit ventilators provide heating, cooling, and ventilation to classrooms and offices. They are equipped with supply fan motors and digitally controlled outside air dampers and fan coil valves connected to the hot water distribution system and to direct expansion (DX) coils associated with roof mounted condensing units. This system was upgraded in the early 2000's and appears to be in fair operating condition, although it is now operating beyond its expected useful life.



Typical Classroom Unit Ventilator



BAS Screenshot - Unit Ventilator

Unitary Electric HVAC Equipment

Various office areas and classrooms throughout the school building are conditioned by unitary electric HVAC equipment. These include split air conditioning (AC) systems in the faculty dining area and the print room. Classrooms and offices within the southeastern and southwestern sections of the school building receive cooling from split AC systems attached to the unit ventilators within these spaces. These are all operating beyond their useful life, are in fair to poor condition, and are rated as standard efficiency. Their cooling capacities range between 1.0 tons and 9.0 tons with energy efficiency ratings (EER) ranging between 8.4 and 11.5. These systems are controlled by the school district's building automation system (BAS).

Mitsubishi Split System AC

Thermal Zone Condensing Unit (CU)

Unitary Heating Equipment

The gymnasium office and mechanical room are heated with hydronic unit heaters connected to the hot water heating loop. These units are capable of producing up to 100,000 BTU/hr. and are controlled by manual thermostats within each room. The units are in fair condition.

Hydronic Unit Heater

Packaged Units

Larger building spaces are served by multiple roof- mounted packaged air conditioning units. The units provide cooling through direct expansion coils and heating from the hot water loop. They are a mix of single and multizone units. These vary in cooling capacity between 3 tons and 20 tons. The units are equipped with supply fans ranging from 0.75 hp to 3.0 hp. RTU-1 and RTU-2 are equipped with variable frequency drives (VFDs)

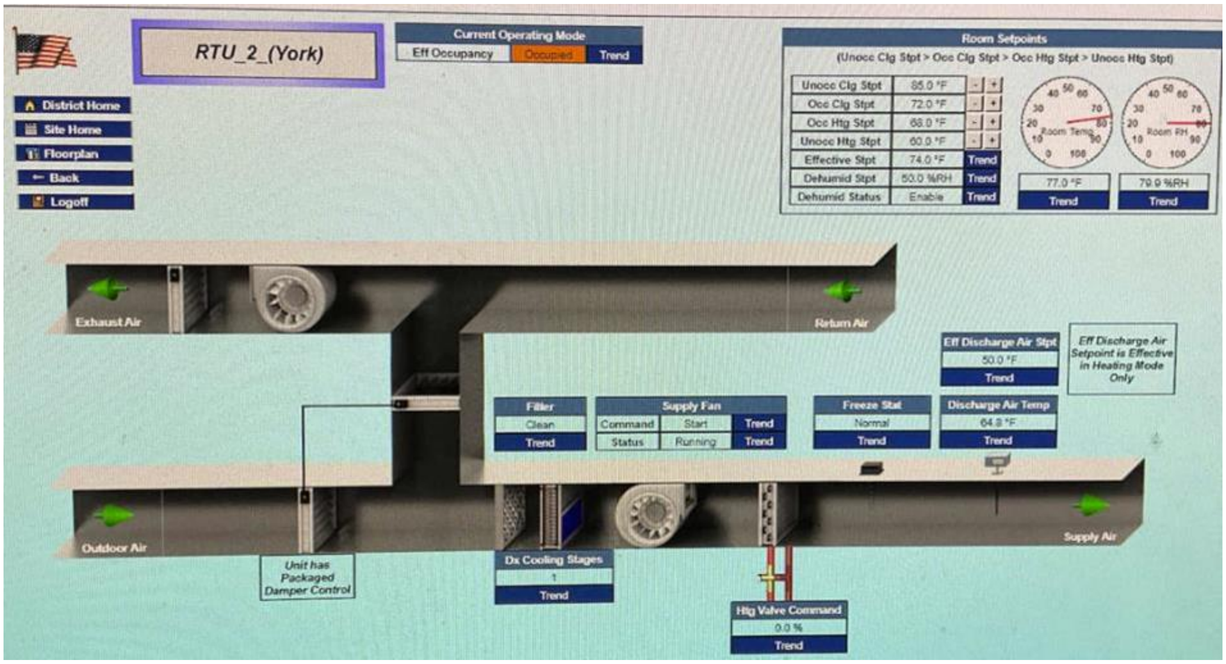
The units are nearing their useful life and have been evaluated for replacement except for RTU-1 which serves the gymnasium and that is in good condition. The units are controlled by the BAS.

Unit	Area Served	Size	Efficiency	Condition
York ZF090C00D2A1AAA1A1 (RTU 1-2)	Multipurpose Room/Cafeteria	7.50 Ton	11 SEER	Beyond Useful Life
ARCOAIRE PAMA060H1 (RTU-3)	Main Office	5.00 Ton	11.3 SEER	Beyond Useful Life
York DF072C00P4 (RTU-5)	Stage	6.00 Ton	10.4 SEER	Beyond Useful Life
TRANE THD240G3 (RTU-1)	Gymnasium	20.00 Ton	11 SEER	Good Condition

Unit	Area Served	Size	Efficiency	Condition
TRANE THD150G3R0B0UH6 (RTU-2)	Media Center/Library	12.50 Ton	12.1 SEER	Beyond Useful Life
York DR048C00PA (RTU-1 & -3 York)	Classrooms and Offices	4.00 Ton	11.5 SEER	Beyond Useful Life
York DR036C00P4 (RTU-2 & -4 York)	Classrooms and Offices	3.00 Ton	11.5 SEER	Beyond Useful Life
Carrier 50TJ004501GA (AC2)	Classrooms and Offices	5.00 Ton	9.2 SEER	Beyond Useful Life
TRANE TCD060C30 (AC5 & AC6)	Classrooms and Offices	5.00 Ton	11.3 SEER	Beyond Useful Life
TRANE TCD120C30 (AC4)	Classrooms and Offices	10.00 Ton	11.3 SEER	Beyond Useful Life
TRANE TCD102C3OAA (AC7)	Classrooms and Offices	8.50 Ton	11.3 SEER	Beyond Useful Life

Refer to Appendix A for detailed information about each unit.

RTU-2 -Media Center (Library)



BAS Screenshot-RTU-2 (York)-Multipurpose Room

Air Handling Units (AHUs)

The multipurpose-cafeteria area is conditioned by two unlabeled air handling units. These units are equipped with supply fan motors, hot water heating coils, and refrigerant coil for cooling. They are physically located above the stage area and were mostly inaccessible during the energy audit. The supply fan motors are assumed to be 3 hp, constant speed, and standard efficiency based on interviews with maintenance staff on-site.

The unit's cooling coils are connected to two outdoor condensing units, each with cooling capacities of 7.5 tons. The condensing units are labelled as ENERGY STAR and are in fair condition despite operating beyond their expected lifespan. The AHUs are controlled by the BAS. The heating coil is supplied by the hot water boiler, which is described in the section that follows.

Air Handling Units

Unit	Room Temp	Occ Clg Stpt	Occ Htg Stpt	Disch Temp	Freeze Stat	Fan Command	Dx Stage 1	Htg Valve Cmd	Oa Damper Cmd
MultiPurpose_AHU_1	32.0 °F	71.0 °F	69.0 °F	72.6 °F	Normal	Stop	Off	100.0 %	0.0 %
MultiPurpose_AHU_2	32.0 °F	73.0 °F	69.0 °F	68.0 °F	Normal	Stop	Off	100.0 %	0.0 %

Outdoor Air Temperature	43.3 °F
Outdoor Air Humidity	-7.0 %RH

Status Indication Legend: Alarm, Fault, Override, Down, Stale

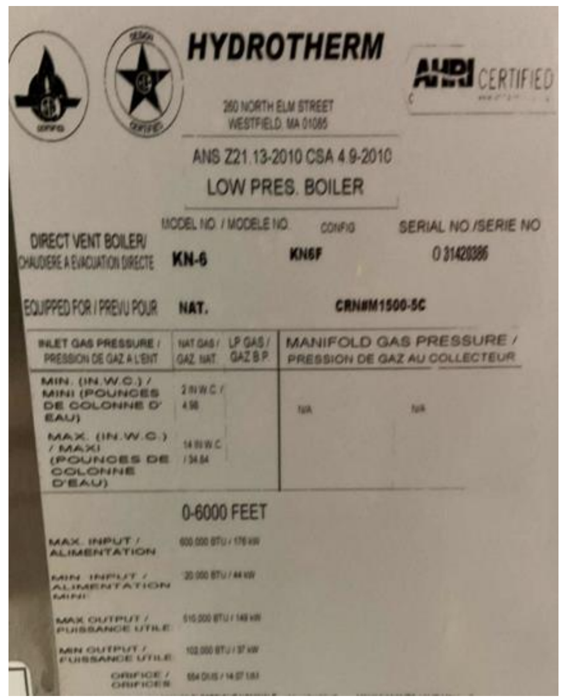
Table 1BAS Screenshot - AHU-1 and 2

2.6 Heating Hot Water Systems

Three Hydrotherm 510 MBh and two Hydrotherm 1,480 MBh condensing hot water boilers serve the facility's heating load. The burners are fully-modulating with a nominal efficiency of 85% and 92.5%, respectively. The boilers are configured in an automated control scheme. Multiple boilers are required under high load conditions. Installed in 2018 and 2019, they are in good condition.

The hydronic distribution system is a two-pipe, heating-only system. The boilers are configured in a variable flow primary distribution with two, 5 hp and 7.5 hp VFD controlled hot water pumps operating with an automated scheme. The boilers provide hot water to unit ventilators, hydronic heating units, and air handling units in the building.

