Local Government Energy Audit Report

Summit Primary Center at Jefferson School/Jefferson Elementary School

August 1, 2023

Prepared for:

Summit Board of Education
110 Ashwood Avenue
Summit, New Jersey 07901

Prepared by:

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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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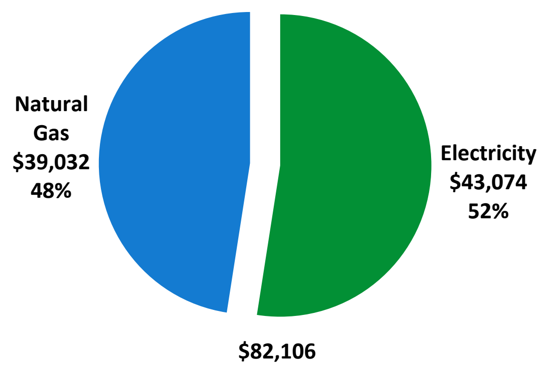
1 Executive Summary

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

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $82,106 Electricity: 361,440 kWh Natural Gas: 33,570 Therms	
ENERGY STAR® Benchmarking Score	54 *(1-100 scale)*	Congratulations, your building performs better than the national average. This report has suggestions about how to keep your building running efficiently, further improve performance, and lower your energy bills even more.

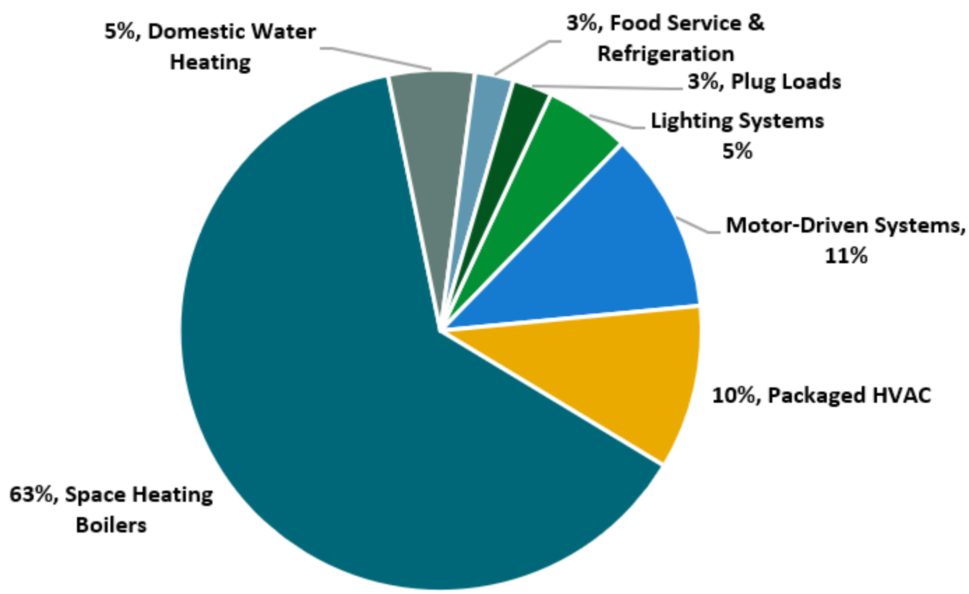


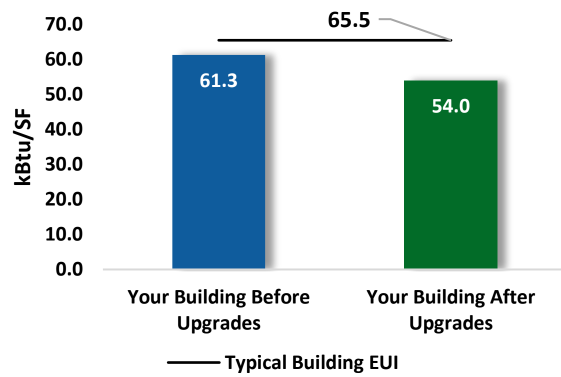
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

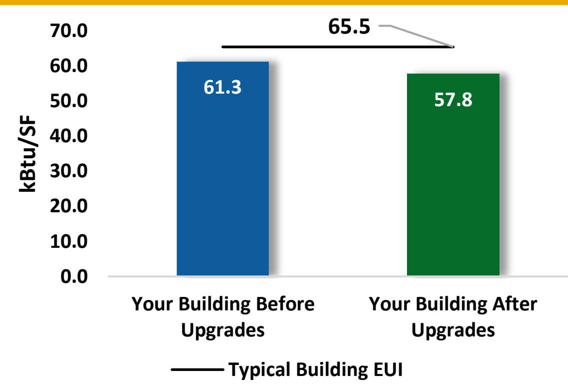
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$281,904
Potential Rebates & Incentives[1]	$11,977
Annual Cost Savings	$10,026
Annual Energy Savings	Electricity: 46,247 kWh Natural Gas: 3,883 Therms
Greenhouse Gas Emission Savings	46 Tons
Simple Payback	26.9 Years
Site Energy Savings (All Utilities)	12%



Scenario 2: Cost Effective Package[2]

Installation Cost	$55,277
Potential Rebates & Incentives	$4,587
Annual Cost Savings	$5,760
Annual Energy Savings	Electricity: 34,389 kWh Natural Gas: 1,429 Therms
Greenhouse Gas Emission Savings	26 Tons
Simple Payback	8.8 Years
Site Energy Savings (all utilities)	6%



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			**10,308**	**1.3**	**-1**	**$1,219**	**$9,947**	**$1,394**	**$8,553**	**7.0**	**10,288**
ECM 1	Install LED Fixtures	Yes	5,570	0.0	0	$664	$6,768	$950	$5,818	8.8	5,609
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,307	0.4	0	$153	$386	$60	$326	2.1	1,284
ECM 3	Retrofit Fixtures with LED Lamps	Yes	3,432	0.9	-1	$403	$2,792	$384	$2,408	6.0	3,395
Lighting Control Measures			**8,664**	**2.7**	**-2**	**$1,011**	**$11,766**	**$2,905**	**$8,861**	**8.8**	**8,512**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	6,977	2.2	-1	$814	$8,526	$945	$7,581	9.3	6,855
ECM 5	Install High/Low Lighting Controls	Yes	1,687	0.5	0	$197	$3,240	$1,960	$1,280	6.5	1,658
Motor Upgrades			**2,824**	**0.8**	**0**	**$337**	**$8,492**	**$0**	**$8,492**	**25.2**	**2,844**
ECM 6	Premium Efficiency Motors	No	2,824	0.8	0	$337	$8,492	$0	$8,492	25.2	2,844
Variable Frequency Drive (VFD) Measures			**16,353**	**5.7**	**0**	**$1,949**	**$31,215**	**$1,275**	**$29,940**	**15.4**	**16,467**
ECM 7	Install VFD on Variable Air Volume (VAV) Fans	No	4,181	1.4	0	$498	$8,442	$275	$8,167	16.4	4,211
ECM 8	Install VFDs on Constant Volume (CV) Fans	No	12,171	4.4	0	$1,451	$22,774	$1,000	$21,774	15.0	12,257
Unitary HVAC Measures			**8,288**	**16.0**	**0**	**$988**	**$169,376**	**$6,115**	**$163,261**	**165.3**	**8,346**
ECM 9	Install High Efficiency Air Conditioning Units	No	5,898	8.2	0	$703	$81,653	$2,657	$78,996	112.4	5,939
ECM 10	Install High Efficiency Heat Pumps	No	2,390	7.8	0	$285	$87,722	$3,458	$84,264	295.8	2,407
HVAC System Improvements			**1,354**	**0.0**	**103**	**$1,361**	**$14,888**	**$188**	**$14,700**	**10.8**	**13,440**
ECM 11	Implement Demand Control Ventilation (DCV)	No	805	0.0	70	$914	$13,594	$0	$13,594	14.9	9,053
ECM 12	Install Pipe Insulation	Yes	548	0.0	33	$446	$1,294	$188	$1,106	2.5	4,388
Domestic Water Heating Upgrade			**2,224**	**0.0**	**19**	**$486**	**$201**	**$100**	**$100**	**0.2**	**4,462**
ECM 13	Install Low-Flow DHW Devices	Yes	2,224	0.0	19	$486	$201	$100	$100	0.2	4,462
Custom Measures			**-3,769**	**0.0**	**269**	**$2,676**	**$36,019**	**$0**	**$36,019**	**13.5**	**27,672**
ECM 14	Retro-Commissioning Study	Yes	9,567	0.0	94	$2,230	$30,000	$0	$30,000	13.5	20,611
ECM 15	Replace Electric Water Heater with Heat Pump Water Heater	Yes	3,077	0.0	0	$367	$2,070	$0	$2,070	5.6	3,099
ECM 16	Replace Gas Fired Water Heater with Heat Pump Water Heater	No	-16,413	0.0	175	$79	$3,950	$0	$3,950	50.0	3,963
TOTALS (COST EFFECTIVE MEASURES)			**34,389**	**3.9**	**143**	**$5,760**	**$55,277**	**$4,587**	**$50,690**	**8.8**	**51,360**
TOTALS (ALL MEASURES)			**46,247**	**26.5**	**388**	**$10,026**	**$281,904**	**$11,977**	**$269,927**	**26.9**	**92,033**

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

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

Figure 2 – Evaluated Energy Improvements

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

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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

Options from Your Utility Company

Prescriptive and Custom Rebates

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

Direct Install

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

Engineered Solutions

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

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

Options from New Jersey's Clean Energy Program

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

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the ESIP. Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as attractive financing for implementing ECMs. You have already taken the first step as an LGEA customer, because this report is required to participate in ESIP.

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

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

Successor Solar Incentive Program (SuSI)

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

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces electric loads at commercial facilities when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. By enabling commercial facilities to reduce electric demand during times of peak demand, the grid is made more reliable, and overall transmission costs are reduced for all ratepayers. Curtailment service providers provide regular payments to medium and large consumers of electric power for their participation in demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

Large Energy User Program (LEUP)

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

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

2 Existing Conditions

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

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

2.1 Site Overview

On December 28, 2022, TRC performed an energy audit at Summit Primary Center at Jefferson School/Jefferson Elementary School located in Summit, New Jersey. TRC met with Michael Martino to review the facility operations and help focus our investigation on specific energy-using systems.

Summit Primary Center at Jefferson School/Jefferson Elementary School is a two-story, 74,890 square foot building originally built in 1931 and expanded in 2009 and 2015 to accommodate the primary center. Spaces are typical of elementary and Pre-K facilities and include offices, classrooms, media center, cafeteria, multipurpose room, atrium, corridors, restrooms, and mechanical spaces.

Lighting systems consist mainly of LED sources. The building is 100% heated by five condensing boilers and several gas-fired furnaces and is 90% cooled by variable refrigerant volume (VRV) heat pumps and roof mounted package units (RTUs). The Daikin heat pumps provide cooling only as space heating is provided by the hot water boiler distribution system. Using the heat pumps for heating rather than the hot water heating system where possible will contribute to reducing the building's GHG emissions and the building O&M costs.

Recent improvements and Facility Concerns

In 2019, Jefferson Elementary School phased out most of the fluorescent fixtures and replaced them with efficient LED sources. Additionally, as part of the school HVAC upgrade, two new RTUs were installed. In 2010, five condensing boilers were installed. The site is interested in replacing the old RTUs and retrofitting the remaining non-LED sources with LED sources.

2.2 Building Occupancy

The school operates Monday through Friday with standard classes running from 8:30 AM to 3:30 PM. Facility operating hours extend from 6:00 AM to 11:30 PM. The school year lasts for the standard 180 days with an average occupancy count of 44 staff and 548 students. It should be noted that the energy and economic analysis for this building is based on the use of the building during the utility billing period, and that results will vary depending on changes to building use patterns.

Building Name	Weekday/Weekend	Operating Schedule
Summit Primary Center at Jefferson School/Jefferson Elementary School - General Operating Hours	Weekday	6:30 AM-11:30 PM
	Saturday	Varies
Summit Primary Center at Jefferson School/Jefferson Elementary School - Class Hours	Weekday	8:30 AM-3:30 PM
	Weekend	Closed

Figure 3 - Building Occupancy Schedule

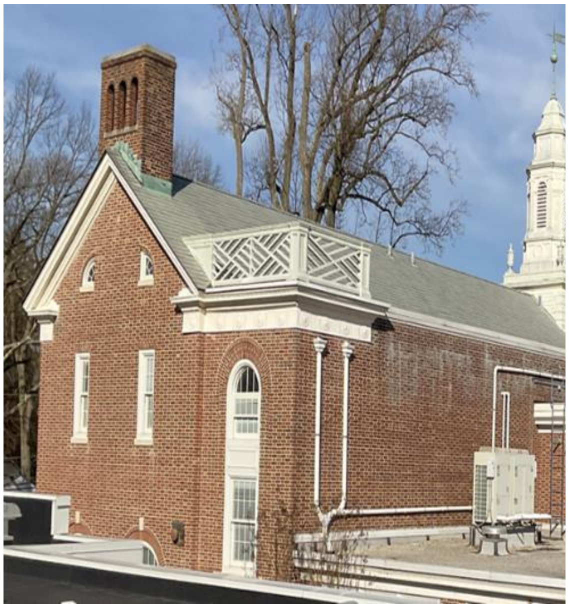
2.3 Building Envelope

The facility was constructed in different phases and is comprised of an elementary school section (original building) and the Pre-K addition sections referred to as the primary center.