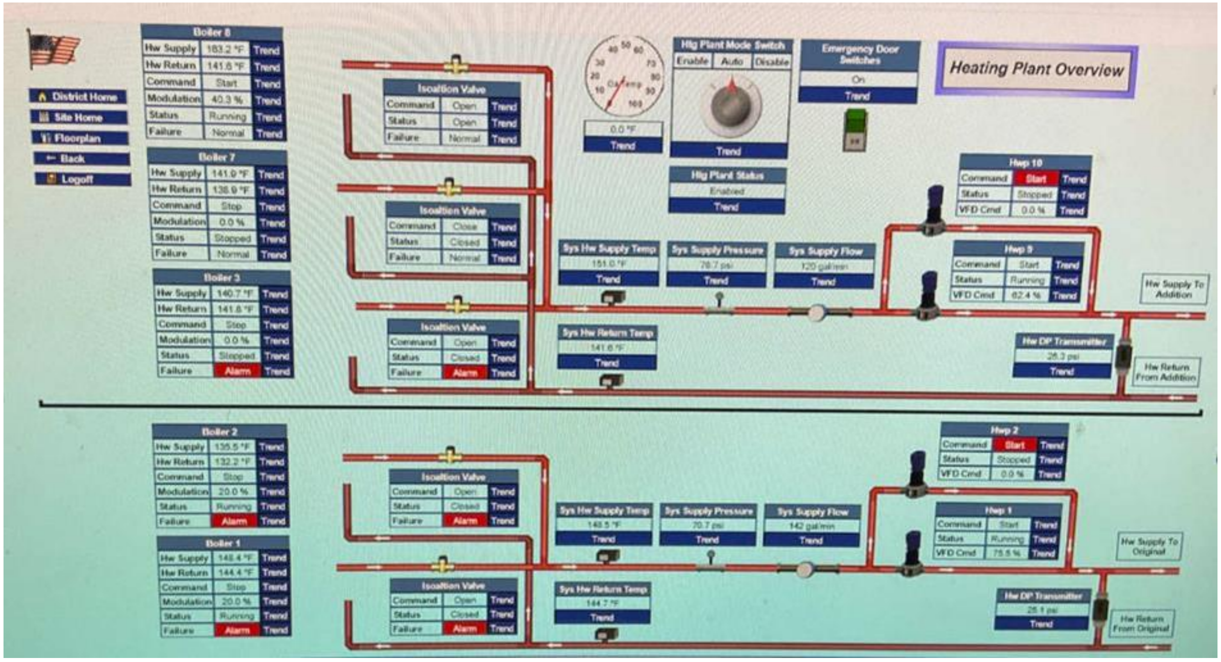
The hot water supply temperature averaged 145°F during the audit. The buildings occupied cooling and heating temperature setpoints are respectively 71°F and 69°F. Unoccupied cooling and heating setpoints are 85°F and 60°F, respectively.



Hot Water Boilers B-7 and B-8

Hot Water Boilers B-1 and B-2

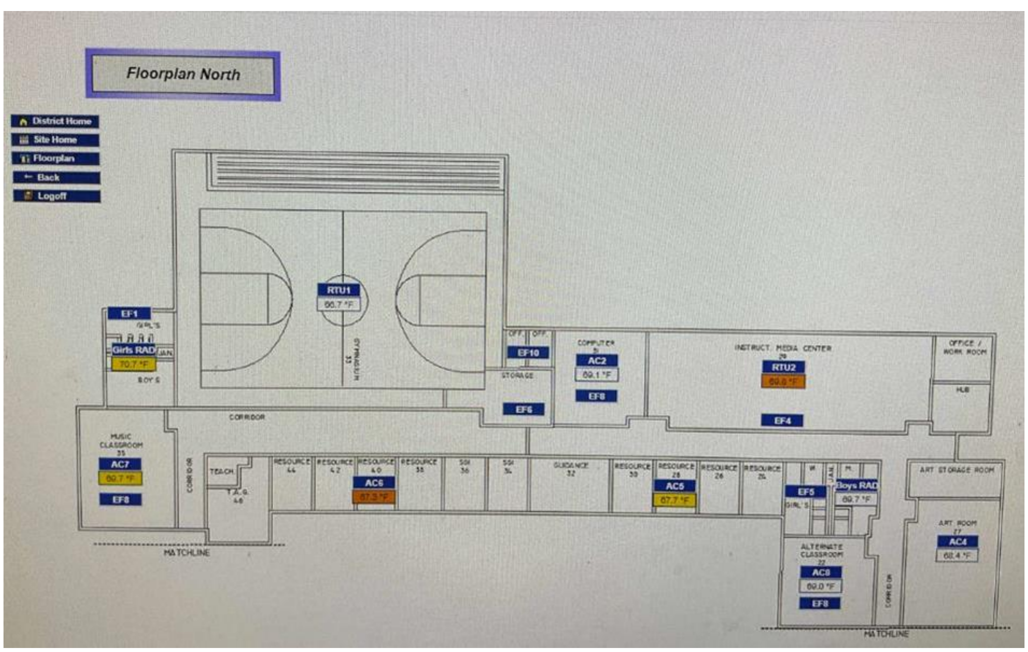
7.5 HP Variable Flow Hot Water Pumps



BAS Screenshot - Heating Hot Water Loops

2.7 Building Automation System (BAS)

A Honeywell BAS controls the HVAC equipment, boilers, air handlers, exhaust fans, and package units. The BAS provides equipment scheduling control and monitors space temperatures, supply air temperatures, humidity, and heating water loop temperatures.

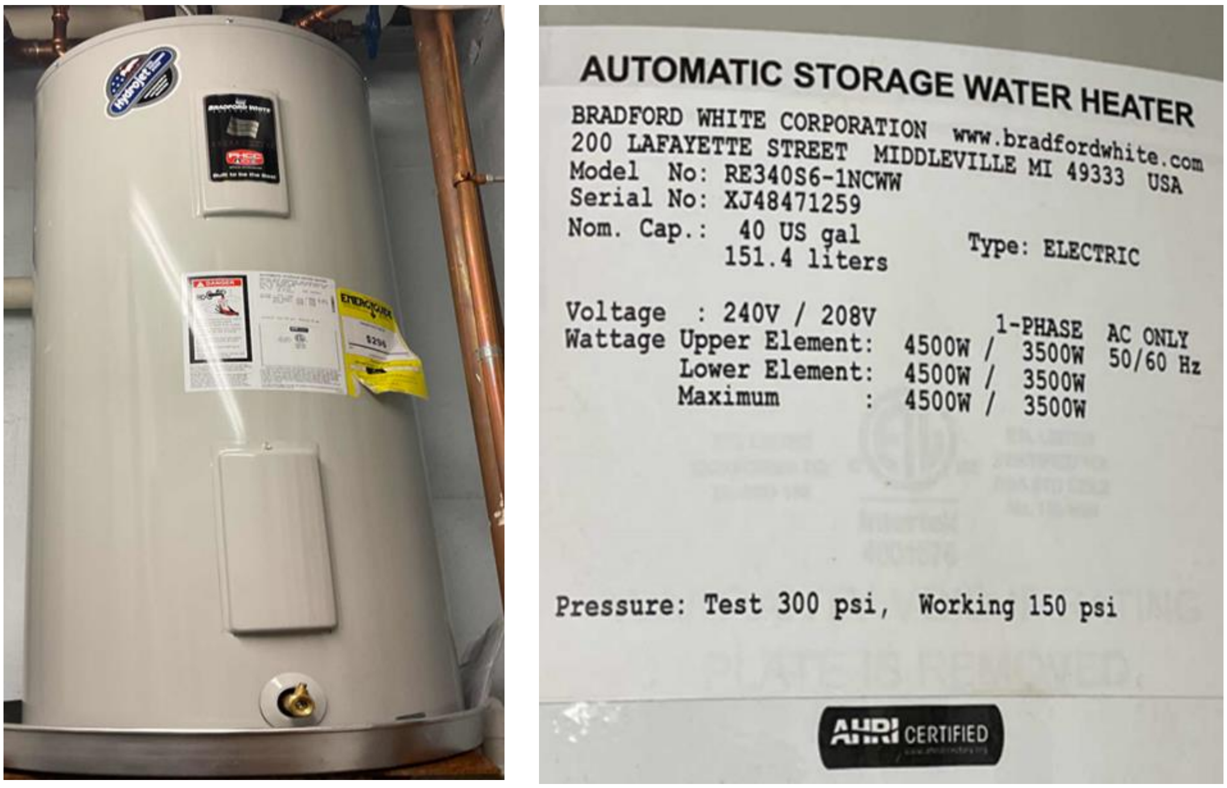


BAS Screenshot - Building Floor Plan

2.8 Domestic Hot Water

Hot water for the main school building is produced by a 93 gallon, 200 MBh Lochinvar condensing gas-fired storage tank water heater with an efficiency rating of 96%. One, 0.17 hp circulation pump distributes water to end uses. The circulation pump operates continuously.

Two, 4.5 kW instantaneous water heaters serve the media center and gymnasium locker rooms. At the time of the site visit, the domestic water heaters were set at 127°F. The domestic hot water pipes are insulated, and the insulation is in good condition.



Electric Tank Water Heater

Condensing Gas Fired Storage Tank Water Heater

2.9 Food Service Equipment

The kitchen has a mix of gas and electric equipment that is used to prepare breakfast and lunch for students. Most cooking is done using an electric oven. Bulk prepared foods are held in several electric holding cabinets. Equipment is not high efficiency and is in fair condition.

The dishwasher is a non-ENERGY STAR high temperature, door type unit. A 12-kW electric booster heater is installed with the dishwasher.

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

Combination Ovens and Insulated Cabinets

Commercial Dishwasher

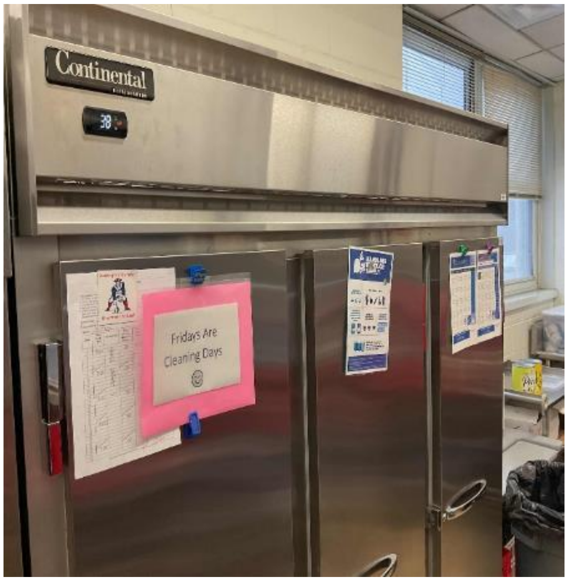
Attached Booster Heater

2.10 Refrigeration

The kitchen has several stand-up refrigerators with solid doors. There is also an energy efficient stand-up solid door freezer. There is a freezer chest as well as several refrigerator chests. All equipment is standard efficiency and in good condition.

The walk-in low temperature freezer has an estimated 0.75-ton compressor and a two-fan evaporator. The unit does not have evaporator fan or electric defrost control modules.

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



Typical Refrigeration Equipment in Kitchen

Walk-In Freezer

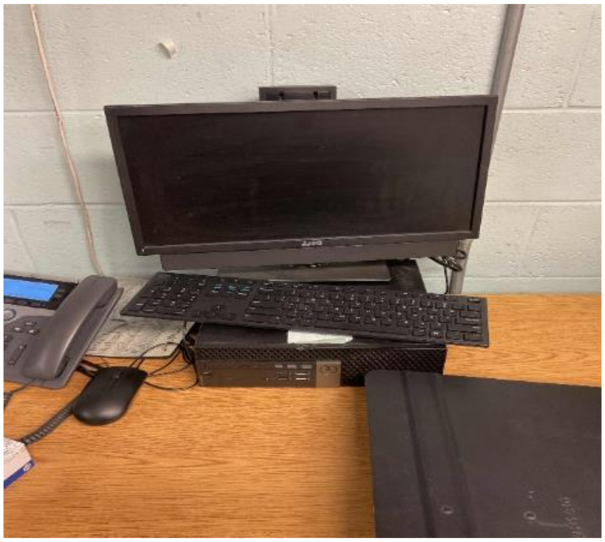
Evaporator

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.