Building walls are constructed of concrete masonry units (CMU) over structural steel with a brick façade, with gypsum drywall painted and CMU interior finish. The level of exterior wall insulation is unknown. The building has both flat roof areas and pitched roof sections supported by steel trusses. The original building has a pitched roof covered with slate shingles that are in aging and in fair condition. The additions have flat roof sections covered with a grey and black membrane and small stone granular elements that are in fair and good condition. Additionally, the primary center main entrance has a small, pitched roof section with a covering of asphalt shingles.

The original building windows are single paned glass with aluminum frames and are in fair condition. The glass-to-frame seals are in fair condition. The fixed window weather seals are in fair condition, showing some signs of wear. The exterior doors are a mix of wood framed and FRP (fiberglass-reinforced polymer) rated doors. They are in poor to fair condition. Degraded window and door seals increase drafts and outside air infiltration.

The primary center section windows are double paned glass with aluminum frames. The glass-to-frame seals are in good condition. The fixed window weather seals are in good condition, showing little evidence of excessive wear. Exterior doors are aluminum frames doors with incorporated glass. They are in good condition.


Original Building Walls

Original Building Walls

Addition Building Walls

Addition Building Walls

Roof Membranes

Clay Type Roof - Original Building

Windows

Exterior Doors

2.4 Lighting Systems

Jefferson Elementary School has been operating an LED lighting system after New Jersey's Clean Energy Direct Install Program retrofits were performed in 2019.

Lighting fixtures consist of linear LED tubes, LED panels, and LED lamps. LED tubes include 2-lamp, 3-lamp, 4-lamp, and 6-lamp; 2-foot or 4-foot-long troffer, recessed, and surface mounted fixtures. Additionally, there are some compact fluorescent lamps (CFL)found in classrooms and in the kindergarten corridor. The primary center boiler room is lit with 32-Watt linear fluorescent lamps while the original building boiler room has three. 8-foot, 2-lamp fluorescent T12 fixtures. Six, 1-lamp, 4-foot T5 fixtures were found in the main office entrance and lobby. The remaining spaces are lit with LED sources. Exit signs are LED sources.

Most fixtures are in good condition. Interior lighting levels were generally sufficient. Light fixtures are controlled by both occupancy sensors and wall switches.

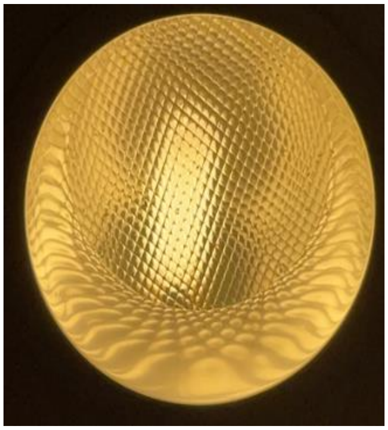
Exterior fixtures include LED lamps, CFLs, high pressure sodium, and metal halide and LED fixtures. Fixtures are wall, recessed, and pole mounted, and controlled by timers.



LED Fixtures and Linear T8 Lamps



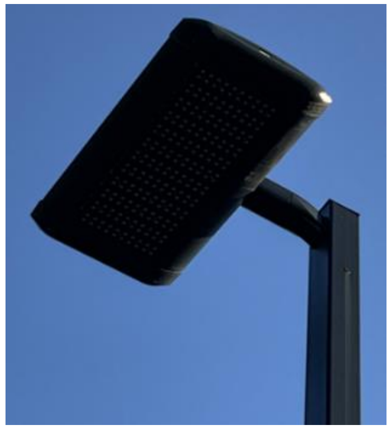
LED Tube Fixtures



Recessed CFL

Ceiling Mounted Occupancy Sensor

Wall Switches



Exterior LED Fixtures

Exterior HID Lamps

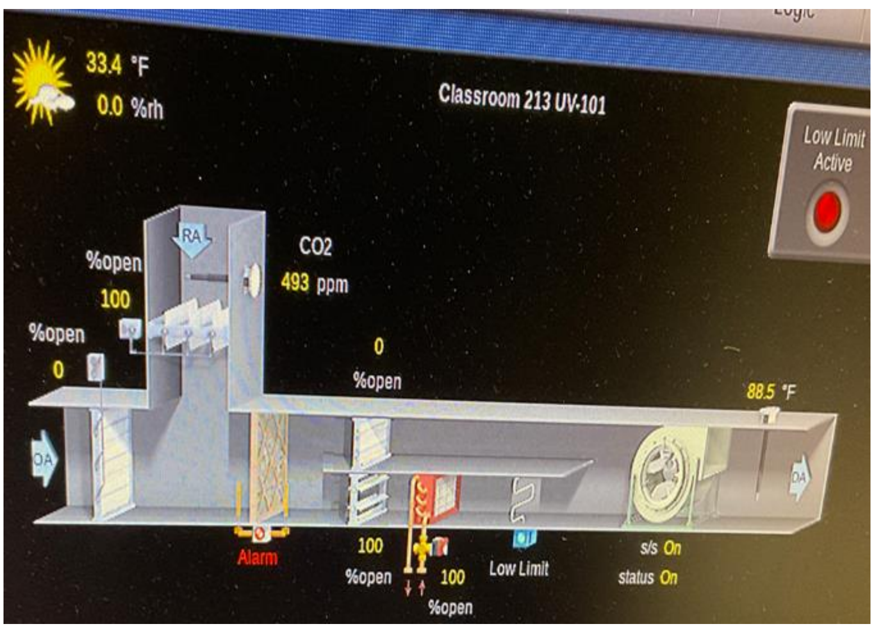
Timer

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators (UVs) are equipped with supply fan motors and digitally controlled outside air dampers and fan coil valves connected to the hot water distribution system. They provide heating and ventilation to classrooms. Some units appear to be in good operating condition while others are in fair condition. Equipment is controlled by the building automation system (BAS).

Typical Classroom Unit Ventilator



BAS Screenshot

Unitary Electric HVAC Equipment

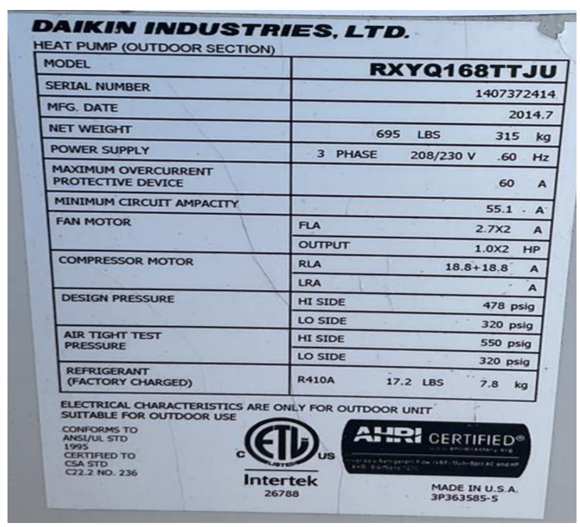
Various classrooms in the original building section are cooled by twenty-one, 2-ton window air conditioning units (ACs). Nineteen of the window ACs appear in fair condition and have been evaluated for replacement.

Two, 4-ton condensing units and one, 6-ton condensing unit are used to cool various spaces of the primary center. These units have reached the end of their useful life and have been evaluated for replacement. They appear to be connected to indoor fan coil units.

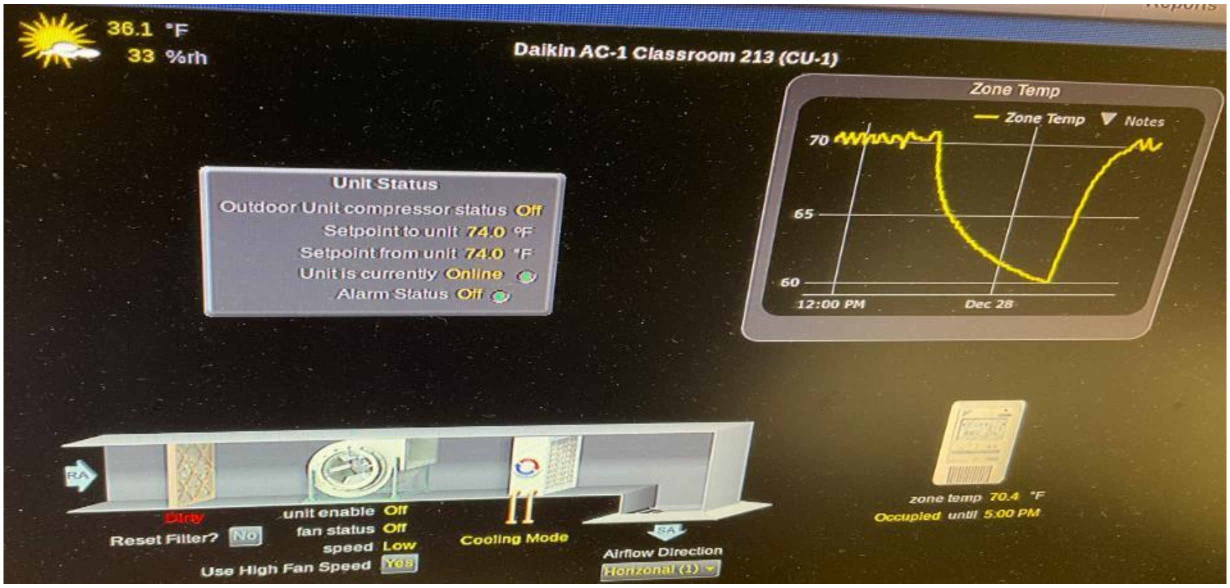
Five Daikin VRV heat pumps located on the roof and labeled as "CU," serve the new addition. Indoor units are typically located on the wall or ceiling. The heat pumps provide cooling only as the heating capabilities are not used; heating is provided by the hot water boiler distribution system. The heat pumps range in cooling capacity from 6 tons to 14 tons. The units are near the end of their useful life and have been evaluated for replacement. They are controlled by the BAS.

Window AC Unit

Condensing Unit



Typical Daikin VRV Heat Pump



BAS Screenshot - CU-1

Unitary Heating Equipment

Some building spaces including entrances and foyers are heated by ceiling mounted electric resistance heaters that are controlled by local thermostats.

Packaged Units

Larger spaces and offices of the new addition are conditioned by six rooftop units (RTU-1 to RTU-6). The units provide cooling through direct expansion (DX) and are equipped with supply and exhaust fans except for RTU-4 and RTU-5 that have supply fans only.

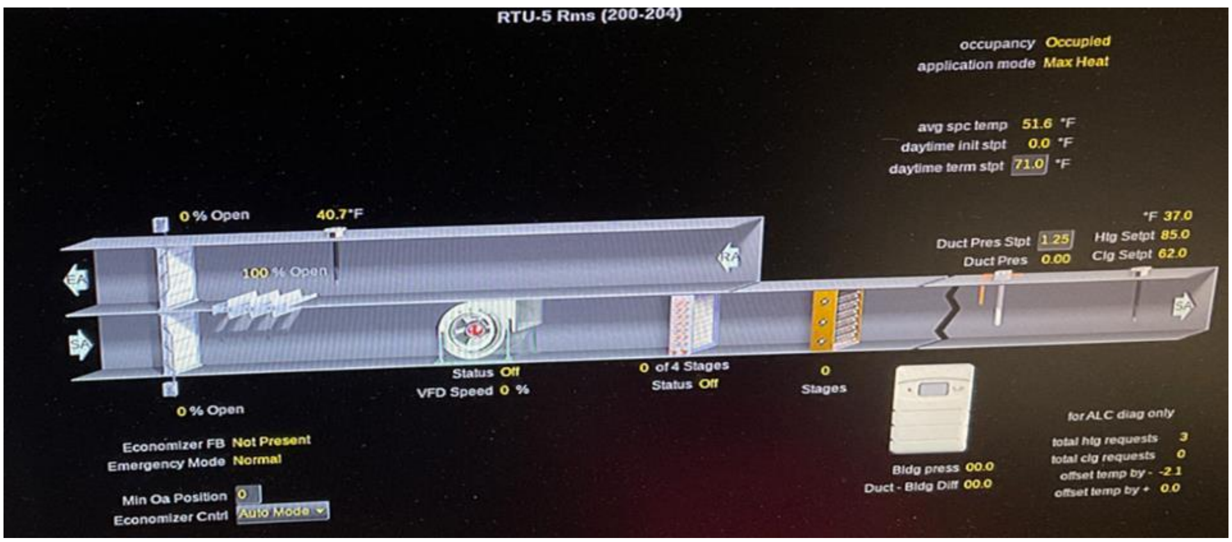
RTU-1, RTU-5 and RTU-6 are variable air volume units and are equipped with variable speed drive motors. RTU-2 and RTU-3 have reached their useful live and have been evaluated for replacement. The RTUs are controlled by the BAS. Location and capacities are provided below. Refer to Appendix A for additional detailed information about each unit.

There is one heat recovery unit (HRU-1) that was not accessible during the audit. The unit is controlled by the BAS.

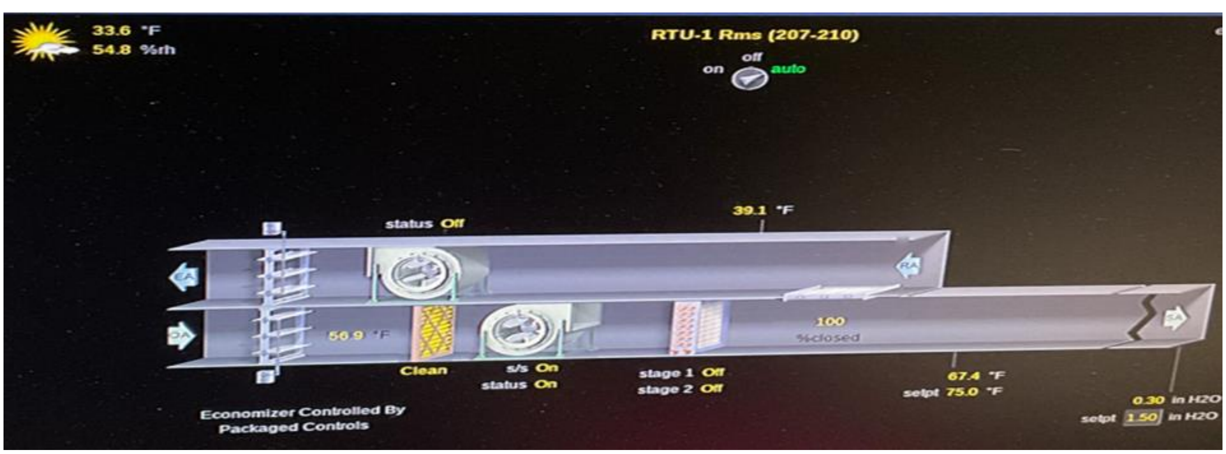
Location	Unit ID	Areas Served	Supply Fan (hp)	Exhaust Fan (hp)	Cooling Capacity (Ton)	Heating Capacity (MBh)	Condition
Roof	RTU-1	Rooms 207-210	3.0	0.75	8.50	96.00	Good
Roof	RTU-2	Room 171A (Multipurpose Room	3.0	0.75	8.50	N/A	Fair
Roof	RTU-3	Room 171B (Multipurpose Room	3.0	0.75	8.50	N/A	Fair
Roof	RTU-4	Library	3.0	N/A	10.00	N/A	Good
Roof	RTU-5	Room 200-204	3.0	N/A	12.50	284.00	Good
Roof	RTU-6	Corridors	3.0	0.75	10.00	180.00	Good

RTU-5 - Rooms 200-204

RTU-1 - Rooms 207-210



BAS Screenshot RTU-5

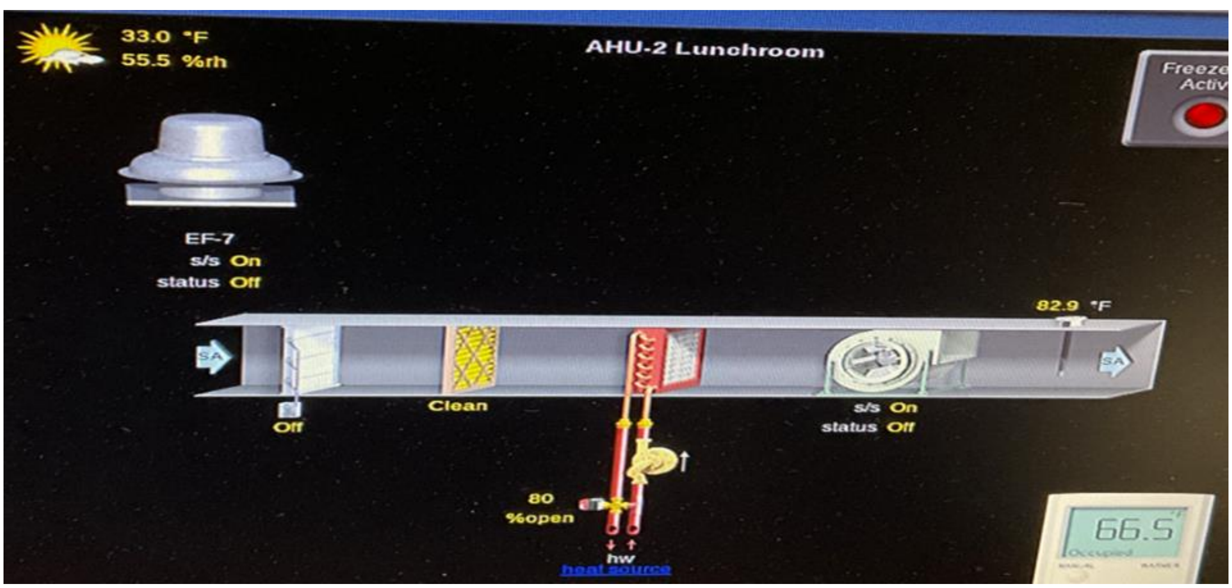


BAS Screenshot RTU-1

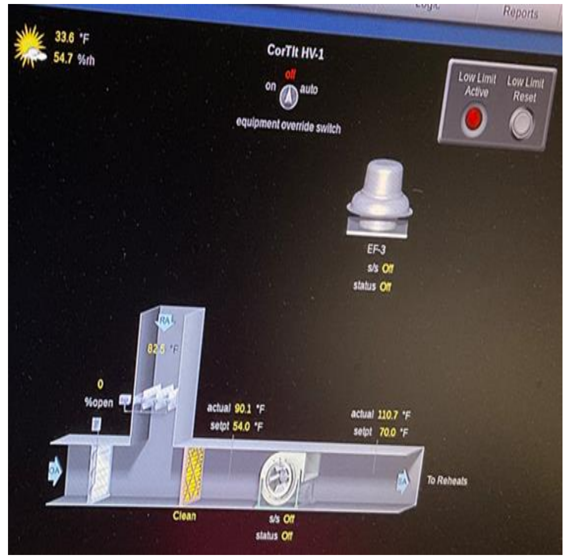
Air Handling Units (AHUs)

The gymnasium is heated by two roof mounted AHUs labeled as HV-1 and HV-2. The units are equipped with 3 hp supply fans and hot water coils. The units appear in fair condition. They are controlled by the BAS.

The lunchroom is served by a ceiling mounted unit labeled as AHU-2. It is equipped with a supply fan and hot water coil for heating. AHU-2 appears in good condition and is controlled by the BAS. The building air distribution setpoints are 72°F for cooling and 68°F for heating when occupied, and 80°F for cooling and 55°F for heating when unoccupied.



AHU-2 – BAS Screenshot

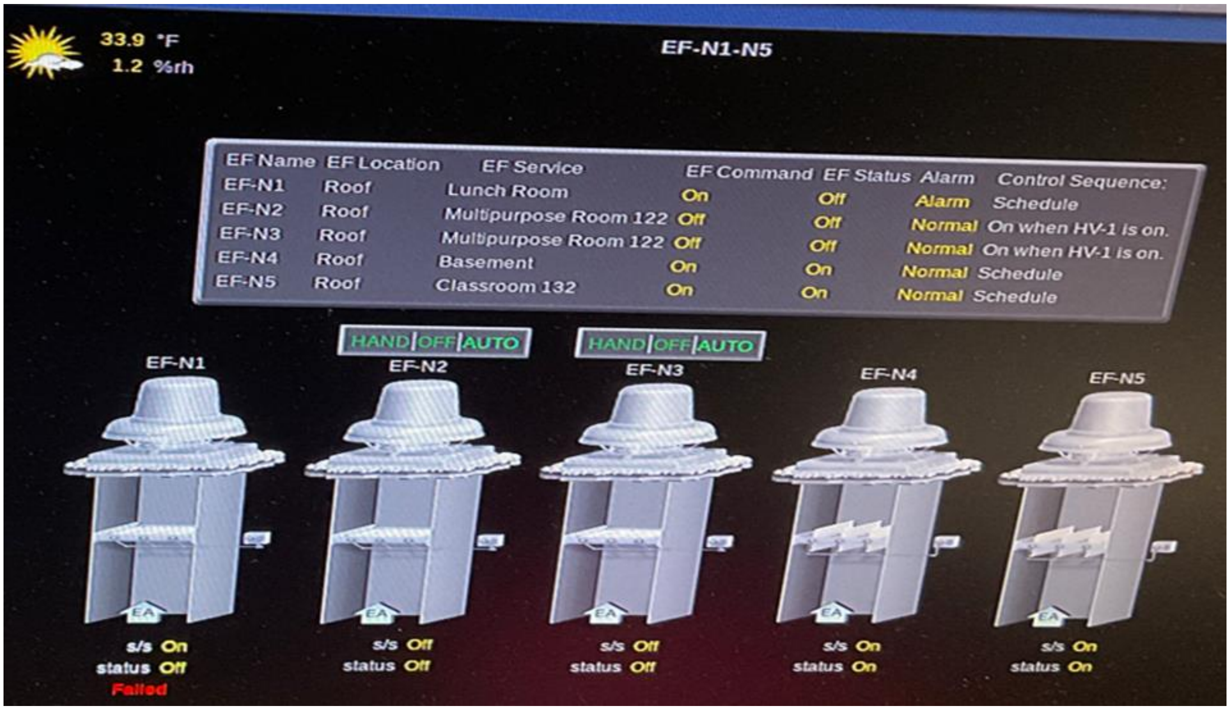


HV-1 – Gymnasium

2.6 Building General Exhaust Air Systems

The restrooms, hallways, classrooms, and other areas are exhausted by motor driven exhaust fans. The equipment is in good condition and is controlled by the BAS or manual switches, depending on the system.

Typical Exhaust Fans



BAS Screenshot - Exhaust Fans

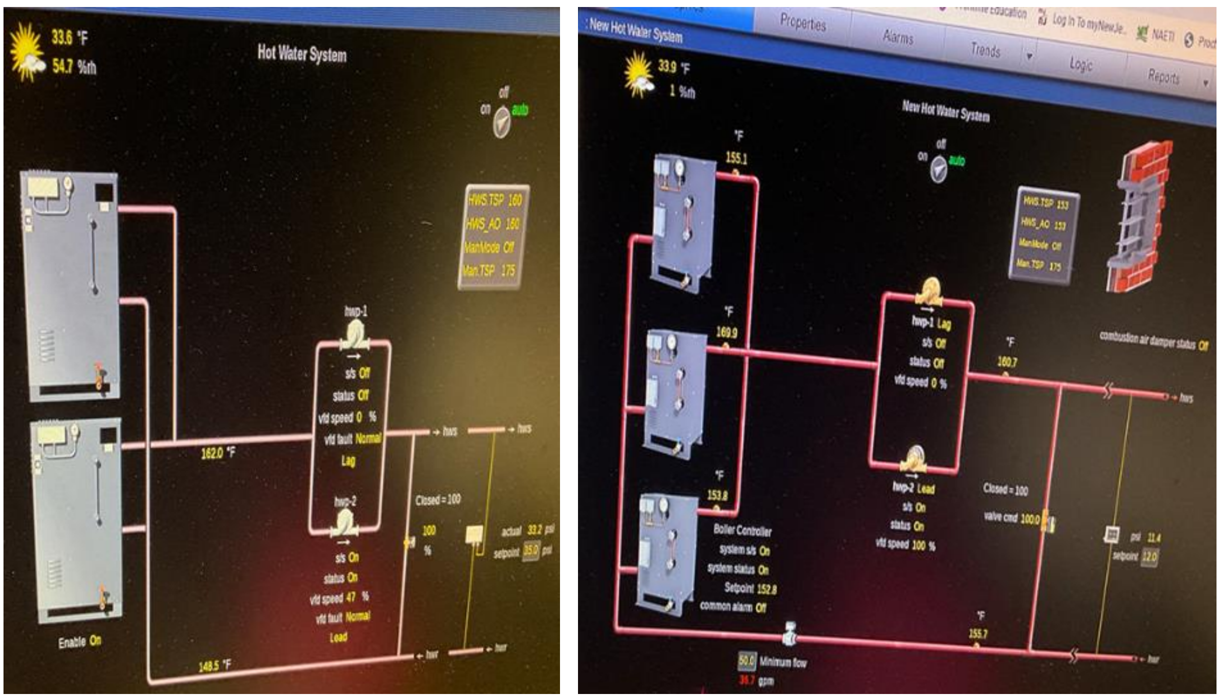
2.7 Heating Hot Water Systems

The facility has two boiler plants. The original building is equipped with three, 1290 MBh condensing boilers while the primary center heating load is met by two, 1720 MBh condensing boilers.