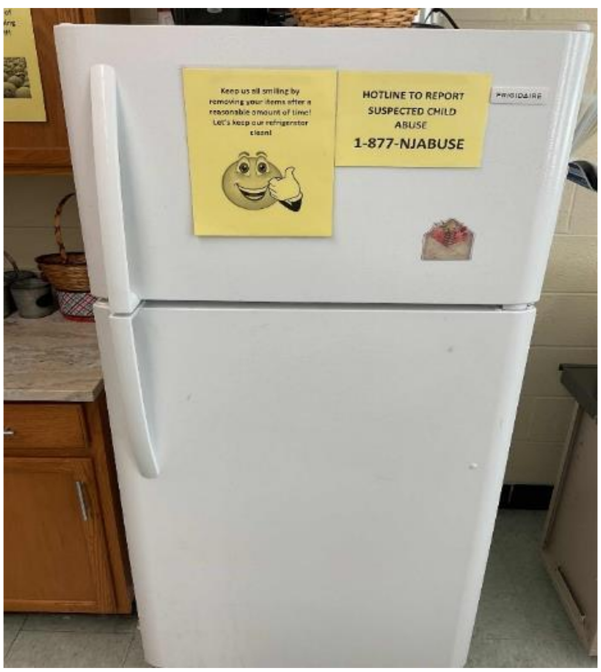
There are 95 computer workstations throughout the facility. Plug loads include general cafe and office equipment. There are classroom typical loads such as smartboards, projectors, and fans.

There are several residential-style refrigerators throughout the building that are used to store meals for staff or classroom supplies. These vary in condition and efficiency.



Typical Desktops

Typical Laptops



Typical Residential-Style Refrigerator

Typical Mini Refrigerator

2.12 Water-Using Systems

Water is provided by a municipal water supply company. Potable water is used for drinking, cleaning, cooking, sanitary fixtures, building conditioning, and laundry. Water leaks were not observed/reported.

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 ten restrooms with toilets, urinals, and sinks. The majority of faucet flow rates are 1.5 gpm or higher. Some faucets have been updated to low-flow devices, but no singular restroom has been fully updated.

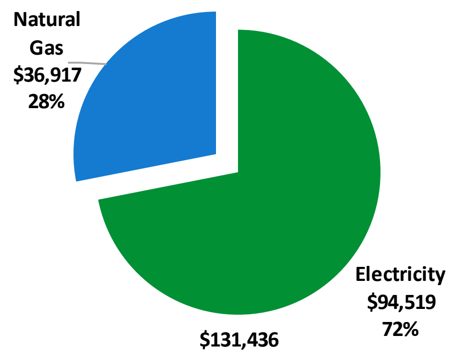
In addition to the restrooms, the facility kitchen has a commercial kitchen with a non-ENERGY STAR dishwasher.

Typical Restroom Fixtures

3 Energy and Water Use and Costs

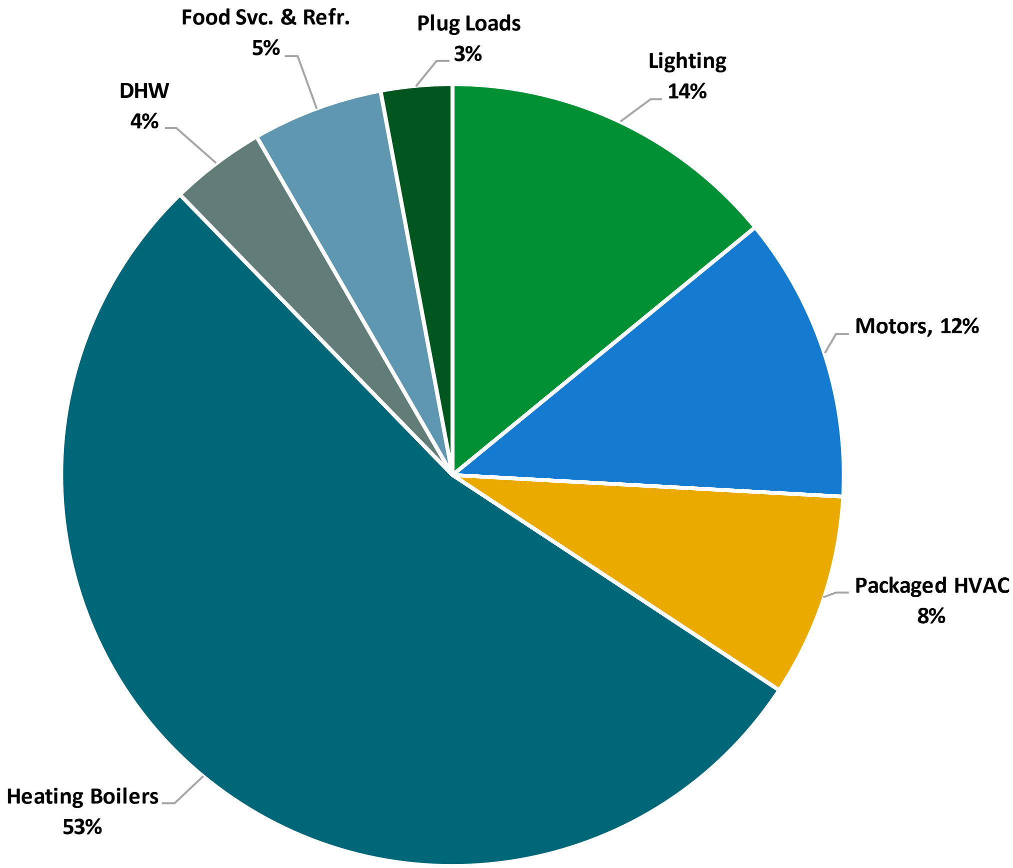
Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

Utility Summary		
Fuel	**Usage**	**Cost**
Electricity	485,480 kWh	$94,519
Natural Gas	22,389 Therms	$36,917
Total		**$131,436**



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.

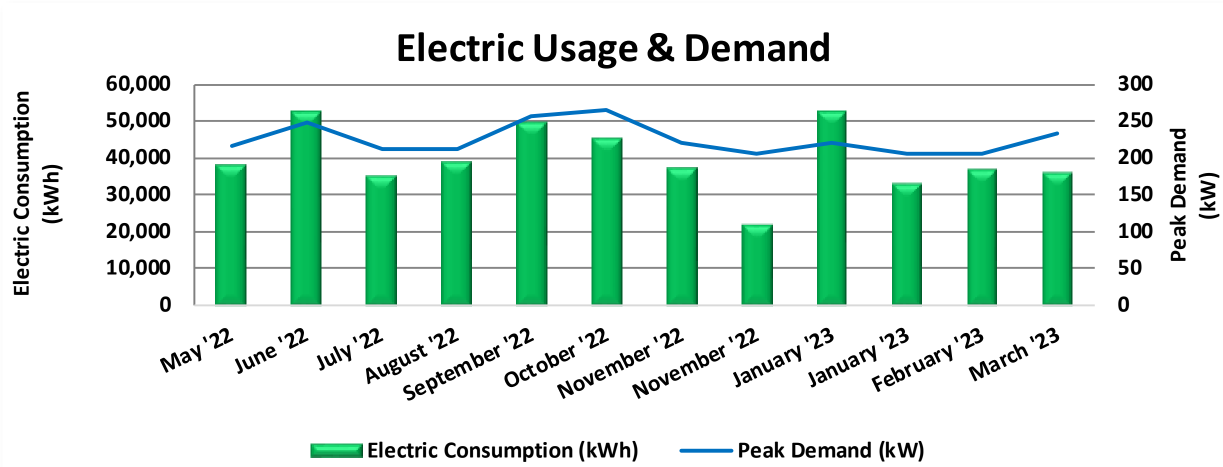
The energy auditor collects information regarding equipment operating hours, capacity, efficiency, and other operational parameters from facility staff, drawings, and on-site observations. This information is used as the inputs to calculate the existing conditions energy use for the site. The calculated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

Atlantic City Electric delivers electricity under rate class Annual General Secondary Service.



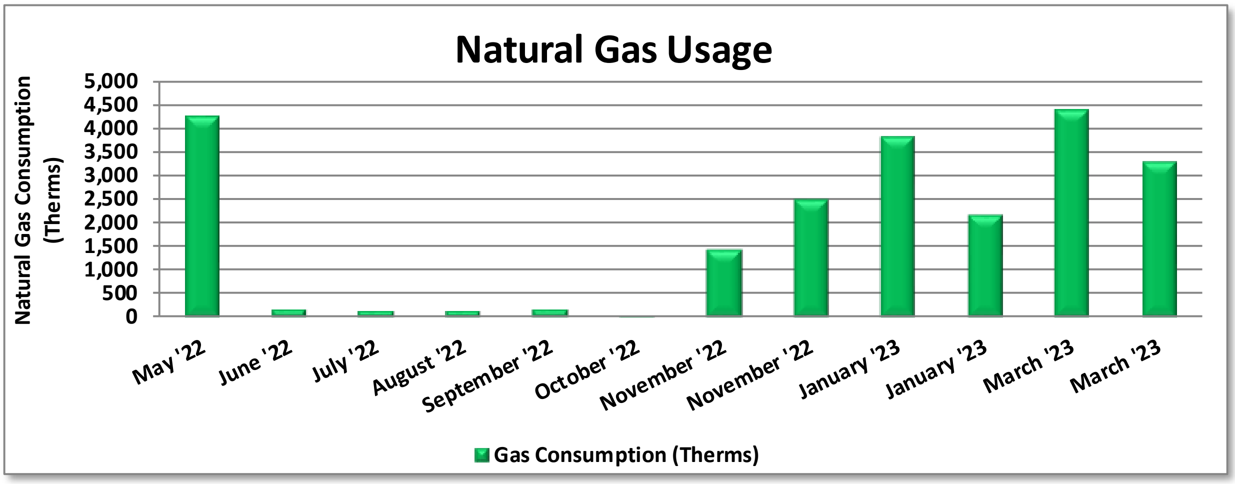
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
5/18/22	29	38,480	217	$2,647	$7,024
6/20/22	33	52,880	248	$3,445	$9,251
7/19/22	29	35,200	212	$3,041	$6,450
8/18/22	30	39,280	212	$2,676	$6,972
9/16/22	29	49,760	257	$3,135	$9,437
10/18/22	32	45,440	265	$3,575	$9,614
11/16/22	29	37,520	220	$2,697	$7,501
12/14/22	28	22,240	205	$2,431	$5,707
1/19/23	36	52,640	220	$3,348	$9,863
2/14/23	26	33,360	205	$2,258	$6,524
3/15/23	29	36,960	205	$2,518	$7,193
4/15/23	31	36,400	233	$3,050	$7,948
Totals	**361**	**480,160**	**265**	**$34,821**	**$93,483**

Notes:

- Peak demand of 265 kW occurred in October '22.
- Average demand over the past 12 months was 225 kW.
- The average electric cost over the past 12 months was $0.195/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 Natural Gas

South Jersey Gas delivers natural gas under rate class General Service (SJ-GSG), with natural gas supply provided by UGI Energy Services, a third-party supplier.