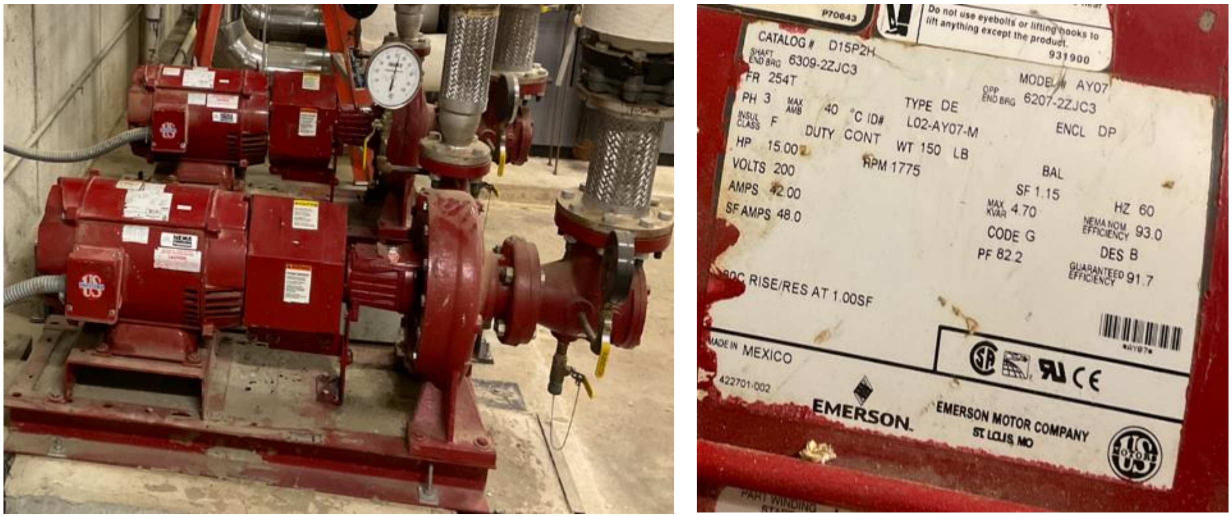
The burners are modulating with a nominal efficiency of 86%. The boilers are configured in an automated sequence, and they all run together to modulate the load and stage based on the outside air temperature. Installed in 2011, the boilers are in good condition. The hydronic distribution system is a two-pipe, heating-only system. The original building and primary center boiler rooms contain two, 10 hp and two, 15 hp variable speed pumps, respectively, that distribute heating hot water to unit ventilators, fan coil units, AHUs, hydronic baseboards, and unit heaters in their respective buildings.

The boilers operate based on outside air temperature. The boilers and the hot water loops are controlled by the BAS. The building occupied heating setpoint is 68°F, and the unoccupied heating setpoint is 55°F.

Condensing Boilers



BAS Screenshot - Hot Water Loops



15 hp Hot Water Pumps P1P2 - Primary Center

2.8 Building Automation System (BAS)

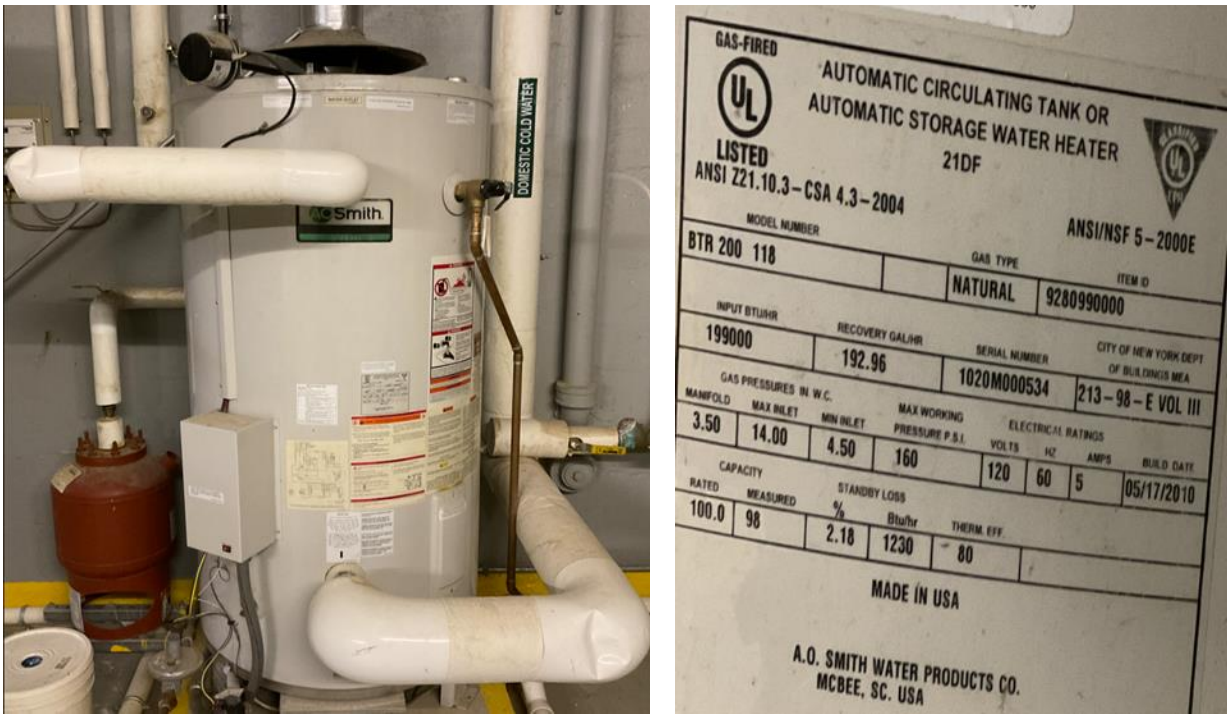
An Automated Logic system controls the HVAC equipment, boilers, UVs, exhaust fans, RTUs, and AHUs. The system provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, humidity, and heating water loop temperatures.

BAS Main Page

2.9 Domestic Hot Water

Hot water for the original building is produced by 100 gallon, 199 MBh gas-fired storage water heater with an efficiency rating of 80% located in the boiler room. Installed in 2010, the water heater is in good condition. Domestic hot water pipes are insulated, and the insulation is in good condition.

The primary center is served by two, 40 gallon and one, 38-gallon electric storage tank water heaters located in the storage rooms. Domestic hot water pipes are not insulated.



Gas-Fired Water Heater - Original Building

2.10 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 a convection gas-fired oven. Some bulk prepared foods are held in one full size electric holding cabinet. Equipment is high efficiency and is in good condition.

Storage room 239 has an under counter, low temperature, gas-fired dishwasher that is in good condition.

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

Gas-Fired Convection Oven

Electric Food Holding Cabinet

2.11 Refrigeration

The kitchen has three stand-up refrigerators with either solid or glass doors, and one solid door stand-up freezer. There are also one refrigerator and one freezer chests. Equipment is standard and high efficiency and in good condition.

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

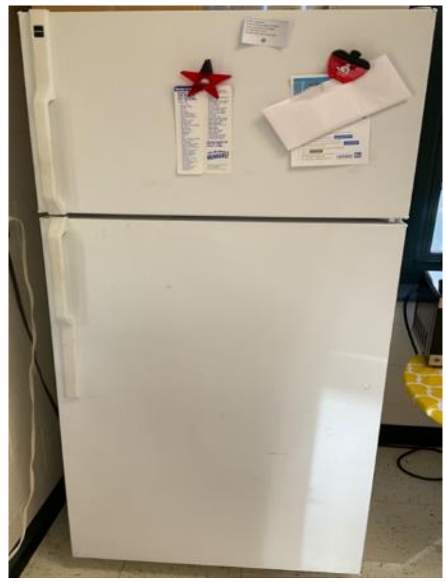
Stand-Up Solid Doors Refrigerators

2.12 Plug Load and Vending Machines

There are 46 computer workstations throughout the facility. Plug loads throughout the building include general café and office equipment. There are classroom-typical loads such as projectors. There are additional loads typically associated with elementary schools.

There are also typical office loads such as scanner/copier, small printers, microwaves, and mini fridges; the site also has a server closet. There are four residential-style refrigerators throughout the facility that are in good condition.

Copier/Scanner



Residential-Style Refrigerator

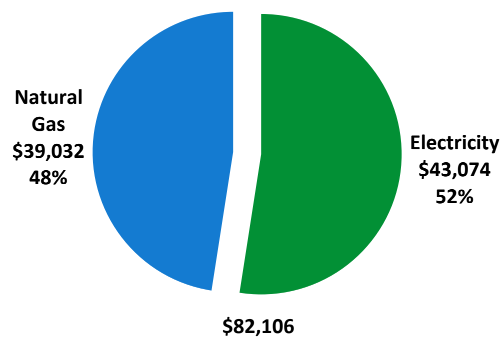
2.13 Water-Using Systems

There are several restrooms with toilets, urinals, and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm) or higher. Toilets are rated at 2.5 gallons per flush (gpf) and urinals are rated at 2.5 gpf.

3 Energy Use and Costs

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

Utility Summary		
Fuel	**Usage**	**Cost**
Electricity	361,440 kWh	$43,074
Natural Gas	33,570 Therms	$39,032
Total		**$82,106**



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

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

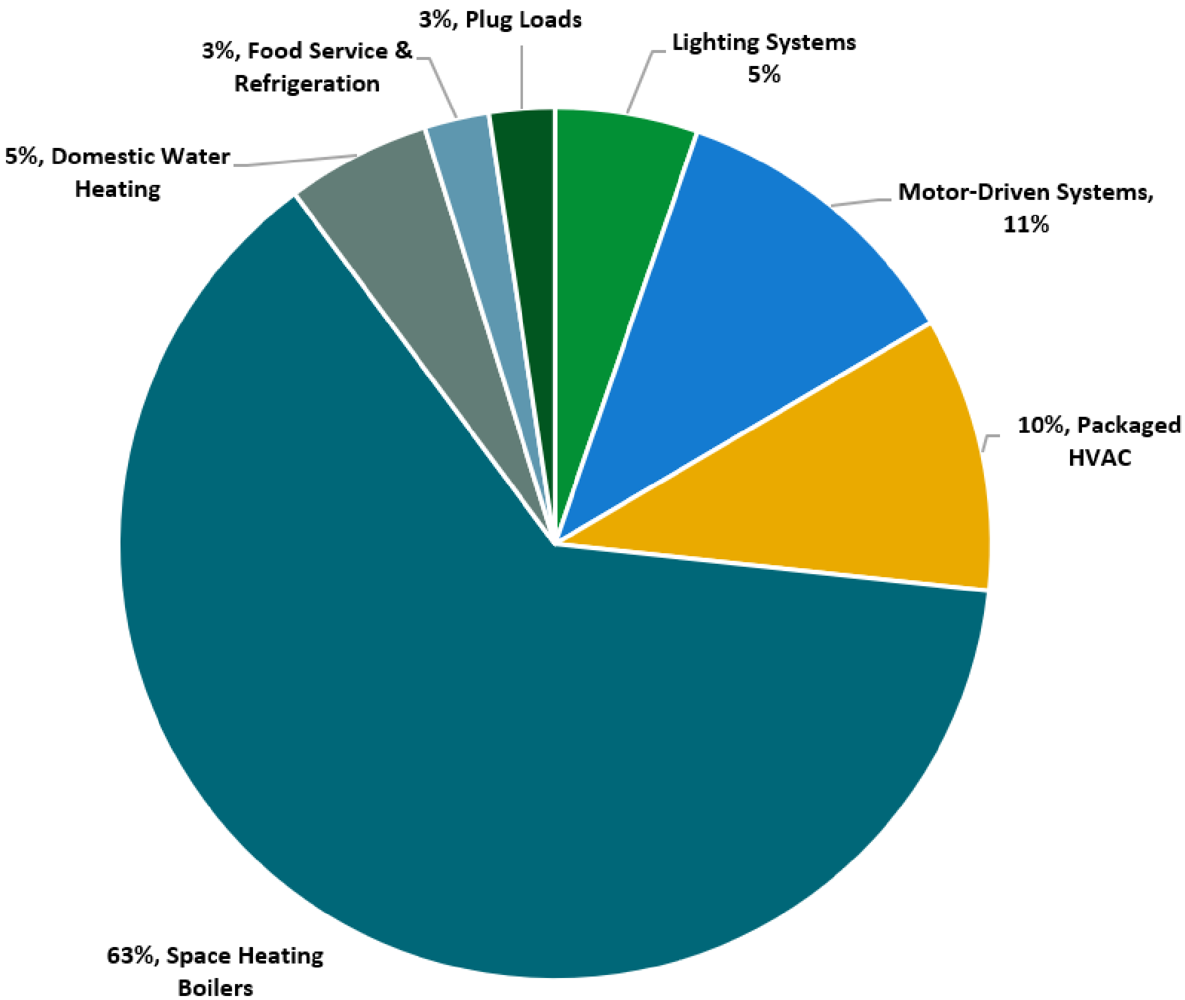
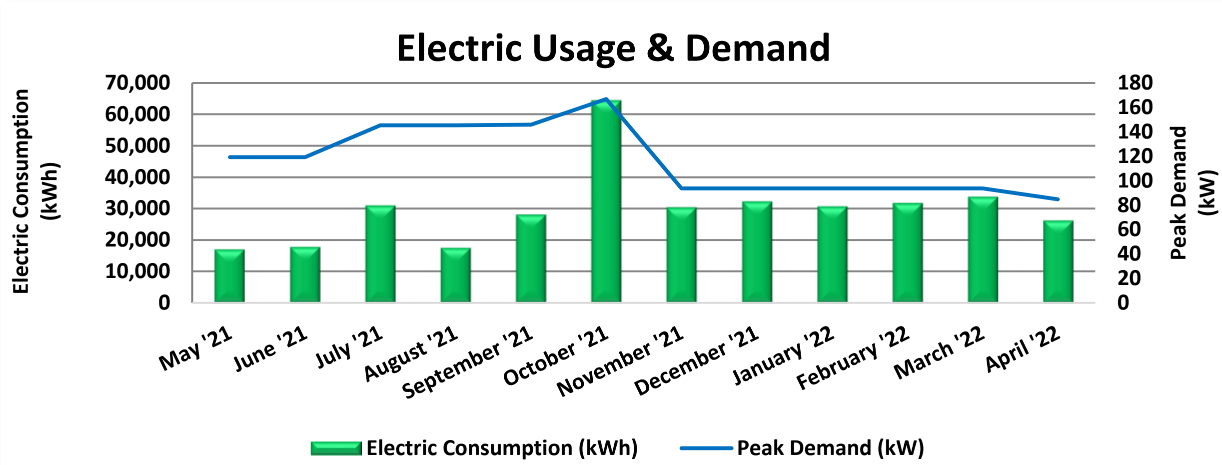


Figure 4 - Energy Balance

3.1 Electricity

JCP&L delivers electricity under General Service Secondary 3 Phase rate class.