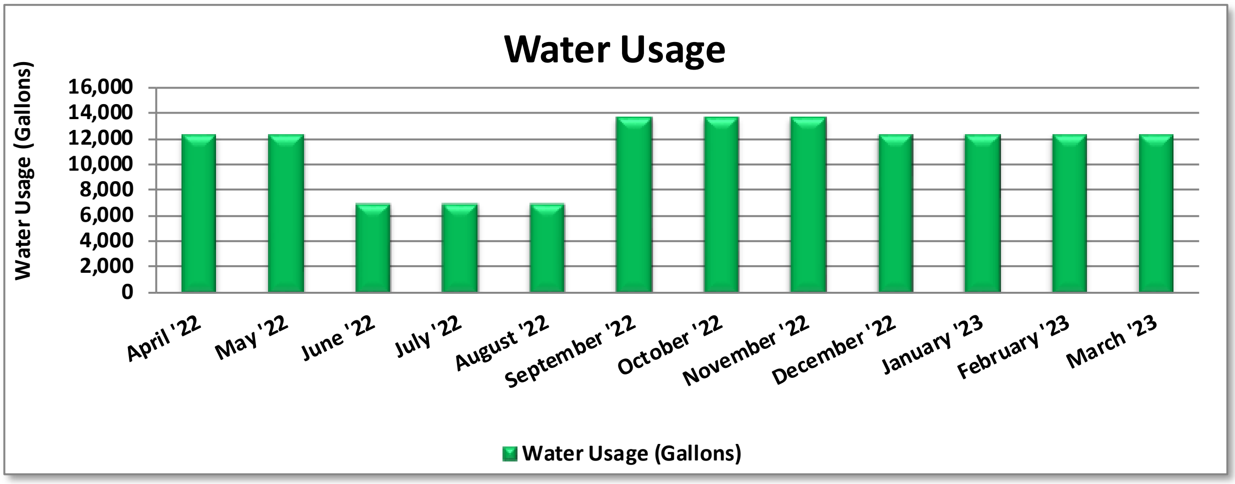
Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
5/18/22	34	4,258	$7,263
6/20/22	33	165	$327
7/19/22	29	123	$251
8/17/22	29	134	$262
9/16/22	30	155	$309
10/16/22	30	31	$89
11/16/22	31	1,430	$2,356
12/14/22	28	2,487	$4,123
1/19/23	36	3,830	$6,690
2/14/23	26	2,169	$3,704
3/17/23	31	4,390	$7,040
4/15/23	29	3,278	$4,604
Totals	**366**	**22,450**	**$37,018**
Annual	**365**	**22,389**	**$36,917**

Notes:

- The average gas cost for the past 12 months is $1.649/therm, which is the blended rate used throughout the analysis.

3.3 Water

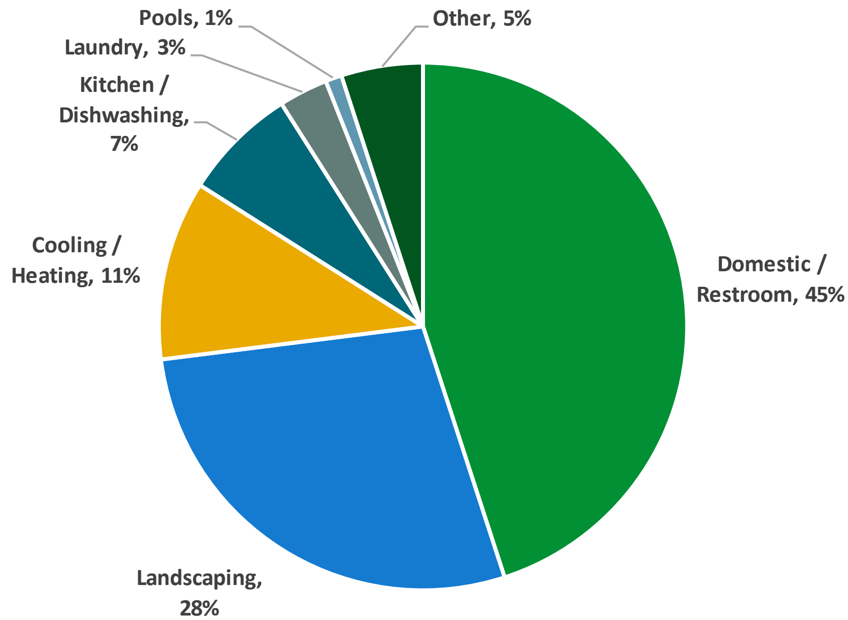
Washington Township Municipal Water Authorities delivers water to the project site.



Water Billing Data			
Period Ending	**Days in Period**	**Water Usage (gallons)**	**Water Cost**
5/1/22	30	12,333	$246
6/1/22	31	12,333	$246
7/1/22	30	7,000	$246
8/1/22	31	7,000	$246
9/1/22	31	7,000	$246
10/1/22	30	13,667	$246
11/1/22	31	13,667	$246
12/1/22	30	13,667	$246
1/1/23	31	12,417	$246
2/1/23	31	12,417	$246
3/1/23	28	12,417	$246
4/1/23	31	12,417	$246
Totals	**365**	**136,333**	**$2,951**
Annual	**365**	**136,333**	**$2,951**

Notes:

- The average cost of water for the past 12 months is $0.0216/gal.



Typical Education Water End Use[4]

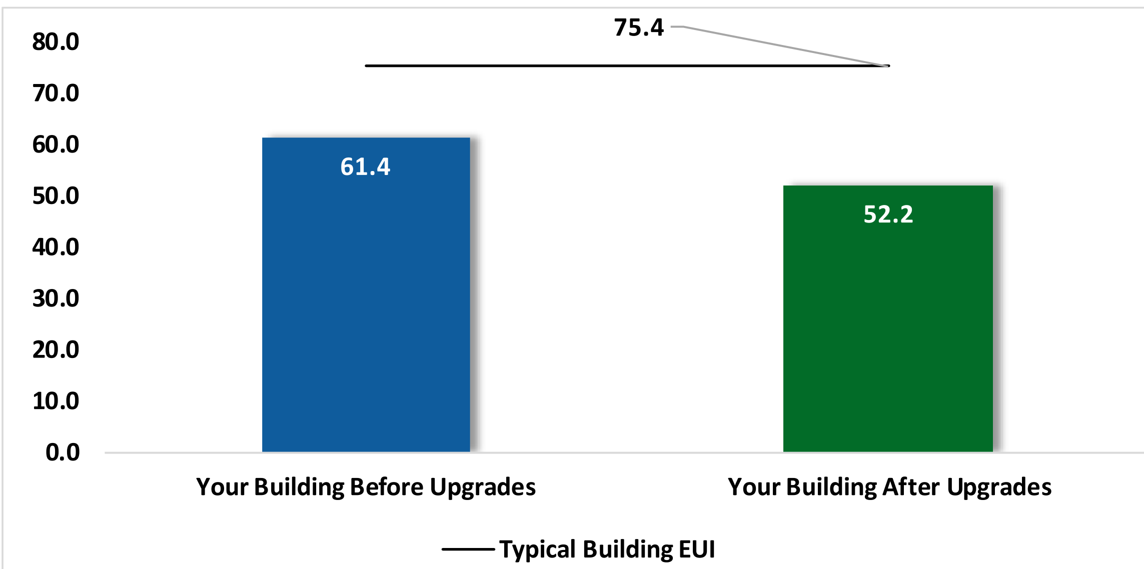
[4] Chart is of typical water end use and not specific to the facility

3.4 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	68



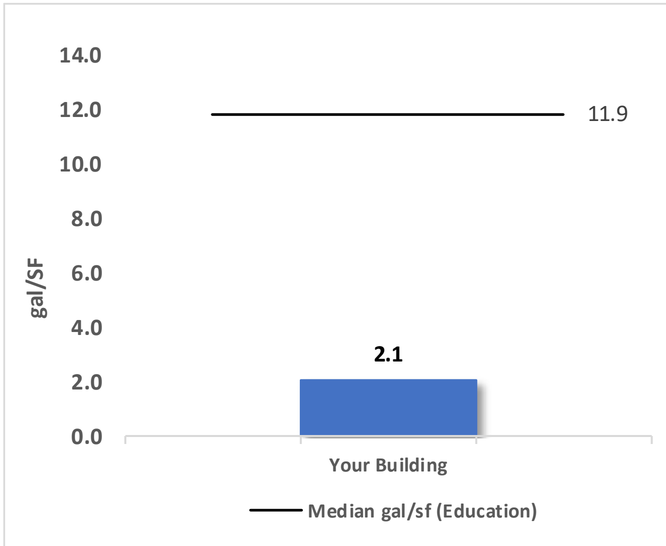
Energy Use Intensity Comparison[5]

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

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

[5] Based on all evaluated ECMs

Water Benchmarking



A benchmark is provided for your building's water use based on the annual water use in gallons per square foot of building area (gal/sf-yr.). Your building is compared to other similar buildings based on average water usage as available from the 2012 Commercial Buildings Energy Consumption Survey (CBECS) and from the EPA ENERGY STAR DataTrends Water Use Tracking database.

Water use varies considerably depending mainly on the extent of outdoor water use and whether process water is used, such as for vehicle washing and for laboratory sterilizers. Cooling towers and steam boilers are also significant water users. Kitchens and sanitary fixtures may use varying amounts of water.

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.](https://www.energystar.gov/buildings/training)

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

3.5 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			**88,175**	**22.4**	**-16**	**$16,899**	**$60,670**	**$10,740**	**$49,930**	**3.0**	**86,888**
ECM 1	Install LED Fixtures	Yes	9,246	0.0	0	$1,800	$7,080	$1,100	$5,980	3.3	9,311
ECM 2	Retrofit Fixtures with LED Lamps	Yes	78,929	22.4	-16	$15,099	$53,590	$9,640	$43,950	2.9	77,577
Lighting Control Measures			**24,478**	**7.0**	**-5**	**$4,681**	**$30,740**	**$6,500**	**$24,240**	**5.2**	**24,050**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	21,793	6.2	-5	$4,168	$25,670	$2,990	$22,680	5.4	21,412
ECM 4	Install High/Low Lighting Controls	Yes	2,684	0.7	-1	$513	$5,070	$3,510	$1,560	3.0	2,637
Variable Frequency Drive (VFD) Measures			**29,060**	**9.1**	**0**	**$5,658**	**$58,200**	**$2,000**	**$56,200**	**9.9**	**29,263**
ECM 5	Install VFDs on Constant Volume (CV) Fans	Yes	29,060	9.1	0	$5,658	$58,200	$2,000	$56,200	9.9	29,263
Unitary HVAC Measures			**26,879**	**34.1**	**0**	**$5,233**	**$322,100**	**$16,800**	**$305,300**	**58.3**	**27,067**
ECM 6	Install High Efficiency Air Conditioning Units	No	26,879	34.1	0	$5,233	$322,100	$16,800	$305,300	58.3	27,067
HVAC System Improvements			**835**	**0.0**	**16**	**$418**	**$11,700**	**$0**	**$11,700**	**28.0**	**2,656**
ECM 7	Implement Demand Control Ventilation (DCV)	No	835	0.0	16	$418	$11,700	$0	$11,700	28.0	2,656
Domestic Water Heating Upgrade			**0**	**0.0**	**11**	**$180**	**$190**	**$90**	**$100**	**0.6**	**1,278**
ECM 8	Install Low-Flow DHW Devices	Yes	0	0.0	11	$180	$190	$90	$100	0.6	1,278
Food Service & Refrigeration Measures			**1,499**	**0.0**	**0**	**$292**	**$2,700**	**$130**	**$2,570**	**8.8**	**1,509**
ECM 9	Refrigeration Controls	Yes	1,499	0.0	0	$292	$2,700	$130	$2,570	8.8	1,509
TOTALS			**170,926**	**72.6**	**5**	**$33,361**	**$486,300**	**$36,260**	**$450,040**	**13.5**	**172,711**

* - 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		**88,175**	**22.4**	**-16**	**$16,899**	**$60,670**	**$10,740**	**$49,930**	**3.0**	**86,888**
ECM 1	Install LED Fixtures	9,246	0.0	0	$1,800	$7,080	$1,100	$5,980	3.3	9,311
ECM 2	Retrofit Fixtures with LED Lamps	78,929	22.4	-16	$15,099	$53,590	$9,640	$43,950	2.9	77,577
Lighting Control Measures		**24,478**	**7.0**	**-5**	**$4,681**	**$30,740**	**$6,500**	**$24,240**	**5.2**	**24,050**
ECM 3	Install Occupancy Sensor Lighting Controls	21,793	6.2	-5	$4,168	$25,670	$2,990	$22,680	5.4	21,412
ECM 4	Install High/Low Lighting Controls	2,684	0.7	-1	$513	$5,070	$3,510	$1,560	3.0	2,637
Variable Frequency Drive (VFD) Measures		**29,060**	**9.1**	**0**	**$5,658**	**$58,200**	**$2,000**	**$56,200**	**9.9**	**29,263**
ECM 5	Install VFDs on Constant Volume (CV) Fans	29,060	9.1	0	$5,658	$58,200	$2,000	$56,200	9.9	29,263
Domestic Water Heating Upgrade		**0**	**0.0**	**11**	**$180**	**$190**	**$90**	**$100**	**0.6**	**1,278**
ECM 8	Install Low-Flow DHW Devices	0	0.0	11	$180	$190	$90	$100	0.6	1,278
Food Service & Refrigeration Measures		**1,499**	**0.0**	**0**	**$292**	**$2,700**	**$130**	**$2,570**	**8.8**	**1,509**
ECM 9	Refrigeration Controls	1,499	0.0	0	$292	$2,700	$130	$2,570	8.8	1,509
TOTALS		**143,212**	**38.5**	**-10**	**$27,710**	**$152,500**	**$19,460**	**$133,040**	**4.8**	**142,988**

* - 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		**88,175**	**22.4**	**-16**	**$16,899**	**$60,670**	**$10,740**	**$49,930**	**3.0**	**86,888**
ECM 1	Install LED Fixtures	9,246	0.0	0	$1,800	$7,080	$1,100	$5,980	3.3	9,311
ECM 2	Retrofit Fixtures with LED Lamps	78,929	22.4	-16	$15,099	$53,590	$9,640	$43,950	2.9	77,577

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

ECM 1: Install LED Fixtures

Replace existing fixtures containing metal halide, high-pressure sodium, fluorescent, or incandescent 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, these fixtures can be retrofit with screw-based LED lamps. Replacing an existing fixture with a new LED fixture will generally provide better overall lighting optics; however, replacing the non-LED lamp with a LED screw-in lamp is typically a less expensive retrofit. We recommend you work with your lighting contractor to determine which retrofit solution is best suited to your needs and will be compatible with the existing fixture(s).

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

Affected Building Areas: gymnasium, cafeteria, library, lobby, and exterior fixtures

ECM 2: Retrofit Fixtures with LED Lamps

Replace fluorescent T8 tubes, incandescent, and CFL lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies. Be sure to specify replacement lamps that are compatible with existing dimming controls, where applicable. In some circumstances, you may need to upgrade your dimming system for optimum performance.

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

Affected Building Areas: all areas with fluorescent fixtures with T8 tubes and storage/janitorial areas

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		**24,478**	**7.0**	**-5**	**$4,681**	**$30,740**	**$6,500**	**$24,240**	**5.2**	**24,050**
ECM 3	Install Occupancy Sensor Lighting Controls	21,793	6.2	-5	$4,168	$25,670	$2,990	$22,680	5.4	21,412
ECM 4	Install High/Low Lighting Controls	2,684	0.7	-1	$513	$5,070	$3,510	$1,560	3.0	2,637

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

ECM 3: Install Occupancy Sensor Lighting Controls

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

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

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

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

Affected Building Areas: offices, conference rooms, classrooms, gymnasium, library, and storage rooms

ECM 4: Install High/Low Lighting Controls

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

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

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

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

Affected Building Areas: corridors

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		**29,060**	**9.1**	**0**	**$5,658**	**$58,200**	**$2,000**	**$56,200**	**9.9**	**29,263**
ECM 5	Install VFDs on Constant Volume (CV) Fans	29,060	9.1	0	$5,658	$58,200	$2,000	$56,200	9.9	29,263

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

ECM 5: Install VFDs on Constant Volume (CV) Fans

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

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

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

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

Affected Air Handlers: air handlers serving stage and multipurpose cafeteria room; other package units/RTUs as indicated in Appendix A

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		**26,879**	**34.1**	**0**	**$5,233**	**$322,100**	**$16,800**	**$305,300**	**58.3**	**27,067**
ECM 6	Install High Efficiency Air Conditioning Units	26,879	34.1	0	$5,233	$322,100	$16,800	$305,300	58.3	27,067

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 condensing units servicing the classroom unit ventilators and split system Sanyo air conditioners are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 6: 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: all RTUs except for RTU-1

4.5 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**835**	**0.0**	**16**	**$418**	**$11,700**	**$0**	**$11,700**	**28.0**	**2,656**
ECM 7	Implement Demand Control Ventilation (DCV)	835	0.0	16	$418	$11,700	$0	$11,700	28.0	2,656

ECM 7: Implement Demand Control Ventilation (DCV)

Demand control ventilation (DCV) is a control strategy that monitors the indoor air's carbon dioxide (CO2) content to measure room occupancy. This data is used to regulate the amount of outdoor air provided to the space for ventilation.

Standard ventilation systems often provide outside air based on a space's estimated maximum occupancy but not actual occupancy. During low occupancy periods, the space may then be over ventilated. This wastes energy through heating and cooling the excess outside air flow. DCV reduces unnecessary outdoor air intake by regulating ventilation based on actual occupancy levels. DCV is most suited for facilities where occupancy levels vary significantly from hour to hour and day to day.

Energy savings associated with DCV are based on hours of operation, space occupancy, outside air reduction, and other factors. Energy savings results from eliminating unnecessary ventilation and space conditioning. Implementation of this measure is dependent upon having a building automation system (BAS) or other smart building control system connected to the space conditioning equipment serving the noted areas.

Affected Building Areas: evaluated for the gymnasium, stage, multipurpose-cafeteria area, and media center

4.6 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**11**	**$180**	**$190**	**$90**	**$100**	**0.6**	**1,278**
ECM 8	Install Low-Flow DHW Devices	0	0.0	11	$180	$190	$90	$100	0.6	1,278

ECM 8: Install Low-Flow DHW Devices

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

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

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing.

Additional cost savings may result from reduced water usage.

4.7 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		**1,499**	**0.0**	**0**	**$292**	**$2,700**	**$130**	**$2,570**	**8.8**	**1,509**
ECM 9	Refrigeration Controls	1,499	0.0	0	$292	$2,700	$130	$2,570	8.8	1,509

ECM 9: Refrigeration Controls

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.

4.8 Measures for Future Consideration

There are additional opportunities for improvement that Birches 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.

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

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

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

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 Maintenance

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

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

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

Lighting Controls

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

Motor 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.

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.

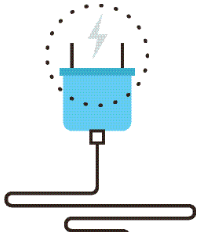
Refrigeration Equipment Maintenance

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

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

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

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.

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.

[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.

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

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[8] Estimated from analyzing data in: Solley, Wayne B,. et al, "Estimated Use of Water in the United States in 1995", U.S Geological Survey 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.

Landscaping and Irrigation

Most facilities that own or maintain surrounding landscape will have outdoor water use. The amount of outdoor water use is dictated by the size and design of the landscape and the need for supplemental irrigation. Studies show that average landscape water use in the institutional sector can range from 7% of total water use for hospitals, 22% for office buildings, and up to 30% for schools.

Proper landscape design can help minimize outdoor water use. Regionally appropriate plant choices, healthy soils with appropriate grading, the use of mulches, and limiting the use of high water-using plants such as turfgrass can significantly reduce the need for supplemental irrigation. In addition, proper design, installation, and maintenance of irrigation equipment can have a dramatic impact on outdoor water use.

- Retain a landscape professional certified in water-efficient landscaping.
- Maintain soil quality by applying mulch, soil amendments, and good topsoil.
- Maintain existing plants by manually pulling weeds, raising the blade on mowers, and including shaded areas in the overall landscape design.

- Minimize water used for hardscape cleaning and use recycled or reclaimed water where applicable, especially in water features.

Irrigation system optimization combines efficient irrigation practices with efficient technologies and can be complex. Irrigation professionals who are properly educated on water-efficient practices can help ensure that existing irrigation systems are efficiently operated and properly maintained. In general, plan for or adjust irrigation systems to prevent over (or under) watering.

- Improve distribution uniformity so water is evenly applied over the landscape.
- Irrigation schedules should be updated based on changing weather conditions.
- In general, apply water in larger amounts, but less frequently, resulting in deep watering.
- If a dedicated landscape water meter is installed, incorporate an outdoor water budget.
- Routinely look for leaks, overwatering, or overspray.
- Require a full irrigation system audit every 3 years by a qualified irrigation auditor.
- Consider drip irrigation systems for plant beds as they can reduce irrigation water use by 20% to 50% as compared to traditional sprinklers.
- More efficient sprinkler heads can reduce irrigation water use by 30%.
- Smart irrigation controllers can schedule irrigation based on weather data or on-site conditions, reducing irrigation water use by 15% compared to manual or clock timer irrigation systems.