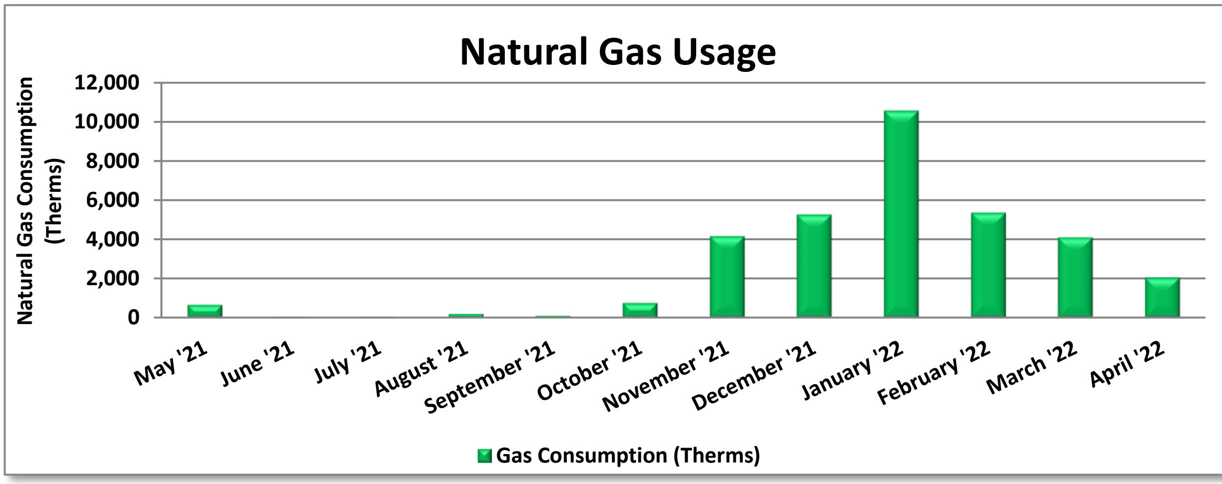
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
6/7/21	33	17,120	119	$724	$2,389
7/7/21	30	17,920	119	$724	$2,462
8/5/21	29	31,040	145	$897	$3,823
9/7/21	33	17,600	145	$897	$2,618
10/6/21	29	28,160	146	$839	$3,509
11/4/21	29	64,320	167	$993	$6,882
12/6/21	32	30,400	94	$617	$3,542
1/6/22	31	32,320	94	$617	$3,707
2/4/22	29	30,720	94	$617	$3,552
3/7/22	31	31,840	94	$617	$3,670
4/5/22	29	33,760	94	$617	$3,830
5/5/22	30	26,240	85	$563	$3,091
Totals	**365**	**361,440**	**167**	**$8,721**	**$43,074**
Annual	**365**	**361,440**	**167**	**$8,721**	**$43,074**

Notes:

- Peak demand of 167 kW occurred in October 2021.
- Average demand over the past 12 months was 116 kW.
- The average electric cost over the past 12 months was $0.119/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

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



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
6/7/21	31	684	$498
7/7/21	30	66	$191
8/5/21	29	54	$185
9/7/21	33	206	$260
10/5/21	28	112	$371
11/3/21	29	771	$1,839
12/7/21	34	4,171	$3,868
1/6/22	30	5,290	$6,573
2/4/22	29	10,569	$11,532
3/8/22	32	5,373	$7,401
4/6/22	29	4,115	$4,014
5/6/22	30	2,066	$2,194
Totals	**364**	**33,478**	**$38,926**
Annual	**365**	**33,570**	**$39,032**

Notes:

- The average gas cost for the past 12 months is $1.163/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

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

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

Benchmarking Score	54

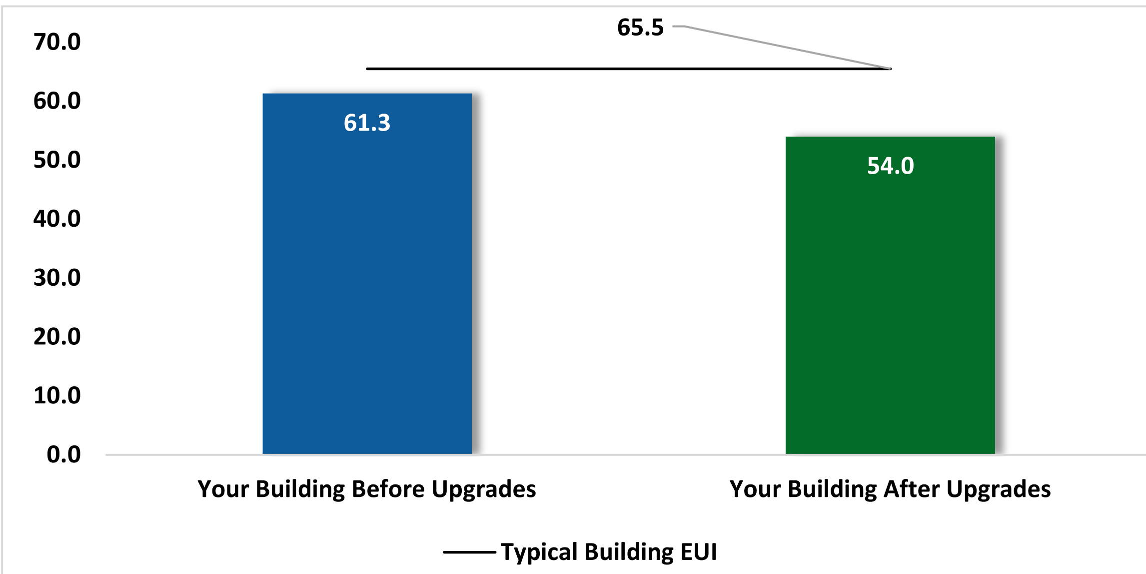


Figure 5 - Energy Use Intensity Comparison[3]

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

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

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

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

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

Free online training is available to help you use ENERGY STAR Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training.

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

4 Energy Conservation Measures

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

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

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

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

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**10,308**	**1.3**	**-1**	**$1,219**	**$9,947**	**$1,394**	**$8,553**	**7.0**	**10,288**
ECM 1	Install LED Fixtures	Yes	5,570	0.0	0	$664	$6,768	$950	$5,818	8.8	5,609
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,307	0.4	0	$153	$386	$60	$326	2.1	1,284
ECM 3	Retrofit Fixtures with LED Lamps	Yes	3,432	0.9	-1	$403	$2,792	$384	$2,408	6.0	3,395
Lighting Control Measures			**8,664**	**2.7**	**-2**	**$1,011**	**$11,766**	**$2,905**	**$8,861**	**8.8**	**8,512**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	6,977	2.2	-1	$814	$8,526	$945	$7,581	9.3	6,855
ECM 5	Install High/Low Lighting Controls	Yes	1,687	0.5	0	$197	$3,240	$1,960	$1,280	6.5	1,658
Motor Upgrades			**2,824**	**0.8**	**0**	**$337**	**$8,492**	**$0**	**$8,492**	**25.2**	**2,844**
ECM 6	Premium Efficiency Motors	No	2,824	0.8	0	$337	$8,492	$0	$8,492	25.2	2,844
Variable Frequency Drive (VFD) Measures			**16,353**	**5.7**	**0**	**$1,949**	**$31,215**	**$1,275**	**$29,940**	**15.4**	**16,467**
ECM 7	Install VFD on Variable Air Volume (VAV) Fans	No	4,181	1.4	0	$498	$8,442	$275	$8,167	16.4	4,211
ECM 8	Install VFDs on Constant Volume (CV) Fans	No	12,171	4.4	0	$1,451	$22,774	$1,000	$21,774	15.0	12,257
Unitary HVAC Measures			**8,288**	**16.0**	**0**	**$988**	**$169,376**	**$6,115**	**$163,261**	**165.3**	**8,346**
ECM 9	Install High Efficiency Air Conditioning Units	No	5,898	8.2	0	$703	$81,653	$2,657	$78,996	112.4	5,939
ECM 10	Install High Efficiency Heat Pumps	No	2,390	7.8	0	$285	$87,722	$3,458	$84,264	295.8	2,407
HVAC System Improvements			**1,354**	**0.0**	**103**	**$1,361**	**$14,888**	**$188**	**$14,700**	**10.8**	**13,440**
ECM 11	Implement Demand Control Ventilation (DCV)	No	805	0.0	70	$914	$13,594	$0	$13,594	14.9	9,053
ECM 12	Install Pipe Insulation	Yes	548	0.0	33	$446	$1,294	$188	$1,106	2.5	4,388
Domestic Water Heating Upgrade			**2,224**	**0.0**	**19**	**$486**	**$201**	**$100**	**$100**	**0.2**	**4,462**
ECM 13	Install Low-Flow DHW Devices	Yes	2,224	0.0	19	$486	$201	$100	$100	0.2	4,462
Custom Measures			**-3,769**	**0.0**	**269**	**$2,676**	**$36,019**	**$0**	**$36,019**	**13.5**	**27,672**
ECM 14	Retro-Commissioning Study	Yes	9,567	0.0	94	$2,230	$30,000	$0	$30,000	13.5	20,611
ECM 15	Replace Electric Water Heater with Heat Pump Water Heater	Yes	3,077	0.0	0	$367	$2,070	$0	$2,070	5.6	3,099
ECM 16	Replace Gas Fired Water Heater with Heat Pump Water Heater	No	-16,413	0.0	175	$79	$3,950	$0	$3,950	50.0	3,963
TOTALS			**46,247**	**26.5**	**388**	**$10,026**	**$281,904**	**$11,977**	**$269,927**	**26.9**	**92,033**

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

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

Figure 6 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**10,308**	**1.3**	**-1**	**$1,219**	**$9,947**	**$1,394**	**$8,553**	**7.0**	**10,288**
ECM 1	Install LED Fixtures	5,570	0.0	0	$664	$6,768	$950	$5,818	8.8	5,609
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,307	0.4	0	$153	$386	$60	$326	2.1	1,284
ECM 3	Retrofit Fixtures with LED Lamps	3,432	0.9	-1	$403	$2,792	$384	$2,408	6.0	3,395
Lighting Control Measures		**8,664**	**2.7**	**-2**	**$1,011**	**$11,766**	**$2,905**	**$8,861**	**8.8**	**8,512**
ECM 4	Install Occupancy Sensor Lighting Controls	6,977	2.2	-1	$814	$8,526	$945	$7,581	9.3	6,855
ECM 5	Install High/Low Lighting Controls	1,687	0.5	0	$197	$3,240	$1,960	$1,280	6.5	1,658
HVAC System Improvements		**548**	**0.0**	**33**	**$446**	**$1,294**	**$188**	**$1,106**	**2.5**	**4,388**
ECM 12	Install Pipe Insulation	548	0.0	33	$446	$1,294	$188	$1,106	2.5	4,388
Domestic Water Heating Upgrade		**2,224**	**0.0**	**19**	**$486**	**$201**	**$100**	**$100**	**0.2**	**4,462**
ECM 13	Install Low-Flow DHW Devices	2,224	0.0	19	$486	$201	$100	$100	0.2	4,462
Custom Measures		**12,644**	**0.0**	**94**	**$2,597**	**$32,070**	**$0**	**$32,070**	**12.3**	**23,710**
ECM 14	Retro-Commissioning Study	9,567	0.0	94	$2,230	$30,000	$0	$30,000	13.5	20,611
ECM 15	Replace Electric Water Heater with Heat Pump Water Heater	3,077	0.0	0	$367	$2,070	$0	$2,070	5.6	3,099
TOTALS		**34,389**	**3.9**	**143**	**$5,760**	**$55,277**	**$4,587**	**$50,690**	**8.8**	**51,360**

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

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

Figure 7 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**10,308**	**1.3**	**-1**	**$1,219**	**$9,947**	**$1,394**	**$8,553**	**7.0**	**10,288**
ECM 1	Install LED Fixtures	5,570	0.0	0	$664	$6,768	$950	$5,818	8.8	5,609
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,307	0.4	0	$153	$386	$60	$326	2.1	1,284
ECM 3	Retrofit Fixtures with LED Lamps	3,432	0.9	-1	$403	$2,792	$384	$2,408	6.0	3,395

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 and high-pressure sodium lamps with new LED light fixtures. This measure saves energy by installing LEDs, which use less power than other technologies with a comparable light output.

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

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

Affected Building Areas: exterior fixtures

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

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

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

Affected Building Areas: original building boiler room

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent T5 and T8, CFL and incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies. Be sure to specify replacement lamps that are compatible with existing dimming controls, where applicable. In some circumstances, you may need to upgrade your dimming system for optimum performance.