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.

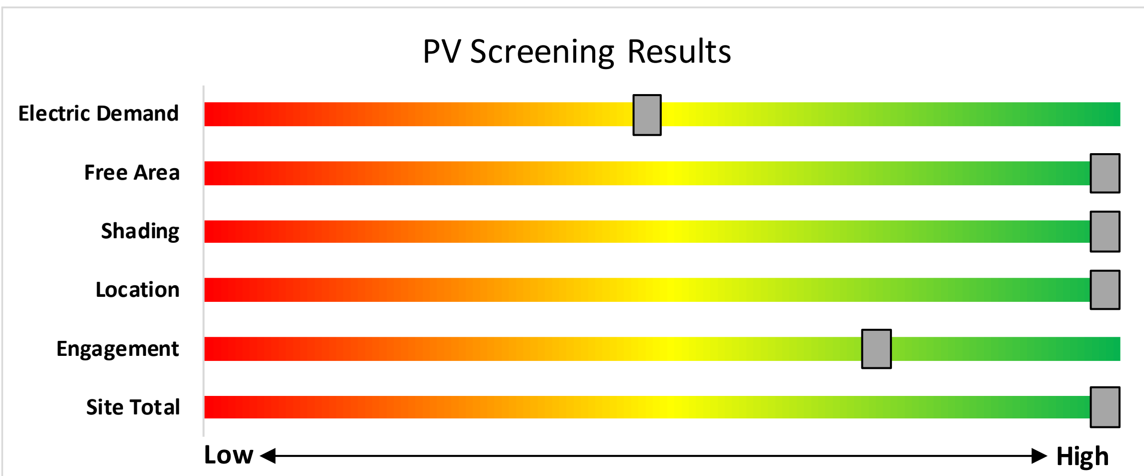
7.1 Solar Photovoltaic

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.

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

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

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



Potential	High	
System Potential	225	kW DC STC
Electric Generation	268,059	kWh/yr
Displaced Cost	$52,190	/yr
Installed Cost	$585,000	

Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

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

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

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

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.

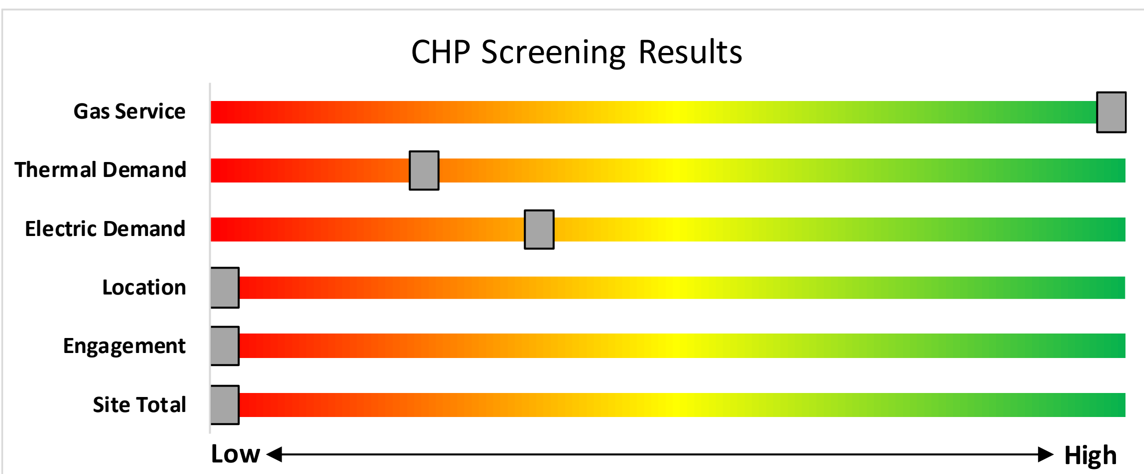
CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be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

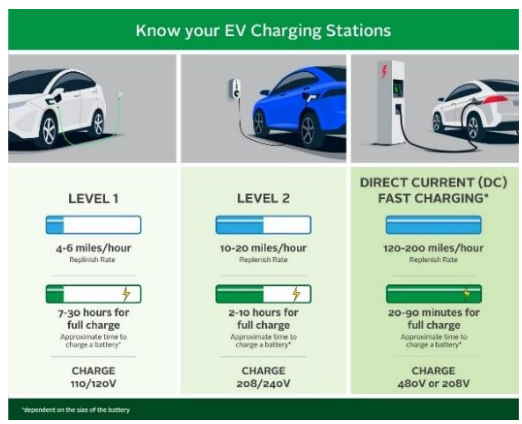
All electric vehicles (EVs) have an electric motor instead of an internal combustion engine. EVs function by plugging into a charge point, taking electricity from the grid, and then storing it in rechargeable batteries. Although electricity production may contribute to air pollution, the U.S. EPA categorizes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

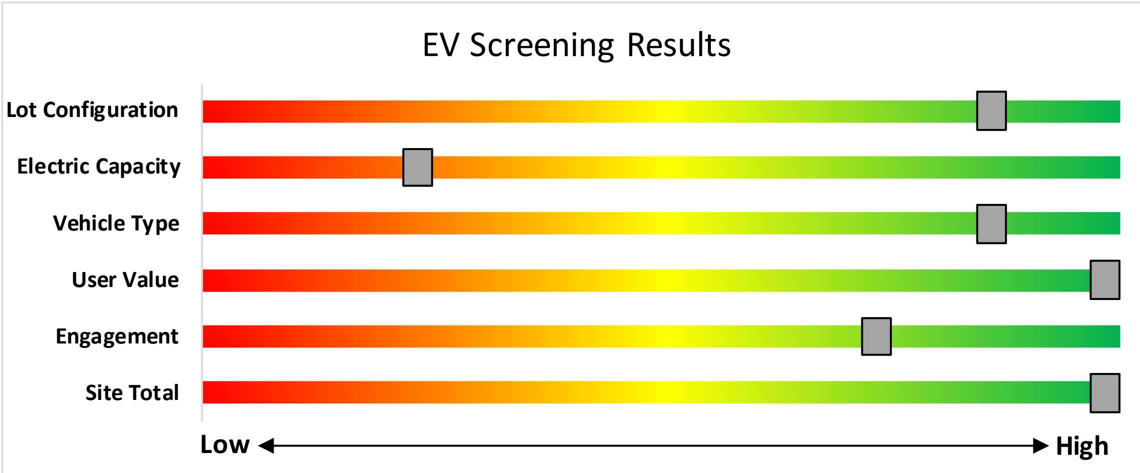
The primary costs associated with installing EV charging are the charger hardware and the cost to extend power from the facility to parking spaces. This may include upgrades to electric panels to serve increased loads.

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[12]

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

12

[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[13]. 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[14].

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.

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

[14] 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.

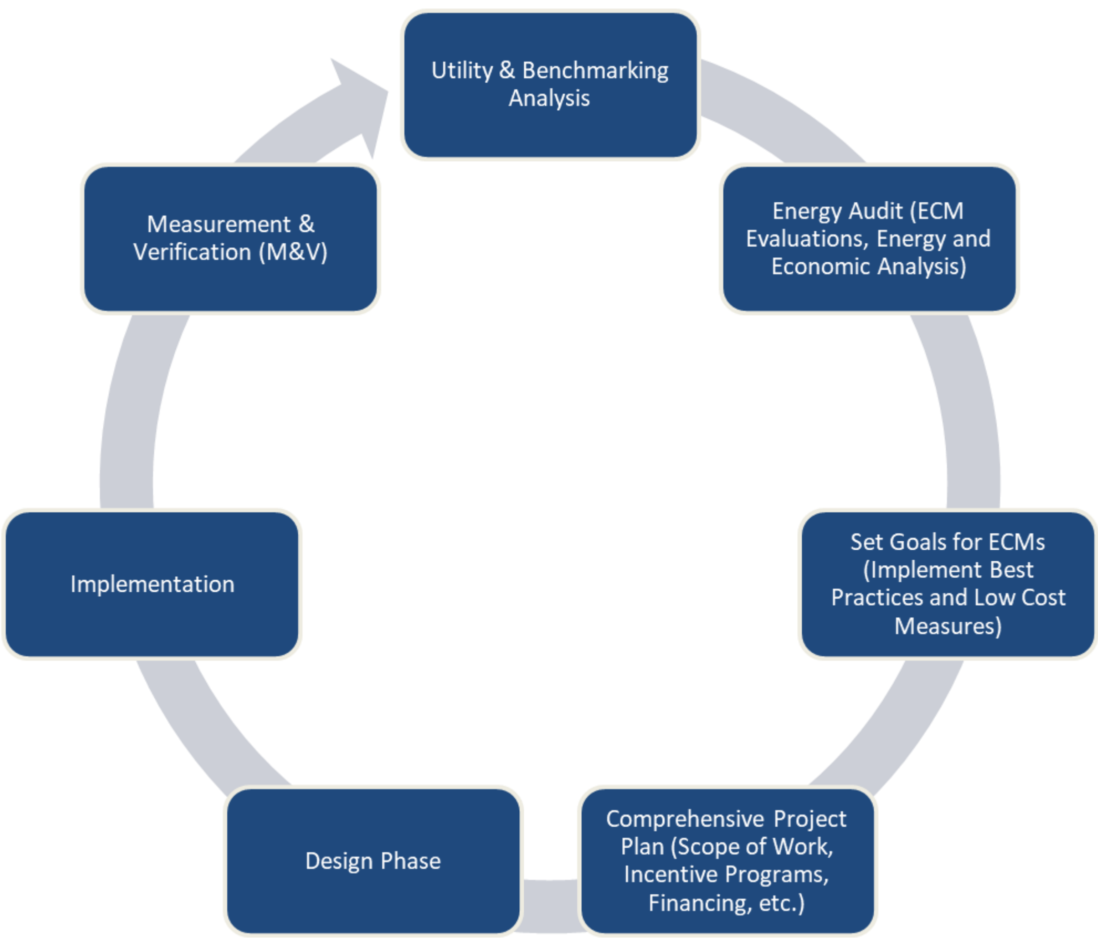
Engineered Solutions

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[15].

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[16].