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

Affected Building Areas: linear T8 in the primary center boiler room, and storage rooms, T5 in main entrance and lobby; all spaces with CFL lamps

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**8,664**	**2.7**	**-2**	**$1,011**	**$11,766**	**$2,905**	**$8,861**	**8.8**	**8,512**
ECM 4	Install Occupancy Sensor Lighting Controls	6,977	2.2	-1	$814	$8,526	$945	$7,581	9.3	6,855
ECM 5	Install High/Low Lighting Controls	1,687	0.5	0	$197	$3,240	$1,960	$1,280	6.5	1,658

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

ECM 4: Install Occupancy Sensor Lighting Controls

Install occupancy sensors to control lighting fixtures in areas that are frequently unoccupied, even for short periods. For most spaces, we recommend that lighting controls use dual technology sensors, which 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, restrooms, and storage rooms

ECM 5: Install High/Low Lighting Controls

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

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

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

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

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

Affected Building Areas: corridors, stairs, and a lobby

4.3 Motors

#	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)
Motor Upgrades		**2,824**	**0.8**	**0**	**$337**	**$8,492**	**$0**	**$8,492**	**25.2**	**2,844**
ECM 6	Premium Efficiency Motors	2,824	0.8	0	$337	$8,492	$0	$8,492	25.2	2,844

ECM 6: Premium Efficiency Motors

We evaluated replacing standard efficiency motors with IHP 2014 efficiency motors. This evaluation assumes that existing motors will be replaced with motors of equivalent size and type. In some cases, additional savings may be possible by downsizing motors to better meet the motor's current load requirements.

The school district is considering replacing some old fan coil units at this site. The primary savings from replacing fan coil units will be from improved fan motor efficiency; however, those savings are unlikely to justify replacing the fan coils. The next potential savings would be from installing fan coils that provide for more optimal use of outside air than the existing fan coil units.

The potential savings from installing new fan coils with electronically commutated (EC) motors was evaluated. EC motors are generally more efficient than other fractional hp motors and have the capability of operating at variable speeds. In general, replacing the fan coils should be considered a capital improvement measure that has the potential to provide energy savings and improve occupant comfort.

Affected Motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Primary Center Various Spaces	Primary Center Various Spaces	28	Fan Coil Unit	0.3	Unit Ventilator

Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours. The base case motor energy consumption is estimated using the efficiencies found on nameplates or estimated based on the age of the motor and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the current *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*.

4.4 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		**16,353**	**5.7**	**0**	**$1,949**	**$31,215**	**$1,275**	**$29,940**	**15.4**	**16,467**
ECM 7	Install VFD on Variable Air Volume (VAV) Fans	4,181	1.4	0	$498	$8,442	$275	$8,167	16.4	4,211
ECM 8	Install VFDs on Constant Volume (CV) Fans	12,171	4.4	0	$1,451	$22,774	$1,000	$21,774	15.0	12,257

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 7: Install VFD on Variable Air Volume (VAV) Fans

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

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

Affected Unit: HRU-1

ECM 8: Install VFDs on Constant Volume (CV) Fans

We evaluated installing 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: HV-1 and HV-2, RTU-2, RTU-3, RTU-4

4.5 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**8,288**	**16.0**	**0**	**$988**	**$169,376**	**$6,115**	**$163,261**	**165.3**	**8,346**
ECM 9	Install High Efficiency Air Conditioning Units	5,898	8.2	0	$703	$81,653	$2,657	$78,996	112.4	5,939
ECM 10	Install High Efficiency Heat Pumps	2,390	7.8	0	$285	$87,722	$3,458	$84,264	295.8	2,407

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

ECM 9: Install High Efficiency Air Conditioning Units

We evaluated replacing standard efficiency window, condensing and packaged air conditioning units with high efficiency window, condensing and 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: nineteen window ACs, three condensing units, and RTU-2 and RTU-3

ECM 10: Install High Efficiency Heat Pumps

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

Note that because the heating components of these units have never been used, no savings can be claimed from increased efficiency during heating operations. The project payback is therefore significantly longer than if these systems were providing both heating and cooling.

Affected Units: all Daikin VRV heat pumps

4.6 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**1,354**	**0.0**	**103**	**$1,361**	**$14,888**	**$188**	**$14,700**	**10.8**	**13,440**
ECM 11	Implement Demand Control Ventilation (DCV)	805	0.0	70	$914	$13,594	$0	$13,594	14.9	9,053
ECM 12	Install Pipe Insulation	548	0.0	33	$446	$1,294	$188	$1,106	2.5	4,388

ECM 11: Implement Demand Control Ventilation (DCV)

Demand control ventilation (DCV) is a control strategy that monitors the indoor air's carbon dioxide (CO_2) 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: We evaluated a demand control ventilation strategy for the gymnasium, multipurpose room, and library, and corridor

ECM 12: Install Pipe Insulation

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

Affected Systems: Heating hot water piping in the Primary Center Boiler Room, and domestic hot water piping in new addition mechanical closet 235

4.7 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**2,224**	**0.0**	**19**	**$486**	**$201**	**$100**	**$100**	**0.2**	**4,462**
ECM 13	Install Low-Flow DHW Devices	2,224	0.0	19	$486	$201	$100	$100	0.2	4,462

ECM 13: 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.

4.8 Custom Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Custom Measures		**-3,769**	**0.0**	**269**	**$2,676**	**$36,019**	**$0**	**$36,019**	**13.5**	**27,672**
ECM 14	Retro-Commissioning Study	9,567	0.0	94	$2,230	$30,000	$0	$30,000	13.5	20,611
ECM 15	Replace Electric Water Heater with Heat Pump Water Heater	3,077	0.0	0	$367	$2,070	$0	$2,070	5.6	3,099
ECM 16	Replace Gas Fired Water Heater with Heat Pump Water Heater	-16,413	0.0	175	$79	$3,950	$0	$3,950	50.0	3,963

ECM 14: Retro-Commissioning Study

Due to the complexity of today's HVAC systems and controls a thorough analysis and rebalance of heating, ventilation, and cooling systems should periodically be conducted. There are indications at this site that systems may not be operating correctly or as efficiently as they could be. One important tool available to building operators to ensure proper system operation is retro-commissioning.

Retro-commissioning is a common practice recommended by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) to be implemented every few years. We recommend that you contact a reputable engineering firm that specializes in energy control systems and retro-commissioning. Ask them to propose a scope of work and an outline of the procedures and processes to be implemented, including a schedule and the roles of all responsible parties.

Once goals and responsibilities are established, the objective of the investigation process is to understand how the building is currently operating, identify the issues, and determine the most cost-effective way to improve performance. The retro-commissioning agent will review building documentation, interview building occupants, and inspect and test the equipment. Information is then compiled into a report and shared with facility staff, who will select which recommendations to implement after reviewing the findings.

The implementation phase puts the selected processes into place. Typical measures may include sensor calibration, equipment schedule changes, damper linkage repair and similar relatively low-cost adjustments—although more expensive sophisticated programming and building control system upgrades may be warranted. Approved measures may be implemented by the agent, the building staff, or by subcontractors. Typically, a combination of these individuals makes up the retro-commissioning team.

After the approved measures are implemented, the team will verify that the changes are working as expected. Baseline and post-case measurements will allow building staff to monitor equipment and ensure that the benefits are maintained.

A high-level evaluation of potential savings and costs is provided for demonstration purposes only. It is a screening evaluation for the potential in HVAC control improvements. Based on industry standards and previous project experience, the potential energy savings may be up to 15% of existing HVAC energy use. We estimate the cost of retro-commissioning studies and control improvements of $0.40 per square foot. Actual savings and costs will need to be outlined by the specific contractor engaged to perform the study. For the purposes of this report, we have conservatively estimated savings to be 3.3% of the HVAC energy consumption baseline.

CM 15: Replace Electric Water Heater with Heat Pump Water Heater

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

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

Most HPWH operate effectively down to an air temperature of 40 °F. Below that temperature, an electric resistance booster heater is typically required to achieve full heating capacity. It is critical that the HPWH controls are set up so that the electric resistance heat only engages when the air temperature is too cold

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

for the HPWH to extract heat from it. HPWHs have a slow recovery. During periods of high demand, the electric resistance heating element, if enabled, may be energized to maintain set point, thus reducing the overall efficiency of the unit. It is recommended that a careful analysis of the hot water demand be conducted to determine if the application makes economic sense, and the HPWH heating capacity and storage are properly sized.

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

Affected Systems: storage hot water heater in new addition mechanical closet 235

ECM 16: Replace Gas Fired Water Heater with Heat Pump Water Heater

A gas fired water heater uses a burner to heat water. Air source heat pump water heaters (HPWH) use a refrigeration cycle to transfer heat from the surrounding air to the domestic water. Water heater efficiency is rated by the uniform energy factor (UEF). For a relative comparison of water heater UEFs, the criteria for certifying a water heater in the ENERGY STAR program are provided below. These values indicate that HPWH heaters are significantly more efficient than gas fired water heaters.

There are two types of HPWH: those integrated with the heat pump and storage tank in the same unit, and those that are split into two sections (with the storage tank separate from the heat pump). The measure considers an integrated HPWH.

ENERGY STAR Uniform Energy Factor (UEF) Criteria for Certified Water Heaters *

Water Heater Type	Minimum UEF	Other
Integrated HPWH	3.3	
Integrated HPWH	2.2	120 Volt, 15 Amp circuit
Split System HPWH	2.2	
Gas Fired Storage	0.64	≤ 55-gal, Medium Draw Pattern
Gas Fired Storage	0.68	≤ 55-gal, High Draw Pattern
Gas Fired Storage	0.78	> 55-gal, Medium Draw Pattern
Gas Fired Storage	0.80	> 55-gal, High Draw Pattern
Gas Fired Storage	0.80	Residential Duty
Gas Fired Instantaneous	0.87	

** Note: Uniform Energy Factor (UEF): The newest measure of water heater overall efficiency. The higher the UEF value is, the more efficient the water heater. UEF is determined by the Department of Energy's test method outlined in 10 CFR Part 430, Subpart B, Appendix E.*[5]

[5] https://www.energy.gov/sites/prod/files/2014/06/f17/rwh_tp_final_rule.pdf

HPWH reject cold air. As such, they need to be installed in an unconditioned space of about 750 cubic feet with good ventilation[6]. Ideal locations are garages, large enclosed, unconditioned storage areas, or areas with excess heat such as a furnace or boiler room. The HPWH will also produce condensate so accommodations for draining the condensate need to be provided.

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

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

Switching from a gas fired water heater to a HPWH has the potential to reduce the sites overall greenhouse gas emissions. If the electricity for the HPWH is provided by an on-site photovoltaic (PV) system, then there are essentially no greenhouse gas (GHG) emissions. A 2016 study conducted at Cornell [7]calculated the kg of methane (CH_4) and carbon dioxide (CO_2) produced per GJ of water heated. The study compared HPWH to gas and electric fired, storage and tankless water heaters. The study also considered electricity produced from natural gas and coal fired electric plants. In all cases the study found that HPWHs produced less methane than all of the other water heaters. The study also found that HPWH produced less carbon dioxide than electric resistance water heaters but more carbon dioxide than tankless gas water heaters and about the same amount of carbon dioxide as storage gas water heaters. The summary tables provide the reduction in CO2 equivalent emissions based on the typical New Jersey electric utility.

This measure has a negative simple payback due to the relative cost of electricity to natural gas. At this site the cost per Btu for natural gas is significantly lower than for electricity. Therefore, even though this measure will result in a net energy savings in terms of Btu at this site it will increase the overall cost for providing domestic hot water.

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

[7] Greenhouse gas emissions from domestic hot water: Heat pumps compared to most commonly used systems. Bongghi Hong, Robert W. Howarth. Department of Ecology and Evolutionary Biology, Cornell University. Energy Science and Engineering 2016.

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[8]. 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.

Lighting Maintenance

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

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

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

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.

Fans to Reduce Cooling Load

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

Thermostat Schedules and Temperature Resets

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

Economizer Maintenance

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

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

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

Ductwork Maintenance

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

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

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

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

Boiler Maintenance

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

Furnace Maintenance

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

Label HVAC Equipment

For improved coordination in maintenance practices, we recommend labeling or re-labeling the site HVAC equipment. Maintain continuity in labeling by following labeling conventions as indicated in the facility drawings or 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 in order to eliminate unnecessary equipment operation and save energy. Monitoring should be performed often at sites with frequently changing usage patterns – daily in some cases. We recommend using the *optimal start* feature of the 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 5% and 10% on energy costs. When condenser coils are dirty, your commercial refrigerators and freezers work harder to maintain the temperature inside. Worn gaskets, hinges, door handles or faulty seals cause cold air to leak from the unit, forcing the unit to run longer and use more electricity.

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

Water Conservation

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

For more information regarding water conservation go to the EPA's WaterSense website[9] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[10] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Water conservation devices that do not reduce hot water consumption will not provide energy savings at the site level, but they may significantly affect your water and sewer usage costs. Any reduction in water use does however ultimately reduce grid-level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users.