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

[16] 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
Classroom 1	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,280	2, 3	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,573	0.6	2,227	0	$426	$1,390	$280	2.6
Closet - Classroom 10	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,280	2, 3	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,573	0.1	270	0	$52	$200	$20	3.5
Classroom 10	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 11	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 13	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Closet - Classroom 14	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,280	2, 3	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,573	0.1	270	0	$52	$200	$20	3.5
Classroom 14	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Closet - Classroom 16	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,280	2, 3	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,573	0.1	270	0	$52	$200	$20	3.5
Classroom 16	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 17	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,280	2, 3	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,573	0.4	1,484	0	$284	$1,040	$200	3.0
Closet - Classroom 18	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,280	2, 3	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,573	0.1	270	0	$52	$200	$20	3.5
Classroom 18	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Closet - Classroom 19	3	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,280	2, 3	Relamp	Yes	3	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,573	0.1	405	0	$77	$230	$20	2.7
Classroom 19	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.6	2,212	0	$423	$1,720	$280	3.4
Classroom 2	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,280	2, 3	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,573	0.4	1,484	0	$284	$1,040	$200	3.0
Closet - Classroom 20	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,280	2, 3	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,573	0.1	270	0	$52	$200	$20	3.5
Classroom 20	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	2,280		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	2,280	0.0	0	0	$0	$0	$0	0.0
Classroom 20	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Closet - Classroom 21	3	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,280	2, 3	Relamp	Yes	3	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,573	0.1	405	0	$77	$230	$20	2.7
Classroom 21	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.6	2,212	0	$423	$1,720	$280	3.4
Classroom 22	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	2,280		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	2,280	0.0	0	0	$0	$0	$0	0.0
Classroom 22	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,280	2, 3	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,573	0.6	2,227	0	$426	$1,390	$280	2.6
Closet - Classroom 23	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,280	2, 3	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,573	0.1	270	0	$52	$200	$20	3.5
Classroom 23	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Closet - Classroom 25	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,280	2, 3	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,573	0.1	270	0	$52	$200	$20	3.5

	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
Classroom 25	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 27 - Art Room	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,573	0.8	2,783	-1	$532	$1,660	$340	2.5
Classroom 27 - Art Room	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,573	0.1	394	0	$75	$680	$80	8.0
Classroom 3 - Table Lamp	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	2,280		None	No	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	2,280	0.0	0	0	$0	$0	$0	0.0
Classroom 3	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,685	0	$322	$1,470	$230	3.8
Classroom 31	17	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,280	2, 3	Relamp	Yes	17	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,573	0.9	3,154	-1	$603	$2,160	$410	2.9
Classroom 35	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,280	2, 3	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,573	0.6	2,227	0	$426	$1,390	$280	2.6
Classroom 37	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 39	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Closet - Classroom 24	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,280	2, 3	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,573	0.1	270	0	$52	$200	$20	3.5
Classroom 4	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 48	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 5	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 50	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 52	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 54	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 56	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 58	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Closet - Classroom 6	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,280	2, 3	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,573	0.1	270	0	$52	$200	$20	3.5
Classroom 6	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 7	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Closet - Classroom 8	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,280	2, 3	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,573	0.1	270	0	$52	$200	$20	3.5
Classroom 8	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Classroom 9	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,280	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,573	0.5	1,580	0	$302	$1,090	$190	3.0
Conference 1	6	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	2,400	3	None	Yes	6	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	1,656	0.0	44	0	$8	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,400	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	9	2,400	0.0	135	0	$26	$30	$0	1.2
Kitchen	4	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,400	2, 3	Relamp	Yes	4	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,656	0.2	568	0	$109	$100	$0	0.9
Kitchen	3	LED Lamps: (1) 15W A19 Screw-In Lamp	Wall Switch	S	15	2,400	3	None	Yes	3	LED Lamps: (1) 15W A19 Screw-In Lamp	Occupancy Sensor	15	1,656	0.0	37	0	$7	$330	$40	41.2
Kitchen	13	LED Lamps: (1) 12W PAR30 Screw-In Lamp	Wall Switch	S	12	2,400	3	None	Yes	13	LED Lamps: (1) 12W PAR30 Screw-In Lamp	Occupancy Sensor	12	1,656	0.0	128	0	$24	$330	$40	11.9
Kitchen	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,656	0.5	1,663	0	$318	$1,090	$190	2.8
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	38	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	38	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	2.0	7,422	-2	$1,419	$4,350	$870	2.5
Lobby - Main Vestibule	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 4	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	1,656	0.1	207	0	$40	$460	$90	9.3
Mechanical - Boiler Room	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler Room	9	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,400	3	None	Yes	9	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,656	0.0	107	0	$20	$330	$40	14.2
Mechanical - Boiler Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,400	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,400	0.0	87	0	$17	$50	$10	2.4
Multipurpose - All Purpose Room	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Multipurpose - All Purpose Room	1	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,400	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	9	2,400	0.0	135	0	$26	$30	$0	1.2
Multipurpose - All Purpose Room	6	LED Lamps: (1) 12W A19 Screw-In Lamp	Wall Switch	S	12	2,400	3	None	Yes	6	LED Lamps: (1) 12W A19 Screw-In Lamp	Occupancy Sensor	12	1,656	0.0	59	0	$11	$330	$40	25.7
Multipurpose - All Purpose Room	44	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	50	2,400	3	None	Yes	44	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	50	1,656	0.5	1,800	0	$344	$990	$110	2.6
Multipurpose - All Purpose Room	1	LED Lamps: (1) 12W PAR30 Screw-In Lamp	Wall Switch	S	12	2,400		None	No	1	LED Lamps: (1) 12W PAR30 Screw-In Lamp	Wall Switch	12	2,400	0.0	0	0	$0	$0	$0	0.0
Office - 24	3	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	2,400	3	None	Yes	3	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	1,656	0.0	22	0	$4	$0	$0	0.0
Office - 24	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	0.1	195	0	$37	$420	$60	9.6
Office - 24	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,656	0.0	104	0	$20	$90	$10	4.0
Office - 26	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	0.1	195	0	$37	$240	$40	5.4
Office - 26	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,656	0.0	104	0	$20	$90	$10	4.0
Office - 28	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	0.1	195	0	$37	$240	$40	5.4
Office - 28	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,656	0.0	104	0	$20	$90	$10	4.0
Office - 30	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	0.1	195	0	$37	$240	$40	5.4
Office - 30	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,656	0.0	104	0	$20	$90	$10	4.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Office - 32	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	0.3	977	0	$187	$770	$140	3.4
Office - 32	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,656	0.0	104	0	$20	$90	$10	4.0
Office - 34	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	0.1	195	0	$37	$240	$40	5.4
Office - 34	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,656	0.0	104	0	$20	$90	$10	4.0
Office - 36	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	0.1	195	0	$37	$240	$40	5.4
Office - 36	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,656	0.0	104	0	$20	$90	$10	4.0
Office - 38	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	0.1	195	0	$37	$240	$40	5.4
Office - 38	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,656	0.0	104	0	$20	$90	$10	4.0
Office - 40	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	0.1	195	0	$37	$240	$40	5.4
Office - 40	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,656	0.0	104	0	$20	$90	$10	4.0
Office - 42	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	0.1	195	0	$37	$240	$40	5.4
Office - 42	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,656	0.0	104	0	$20	$90	$10	4.0
Office - 44	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	0.1	195	0	$37	$240	$40	5.4
Office - 44	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,656	0.0	104	0	$20	$90	$10	4.0
Office - 46	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	2,400	3	None	Yes	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	1,656	0.0	7	0	$1	$0	$0	0.0
Office - 46	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,400	2, 3	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,656	0.3	977	0	$187	$770	$140	3.4
Office - Gym Office and Storage	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,656	0.2	665	0	$127	$630	$60	4.5
Office - Main Office	1	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,400	2, 3	Relamp	Yes	1	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,656	0.0	142	0	$27	$30	$0	1.1
Office - Main Office	1	LED Lamps: (1) 12W A19 Screw-In Lamp	Occupancy Sensor	S	12	1,800		None	No	1	LED Lamps: (1) 12W A19 Screw-In Lamp	Occupancy Sensor	12	1,800	0.0	0	0	$0	$0	$0	0.0
Office - Main Office	6	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	2,400	3	None	Yes	6	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	1,656	0.0	44	0	$8	$330	$40	34.3
Office - Main Office	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,656	0.5	1,885	0	$360	$1,520	$240	3.6
Office - Main Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,656	0.1	443	0	$85	$530	$80	5.3
Office - Main Office	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,400	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,656	0.0	104	0	$20	$90	$10	4.0
Office - Nurses Office 57	1	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,400	2, 3	Relamp	Yes	1	LED Lamps: A19 Lamps	Occupancy Sensor	9	1,656	0.0	142	0	$27	$30	$0	1.1
Office - Nurses Office 57	8	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	50	2,400	3	None	Yes	8	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	50	1,656	0.1	327	0	$63	$330	$40	4.6

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
Mechanical - Boiler Room	HHW System	2	Heating Hot Water Pump	7.50	91.7%	Yes	WEG	00718ET3E213T-W22	W	2,200		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler Room	HHW System	2	Heating Hot Water Pump	5.00	89.5%	Yes			W	2,200		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler Room	DHW Circulation Pump	1	DHW Circulation Pump	0.17	60.0%	No			W	8,760		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler Room	Sump Pump	1	Process Pump	0.33	65.0%	No			W	1,460		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	Various Spaces	4	Exhaust Fan	0.17	60.0%	No			W	2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	Various Spaces	5	Exhaust Fan	0.75	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	Various Spaces	2	Exhaust Fan	0.75	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	Various Spaces	1	Exhaust Fan	0.25	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	Various Spaces	1	Exhaust Fan	0.25	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	RTU - Supply Fan	1	Supply Fan	1.50	84.0%	No			B	2,745		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	RTU - Supply Fan	1	Supply Fan	5.00	89.5%	Yes			W	2,745		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	RTU - Supply Fan	1	Supply Fan	3.00	85.5%	Yes			W	2,745		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	RTU - Supply Fan	2	Supply Fan	1.50	84.0%	No			B	2,745	5	No	86.5%	Yes	2	0.9	2,885	0	$562	$8,700	$200	15.1
Exterior - Roof	RTU - Supply Fan	1	Supply Fan	3.00	85.5%	No			B	2,745	5	No	89.5%	Yes	1	0.9	2,911	0	$567	$5,100	$200	8.6
Exterior - Roof	RTU - Supply Fan	1	Supply Fan	3.00	85.5%	No			B	2,745	5	No	89.5%	Yes	1	0.9	2,911	0	$567	$5,100	$200	8.6
Exterior - Roof	RTU - Supply Fan	1	Supply Fan	3.00	85.5%	No			B	2,745	5	No	89.5%	Yes	1	0.9	2,911	0	$567	$5,100	$200	8.6
Exterior - Roof	RTU - Supply Fan	2	Supply Fan	0.75	70.0%	No			B	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	RTU - Supply Fan	1	Supply Fan	3.00	85.5%	No			B	2,745	5	No	89.5%	Yes	1	0.9	2,911	0	$567	$5,100	$200	8.6
Exterior - Roof	RTU - Supply Fan	2	Supply Fan	1.50	84.0%	No			B	2,745	5	No	86.5%	Yes	2	0.9	2,885	0	$562	$8,700	$200	15.1
Exterior - Roof	RTU - Supply Fan	2	Supply Fan	3.00	85.5%	No			B	2,745	5	No	89.5%	Yes	2	1.8	5,822	0	$1,134	$10,200	$400	8.6