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

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

Procurement Strategies

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

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

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

6 ON-SITE GENERATION

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

Preliminary screenings were performed to determine if an on-site generation measure could be a cost-effective solution for your facility. Before deciding to install an on-site generation system, we recommend conducting a feasibility study to analyze existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

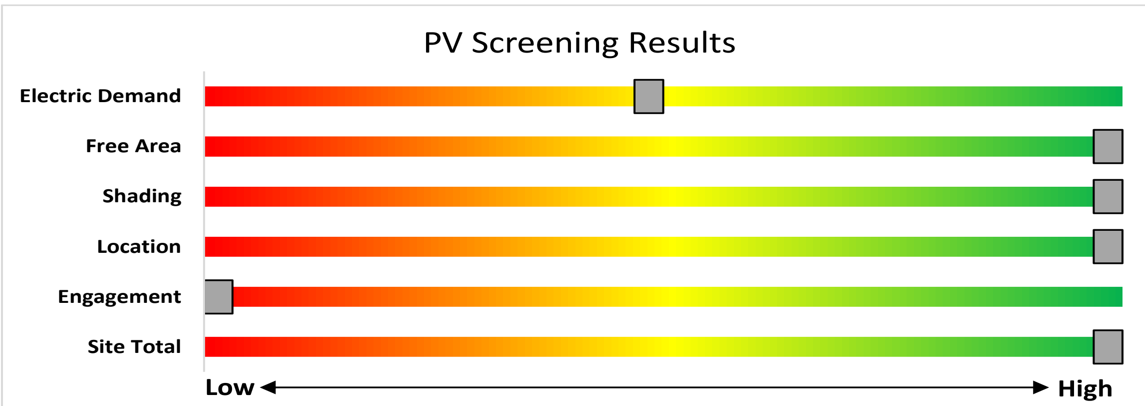
6.1 Solar Photovoltaic

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

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

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

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



Potential	High	
System Potential	116	kW DC STC
Electric Generation	138,199	kWh/yr
Displaced Cost	$16,470	/yr
Installed Cost	$301,600	

Figure 8 - Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

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

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

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

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

6.3 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.

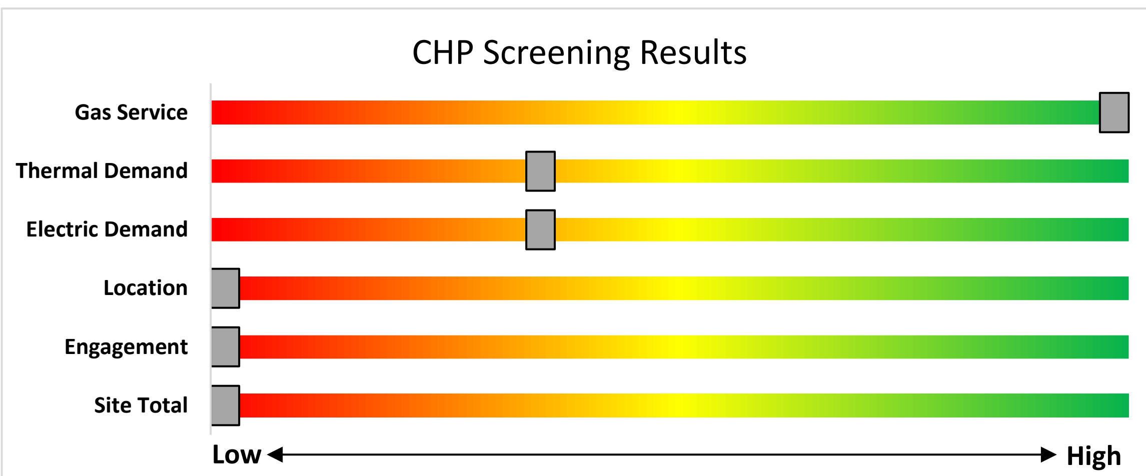


Figure 9 - Combined Heat and Power Screening

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

7 Electric Vehicles (EV)

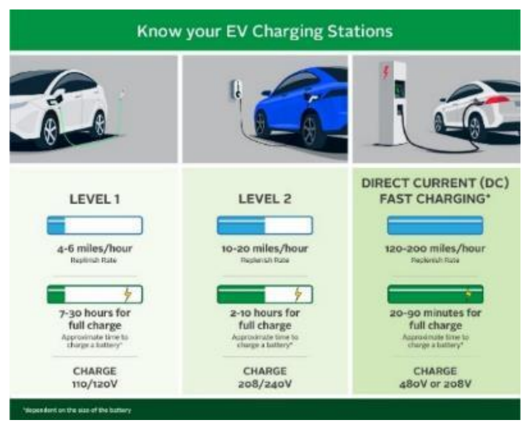
All electric vehicles (EVs) have an electric motor instead of an internal combustion engine. EVs function by plugging into a charge point, taking electricity from the grid, and then storing it in rechargeable batteries. Although electricity production may contribute to air pollution, the U.S. EPA categorizes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

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

7.1 Electric Vehicle Charging

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

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



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

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

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

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

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

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

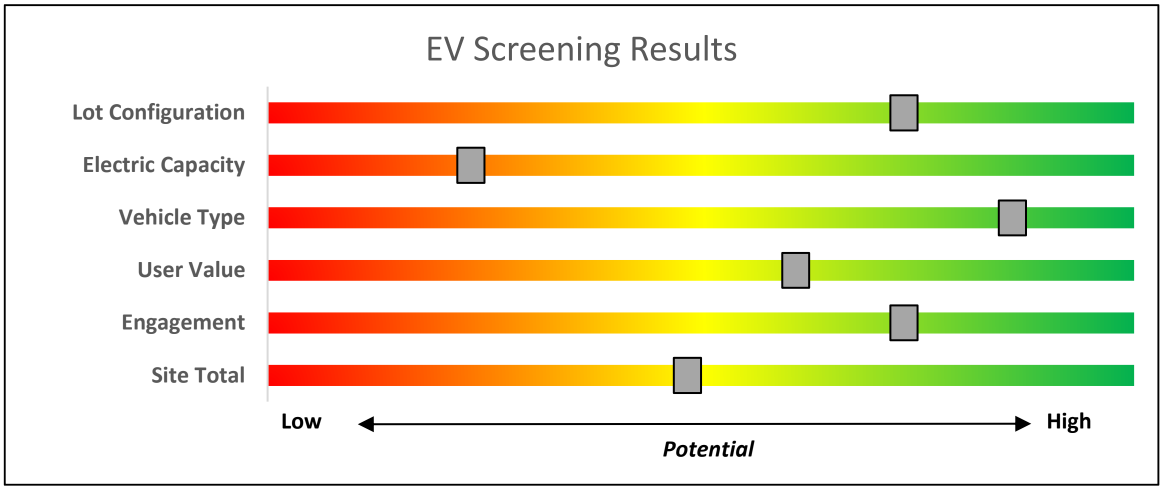


Figure 10 – EV Charger Screening

Electric Vehicle Programs Available

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

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

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

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

8 Project Funding and Incentives

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

8.1 Utility Energy Efficiency Programs

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

Prescriptive and Custom

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

Equipment Examples

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

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

Direct Install

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

Incentives

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

How to Participate

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

Engineered Solutions

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

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

8.2 New Jersey's Clean Energy Programs

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

Large Energy Users

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

Incentives

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

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

How to Participate

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

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

Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

Successor Solar Incentive Program (SuSI)

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

Administratively Determined Incentive (ADI) Program

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

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

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

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

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

The ADI Program online portal is now open to new registrations.

Competitive Solar Incentive Program

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

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

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

Energy Savings Improvement Program

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

ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs described above can also be used to help further reduce the total project cost of eligible measures.

How to Participate

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an energy services company or "ESCO."

(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.

(3) Use a hybrid approach of the two options described above where the ESCO is used for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the energy savings plan can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program descriptions and application can be found at www.njcleanenergy.com/ESIP.

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

9 Project Development

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

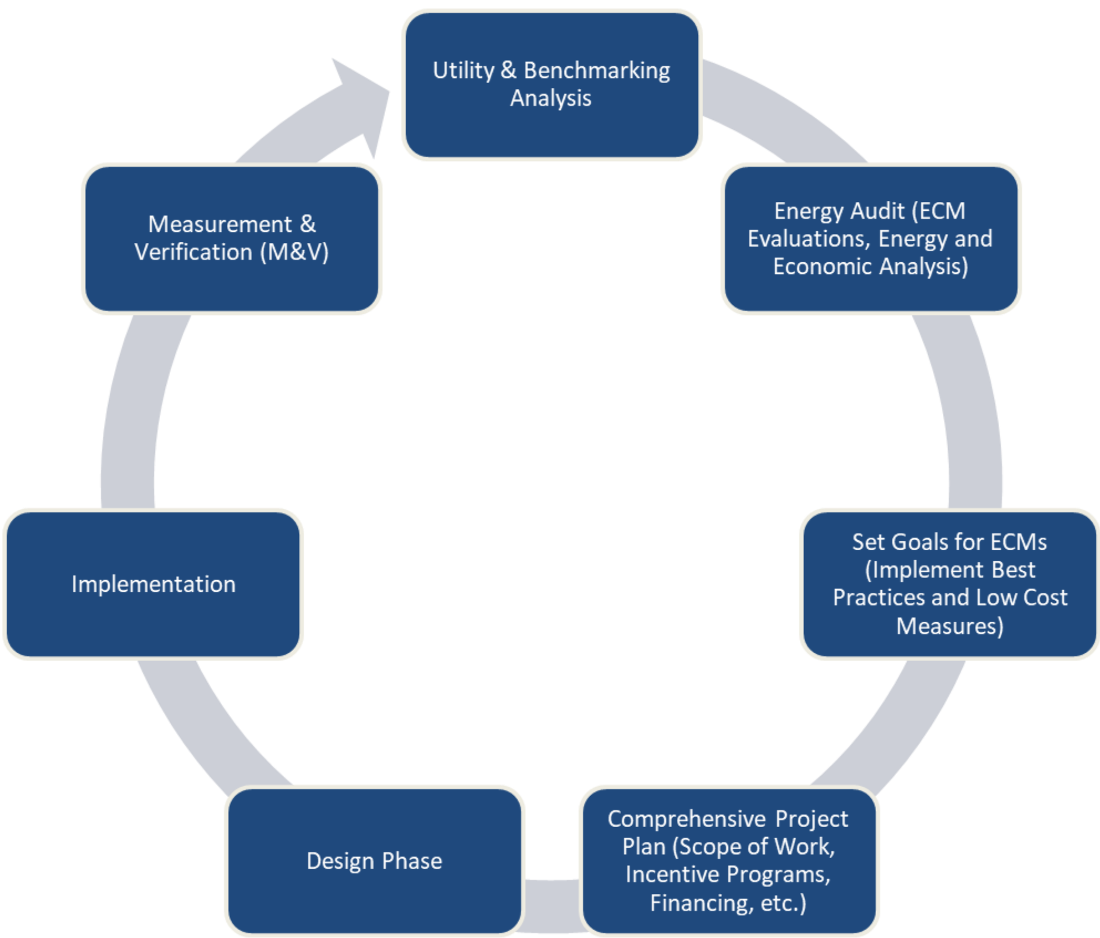


Figure 11 – Project Development Cycle

10 Energy Purchasing and Procurement Strategies

10.1 Retail Electric Supply Options

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. Though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third-party supplier, consider shopping for a reduced rate from third-party electric suppliers. If your facility already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party electric suppliers is available at the NJBPU website[11].

10.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market based and fluctuate monthly. The utility provides basic gas supply service to customers who choose not to buy from a third-party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier typically depends on whether a customer prefers budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third-party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility does not already purchase natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility already purchases natural gas from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party natural gas suppliers is available at the NJBPU website[12].

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

[12] 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
Room 102 Nurses Office	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Room 103 Work Room	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	38	1,518		None	No	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Room 156 SGI	5	LED - Fixtures: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	5	LED - Fixtures: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 160	3	Compact Fluorescent: (1) 26W Spiral Plug-In Lamp	Wall Switch	S	26	2,200	3	Relamp	No	3	LED Lamps: LED Lamps	Wall Switch	18	2,200	0.0	58	0	$7	$75	$15	8.8
Classroom 160	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 162	3	Compact Fluorescent: (1) 26W Spiral Plug-In Lamp	Wall Switch	S	26	2,200	3	Relamp	No	3	LED Lamps: LED Lamps	Wall Switch	18	2,200	0.0	58	0	$7	$75	$15	8.8
Classroom 162	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 164	3	Compact Fluorescent: (1) 26W Spiral Plug-In Lamp	Wall Switch	S	26	2,200	3	Relamp	No	3	LED Lamps: LED Lamps	Wall Switch	18	2,200	0.0	58	0	$7	$75	$15	8.8
Classroom 164	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 165	3	Compact Fluorescent: (1) 26W Spiral Plug-In Lamp	Wall Switch	S	26	2,200	3	Relamp	No	3	LED Lamps: LED Lamps	Wall Switch	18	2,200	0.0	58	0	$7	$75	$15	8.8
Classroom 165	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 166	3	Compact Fluorescent: (1) 26W Spiral Plug-In Lamp	Wall Switch	S	26	2,200	3	Relamp	No	3	LED Lamps: LED Lamps	Wall Switch	18	2,200	0.0	58	0	$7	$75	$15	8.8
Classroom 166	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 167	3	Compact Fluorescent: (1) 26W Spiral Plug-In Lamp	Wall Switch	S	26	2,200	3	Relamp	No	3	LED Lamps: LED Lamps	Wall Switch	18	2,200	0.0	58	0	$7	$75	$15	8.8
Classroom 167	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 168	3	Compact Fluorescent: (1) 26W Spiral Plug-In Lamp	Wall Switch	S	26	2,200	3	Relamp	No	3	LED Lamps: LED Lamps	Wall Switch	18	2,200	0.0	58	0	$7	$75	$15	8.8
Classroom 168	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 169	3	Compact Fluorescent: (1) 26W Spiral Plug-In Lamp	Wall Switch	S	26	2,200	3	Relamp	No	3	LED Lamps: LED Lamps	Wall Switch	18	2,200	0.0	58	0	$7	$75	$15	8.8
Classroom 169	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Closet 170	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	2,200		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	25	2,200	0.0	0	0	$0	$0	$0	0.0
Multipurpose Room 171a	32	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	38	2,200	4	None	Yes	32	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.3	912	0	$106	$810	$105	6.6
Classroom 213	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.1	300	0	$35	$270	$35	6.7
Classroom 214	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.1	300	0	$35	$270	$35	6.7
Storage 215 slop sink	1	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,200	3	Relamp	No	1	LED Lamps: LED Lamps	Wall Switch	9	2,200	0.0	123	0	$14	$17	$1	1.1
Classroom 216	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.1	300	0	$35	$270	$35	6.7