		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
Classrooms, Offices, & Corridors	Interior Spaces - Unit Ventilator	34	Fan Coil Unit	0.33	66.6%	Yes			B	2,745		No	66.6%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler Room	Hydronic Unit Heater	1	Fan Coil Unit	0.08	62.2%	No			W	2,745		No	62.2%	No		0.0	0	0	$0	$0	$0	0.0
Office - Gym	Hydronic Unit Heater	1	Fan Coil Unit	0.08	62.2%	No			W	2,745		No	62.2%	No		0.0	0	0	$0	$0	$0	0.0
Theater - Stage	AHU-1 & 2 - Multipurpose Room	2	Supply Fan	3.00	85.5%	No				2,745	5	No	89.5%	Yes	2	1.8	5,822	0	$1,134	$10,200	$400	8.6

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
Exterior - Roof	Interior Spaces	16	Split-System	3.50		10.00		York	H1RA042S46G	B	6	Yes	16	Split-System	3.50		16.00		12.6	9,929	0	$1,933	$111,700	$5,900	54.7
Exterior - Roof	Interior Spaces	8	Split-System	3.00		10.00		York	H1RA036S46G	B	6	Yes	8	Split-System	3.00		16.00		5.4	4,255	0	$828	$48,200	$2,500	55.2
Exterior - Roof	Interior Spaces	1	Split-System	3.00		11.50		Thermal Zone	TZAA-336-C757	B	6	Yes	1	Split-System	3.00		16.00		0.4	347	0	$68	$6,000	$300	84.4
Exterior - Roof	Interior Spaces	1	Split-System	3.00		10.50		Sanyo	C3622	B	6	Yes	1	Split-System	3.00		16.00		0.6	464	0	$90	$6,000	$300	63.0
Exterior - Roof	Interior Spaces	1	Split-System	1.00		10.00		Mitsubishi	PU12EK	B	6	Yes	1	Split-System	1.00		16.00		0.2	177	0	$35	$3,700	$100	104.3
Exterior - Roof	Interior Spaces	1	Split-System	3.00		10.50		Sanyo	TS3622	B	6	Yes	1	Split-System	3.00		16.00		0.6	464	0	$90	$6,000	$300	63.0
Exterior - Roof	Interior Spaces	1	Split-System	1.92		9.50		Sanyo	SAP243T	B	6	Yes	1	Split-System	1.92		16.00		0.5	388	0	$76	$4,400	$200	55.6
Exterior - Roof	RTU - Main Office	1	Package Unit	5.00		11.30		ARCOAIRE	PAMA060H1	B	6	Yes	1	Package Unit	5.00		16.00		0.8	615	0	$120	$8,600	$500	67.7
Exterior - Roof	RTU-2 - Media Center (Library)	1	Package Unit	12.50		12.10		Trane	THD150G3R0B0U H6	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	RTU - School Spaces	2	Package Unit	4.00		11.50		York	DR048C00PA	B	6	Yes	2	Package Unit	4.00		16.00		1.2	925	0	$180	$16,300	$800	86.1
Exterior - Roof	RTU - School Spaces	1	Package Unit	5.00		9.20		Carrier	50TJ004501GA	B	6	Yes	1	Package Unit	5.00		16.00		1.4	1,092	0	$213	$8,600	$500	38.1
Exterior - Roof	RTU - School Spaces	2	Package Unit	5.00		11.30		Trane	TCD060C30	B	6	Yes	2	Package Unit	5.00		16.00		1.6	1,229	0	$239	$17,200	$1,000	67.7
Exterior - Roof	RTU - School Spaces	1	Package Unit	10.00		11.30		Trane	TCD120C30	B	6	Yes	1	Package Unit	10.00		14.00		1.0	807	0	$157	$14,800	$800	89.1
Exterior - Roof	RTU - School Spaces	1	Package Unit	8.50		11.30		Trane	TCD102C3OAA	B	6	Yes	1	Package Unit	8.50		14.00		0.9	686	0	$134	$12,300	$700	86.9
Exterior - Roof	RTU-1 - Gymnasium	1	Package Unit	20.00		11.00		Trane	THD240G3	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	RTU-1 & 2 - Multpurose Room	2	Package Unit	7.50		11.00		York	ZF090C00D2A1AA A1A1	B	6	Yes	2	Package Unit	7.50		14.00		1.8	1,382	0	$269	$21,400	$1,200	75.1
Exterior - Roof	RTU - Stage	1	Package Unit	6.00		10.40		York	DF072C00P4	B	6	Yes	1	Package Unit	6.00		14.00		0.9	701	0	$137	$9,400	$500	65.2
Exterior - Roof	Interior Spaces	2	Package Unit	3.00		11.50		York	DR036C00P4	B		No							0.0	0	0	$0	$0	$0	0.0
Exterior - Roof	Multipurpose Room AHUs	2	Split-System	7.50		8.36		York	H3CE090A25A	B	6	Yes	2	Split-System	7.50		14.00		4.3	3,418	0	$665	$27,500	$1,200	39.5

Space Heating Boiler Inventory & Recommendations

		Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical - Boiler Room	HHW System - B-1 & B-2	2	Condensing Hot Water Boiler	1,480	Hydrotherm	KN16	W		No						0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler Room	HHW System - B-3, B-7, B-8	3	Condensing Hot Water Boiler	510	Hydrotherm	KN-6	W		No						0.0	0	0	$0	$0	$0	0.0

Demand Control Ventilation Recommendations

		Recommendation Inputs					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Number of Zones	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior - Roof	RTU-2 - Media Center (Library)	7	2.00	12.50	0.00	222.00	0.0	244	5	$131	$2,900	$0	22.2
Exterior - Roof	RTU-1 - Gymnasium	7	2.00	20.00	0.00	296.00	0.0	430	7	$204	$2,900	$0	14.2
Exterior - Roof	RTU-1 & 2 - Multpurose Room	7	4.00	7.50	0.00	127.50	0.0	161	3	$83	$5,900	$0	70.8

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
Gym Closet	Locker Rooms	1	Storage Tank Water Heater (≤ 50 Gal)	Rheem	XE30M06ST45U1	W		No						0.0	0	0	$0	$0	$0	0.0
Janitorial - Library	Library	1	Storage Tank Water Heater (≤ 50 Gal)	Bradford White	RE340S6-1NCWW	W		No						0.0	0	0	$0	$0	$0	0.0
Mechanical - Boiler Room	Main DHW Heater	1	Storage Tank Water Heater (> 50 Gal)	Lochinvar	SNR200-100	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	8	23	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	11	$180	$190	$90	0.6

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	Low Temp Freezer (-35F to -5F)	Heatcraft	Unknown	9	No	Yes	Yes	0.0	1,499	0	$292	$2,700	$130	8.8

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Freezer Chest			No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Freezer Chest	Coldtech	43SLC-LH-DGM	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Refrigerator Chest	Powers Equipment Co	#681	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	Continental	2F-SA	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	Continental	3R	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Continental	2R	No		No	0.0	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	Manufacturer	Model	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Electric Combination Oven/Steam Cooker (<15 Pans)	Market Forge	ETP-10E	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Electric Convection Oven (Full Size)	Blodgett	Mark V	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (Full Size)	Cres Cor	H-138-NPS-CC3MQ	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Electric Griddle (4 Feet Width)	Unknown	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (Full Size)	Servolift	1500	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Gas Rack Oven (Single)	Vulcan	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

Location	Existing Conditions					
	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Birches Elementary School	1	Clothes Washer	1,200	No		
Birches Elementary School	5	Coffee Machine	900	No		
Birches Elementary School	53	Desktop	270	No		
Birches Elementary School	36	Fan (Ceiling)	200	No		
Birches Elementary School	1	Kiln	11,000	No		
Birches Elementary School	42	Laptop	75	No		
Birches Elementary School	8	Microwave	1,000	No		
Birches Elementary School	1	Other	500	No		
Birches Elementary School	1	Other	70	No		
Birches Elementary School	1	Other	100	No		
Birches Elementary School	3	Paper Shredder	150	No		
Birches Elementary School	15	Printer (Medium/Small)	240	No		
Birches Elementary School	4	Printer/Copier (Large)	600	No		
Birches Elementary School	30	Projector	100	No		
Birches Elementary School	7	Refrigerator (Mini)	126	No		
Birches Elementary School	3	Refrigerator (Residential)	450	No		
Birches Elementary School	2	Serving Table (Chilled/Heated)	300	No		
Birches Elementary School	4	Smart Board	2	No		
Birches Elementary School	3	Television	130	No		
Birches Elementary School	3	Toaster Oven	700	No		
Birches Elementary School	3	Water Fountain	100	No		

Appendix B: ENERGY STAR Statement of Energy Performance

Energy use intensity (EUI) is presented in terms of site energy and source energy. Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

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ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Birches Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 63,411
Built: 1968

For Year Ending: March 31, 2023
Date Generated: March 08, 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
Birches Elementary School 416 Westminster Boulevard Sewell, New Jersey 08012	Washington Township Board of Education 206 Holly Avenue Sewell, NJ 08080 (856) 589-6644	Janine Wechter 206 Holly Avenue Sewell, NJ 08080 (856) 589-6644 x 6502 jwechter@wtps.org

Property ID: 30742134

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
63.5 kBtu/ft²

Source EUI
115.1 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	1,755,727 (44%)
Natural Gas (kBtu)	2,269,976 (56%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	75.4
National Median Source EUI (kBtu/ft²)	136.7
% Diff from National Median Source EUI	-16%

Annual Emissions

Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	278

Signature & Stamp of Verifying Professional

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

LP Signature: ____________________Date: __________

Licensed Professional

____ ________
,
(___)____-______
____

Professional Engineer or Registered Architect Stamp (if applicable)

Appendix C: Glossary

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

gpm	*Gallon per minute*
HID	*High intensity discharge:* high-output lighting lamps such as high-pressure sodium, metal halide, and mercury vapor.
hp	*Horsepower*
HPS	*High-pressure sodium*: a type of HID lamp.
HSPF	*Heating seasonal performance factor:* a measure of efficiency typically applied to heat pumps. Heating energy provided divided by seasonal energy input.
HVAC	*Heating, ventilating, and air conditioning*
IHP 2014	US DOE Integral Horsepower rule. The current ruling regarding required electric motor efficiency.
IPLV	*Integrated part load value:* a measure of the part load efficiency usually applied to chillers.
kBtu	One thousand British thermal units
kW	*Kilowatt*: equal to 1,000 Watts.
kWh	*Kilowatt-hour*: 1,000 Watts of power expended over one hour.
LED	*Light emitting diode*: a high-efficiency source of light with a long lamp life.
LGEA	*Local Government Energy Audit*
Load	The total power a building or system is using at any given time.
Measure	A single activity, or installation of a single type of equipment, 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.