	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 217	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.1	300	0	$35	$270	$35	6.7
Classroom 218	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 219	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 220	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 221	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Service Closet 223	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 225	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 228	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 229	6	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.1	225	0	$26	$270	$35	8.9
Classroom 230	2	Compact Fluorescent: (1) 14W A19 Screw-In Lamp	Wall Switch	S	14	2,200	3	Relamp	No	2	LED Lamps: LED Lamps	Wall Switch	10	2,200	0.0	19	0	$2	$34	$2	14.4
Classroom 230	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	S	50	1,518		None	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 231	6	LED - Fixtures: (3) 4' Lamps	Wall Switch	S	38	2,200	4	None	Yes	6	LED - Fixtures: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.1	171	0	$20	$270	$35	11.8
Classroom 232	2	Compact Fluorescent: (1) 14W A19 Screw-In Lamp	Wall Switch	S	14	2,200	3	Relamp	No	2	LED Lamps: LED Lamps	Wall Switch	10	2,200	0.0	19	0	$2	$34	$2	14.4
Classroom 232	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	S	50	1,518		None	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 233-234 Dual Classroom	24	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	S	50	1,518		None	No	24	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.0	0	0	$0	$0	$0	0.0
Mechanical Closet 235	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	800	4	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	552	0.0	14	0	$2	$116	$0	72.8
Closet 238	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	800	4	None	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	552	0.0	27	0	$3	$116	$0	36.4
Classroom 239	9	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.1	338	0	$39	$270	$35	6.0
Classroom 240	10	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.1	375	0	$44	$270	$35	5.4
Service Closet 241	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,518	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,518	0.0	94	0	$11	$73	$0	6.7
Multi Purpose 242	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
Multi Purpose 242	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,200		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.0	0	0	$0	$0	$0	0.0
Multi Purpose 242	9	LED - Linear Tubes: (6) 4' Lamps	Wall Switch	S	87	2,200	4	None	Yes	9	LED - Linear Tubes: (6) 4' Lamps	Occupancy Sensor	87	1,518	0.2	587	0	$69	$270	$35	3.4
Media Center 243	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,200		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,200	0.0	0	0	$0	$0	$0	0.0
Media Center 243	23	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	38	2,200	4	None	Yes	23	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.2	656	0	$77	$540	$70	6.1

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Fifth Grade Boys Bathroom Closet	1	Compact Fluorescent: (1) 14W A19 Screw-In Lamp	Wall Switch	S	14	800	3	Relamp	No	1	LED Lamps: LED Lamps	Wall Switch	10	800	0.0	4	0	$0	$17	$1	39.5
Atrium	28	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	1,518		None	No	28	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,518	0.0	0	0	$0	$0	$0	0.0
Ball storage room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	800	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	800	0.0	49	0	$6	$73	$0	12.7
Bathroom Foyer	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	2,200		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	30	2,200	0.0	0	0	$0	$0	$0	0.0
Bathroom in Classroom 160	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	2,200		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	25	2,200	0.0	0	0	$0	$0	$0	0.0
Bathroom in Classroom 164	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Bathroom in Classroom 165	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Bathroom in Classroom 166	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Bathroom in 167	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Bathroom in Classroom 168	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Bathroom in Classroom 169	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	2,200		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	25	2,200	0.0	0	0	$0	$0	$0	0.0
Bathroom in 217	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,200		None	No	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,200	0.0	0	0	$0	$0	$0	0.0
Boiler Room Primary Center	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Boiler Room Primary Center	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,518	3	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,518	0.2	551	0	$64	$365	$0	5.7
Fifth Grade Boys Bathroom	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200		None	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	50	2,200	0.0	0	0	$0	$0	$0	0.0
Boys Bath 5th grade	1	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	2,200		None	No	1	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	2,200	0.0	0	0	$0	$0	$0	0.0
Boys Bathroom	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,518		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,518	0.0	0	0	$0	$0	$0	0.0
Boys Bathroom Cafeteria Area	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,518		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,518	0.0	0	0	$0	$0	$0	0.0
Boys Bathroom First grade	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Boys Bathroom Primary	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Cafeteria	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Cafeteria	2	LED - Fixtures: Downlight Recessed	Wall Switch	S	12	2,200		None	No	2	LED - Fixtures: Downlight Recessed	Wall Switch	12	2,200	0.0	0	0	$0	$0	$0	0.0
Cafeteria	35	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	35	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Classroom 226	10	LED - Fixtures: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	10	LED - Fixtures: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Corridor Fifth Grade Wing	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0

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Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Corridor Fifth Grade Wing	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	2,200	5	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	25	1,518	0.0	56	0	$7	$0	$0	0.0
Corridor Fifth Grade Wing	17	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	2,200	5	None	Yes	17	LED - Linear Tubes: (4) 2' Lamps	High/Low Control	34	1,518	0.1	434	0	$51	$900	$595	6.0
Corridor First Floor Original Building	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor First Floor Original Building	21	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	5	None	Yes	21	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	50	1,518	0.2	788	0	$92	$900	$735	1.8
Corridor First grade	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor First grade	8	LED Lamps: (1) 12W Plug-In Lamps	Wall Switch	S	12	2,200	5	None	Yes	8	LED Lamps: (1) 12W Plug-In Lamps	High/Low Control	12	1,518	0.0	72	0	$8	$450	$280	20.2
Corridor First grade	27	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	27	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Corridor Kindergarten	11	Compact Fluorescent: (1) 26W Spiral Plug-In Lamp	Wall Switch	S	26	2,200	3, 5	Relamp	Yes	11	LED Lamps: LED Lamps	High/Low Control	18	1,518	0.1	361	0	$42	$815	$125	16.3
Corridor Kindergarten	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor Kindergarten	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Corridor-Main office	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Custodial Office	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.0	150	0	$18	$270	$35	13.4
Room Dungeon	2	Compact Fluorescent: (1) 13W A19 Plug-In Lamp	Wall Switch	S	13	2,200	3	Relamp	No	2	LED Lamps: LED Lamps	Wall Switch	9	2,200	0.0	19	0	$2	$25	$2	10.2
Room Dungeon	1	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,200	3	Relamp	No	1	LED Lamps: LED Lamps	Wall Switch	9	2,200	0.0	123	0	$14	$17	$1	1.1
E10 Foyer	1	Compact Fluorescent: (1) 13W A19 Plug-In Lamp	Occupancy Sensor	S	13	1,518	3	Relamp	No	1	LED Lamps: LED Lamps	Occupancy Sensor	9	1,518	0.0	7	0	$1	$13	$1	14.7
E4 Entrance Foyer	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	2,200	4	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	75	0	$9	$270	$35	26.8
E5 Entrance Foyer	2	LED Lamps: (1) 14W BR38 Screw-In Lamp	Wall Switch	S	14	2,200		None	No	2	LED Lamps: (1) 14W BR38 Screw-In Lamp	Wall Switch	14	2,200	0.0	0	0	$0	$0	$0	0.0
E5 Entrance Foyer	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.0	38	0	$4	$0	$0	0.0
E5 Entrance Interior Door	2	LED Lamps: (1) 14W BR38 Screw-In Lamp	Wall Switch	S	14	2,200		None	No	2	LED Lamps: (1) 14W BR38 Screw-In Lamp	Wall Switch	14	2,200	0.0	0	0	$0	$0	$0	0.0
Electric Room near Cafeteria	1	LED Lamps: (1) 15W Corn Bulb Screw-In Lamp	Wall Switch	S	15	2,200		None	No	1	LED Lamps: (1) 15W Corn Bulb Screw-In Lamp	Wall Switch	15	2,200	0.0	0	0	$0	$0	$0	0.0
Electrical Panels	1	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	2,200		None	No	1	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	2,200	0.0	0	0	$0	$0	$0	0.0
Electrical Room Old Building	1	LED Lamps: (1) 15W Corn Bulb Screw-In Lamp	Wall Switch	S	15	2,200		None	No	1	LED Lamps: (1) 15W Corn Bulb Screw-In Lamp	Wall Switch	15	2,200	0.0	0	0	$0	$0	$0	0.0
Exterior 226 Window	1	High-Pressure Sodium: (1) 250W Lamp	Timeclock		295	2,000	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	75	2,000	0.0	440	0	$52	$471	$50	8.0
Exterior Door E1	1	LED - Fixtures: Downlight Surface Mount	Timeclock		40	2,000		None	No	1	LED - Fixtures: Downlight Surface Mount	Timeclock	40	2,000	0.0	0	0	$0	$0	$0	0.0
Exterior Door E1	1	LED - Fixtures: Wall Pack	Timeclock		30	2,000		None	No	1	LED - Fixtures: Wall Pack	Timeclock	30	2,000	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior Door E8	2	LED Lamps: (2) 11W Plug-In Lamps	Timeclock		22	2,000		None	No	2	LED Lamps: (2) 11W Plug-In Lamps	Timeclock	22	2,000	0.0	0	0	$0	$0	$0	0.0
Exterior E10	5	LED Lamps: (2) 11W Plug-In Lamps	Timeclock		22	2,000		None	No	5	LED Lamps: (2) 11W Plug-In Lamps	Timeclock	22	2,000	0.0	0	0	$0	$0	$0	0.0
Exterior E11 Side Wall	2	LED Lamps: (2) 11W Plug-In Lamps	Timeclock		22	2,000		None	No	2	LED Lamps: (2) 11W Plug-In Lamps	Timeclock	22	2,000	0.0	0	0	$0	$0	$0	0.0
Exterior E11 Side Wall	2	Metal Halide: (1) 150W Lamp	Timeclock		190	2,000	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	45	2,000	0.0	580	0	$69	$692	$100	8.6
Exterior E12 Rear Wall	3	LED Lamps: (2) 11W Plug-In Lamps	Timeclock		22	2,000		None	No	3	LED Lamps: (2) 11W Plug-In Lamps	Timeclock	22	2,000	0.0	0	0	$0	$0	$0	0.0
Exterior E12 Rear Wall	5	Metal Halide: (1) 150W Lamp	Timeclock		190	2,000	1	Fixture Replacement	No	5	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	45	2,000	0.0	1,450	0	$173	$1,729	$250	8.6
Exterior E5 Door	3	LED Lamps: (1) 10W A19 Screw-In Lamp	Timeclock		10	2,000		None	No	3	LED Lamps: (1) 10W A19 Screw-In Lamp	Timeclock	10	2,000	0.0	0	0	$0	$0	$0	0.0
Exterior E6 Door	2	LED Lamps: (2) 11W Plug-In Lamps	Timeclock		22	2,000		None	No	2	LED Lamps: (2) 11W Plug-In Lamps	Timeclock	22	2,000	0.0	0	0	$0	$0	$0	0.0
Exterior E6 Door	1	Metal Halide: (1) 150W Lamp	Timeclock		190	2,000	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	45	2,000	0.0	290	0	$35	$346	$50	8.6
Exterior E7 Door	2	LED Lamps: (2) 11W Plug-In Lamps	Timeclock		22	2,000		None	No	2	LED Lamps: (2) 11W Plug-In Lamps	Timeclock	22	2,000	0.0	0	0	$0	$0	$0	0.0
Exterior E7 Door	2	Metal Halide: (1) 150W Lamp	Timeclock		190	2,000	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	45	2,000	0.0	580	0	$69	$692	$100	8.6
Exterior Front Main Old Buildind	7	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock		100	2,000		None	No	7	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	100	2,000	0.0	0	0	$0	$0	$0	0.0
Exterior Front Main Old Buildind	1	LED - Fixtures: Wall Pack	Timeclock		30	2,000		None	No	1	LED - Fixtures: Wall Pack	Timeclock	30	2,000	0.0	0	0	$0	$0	$0	0.0
Exterior Front Main Old Buildind	7	Compact Fluorescent: (2) 55W T5 Circle line Fluorescent	Timeclock		110	2,000	3	Relamp	No	7	LED Lamps: 4-pin LED Circline Lamp	Timeclock	77	2,000	0.0	462	0	$55	$350	$70	5.1
Exterior Front Main Old Buildind	8	Compact Fluorescent: (1) 55W T5 Circle line Fluorescent	Timeclock		55	2,000	3	Relamp	No	8	LED Lamps: 4-pin LED Circline Lamp	Timeclock	39	2,000	0.0	256	0	$31	$200	$40	5.2
Exterior Jeff Primary Garden	5	LED Lamps: (2) 11W Plug-In Lamps	Timeclock		22	2,000		None	No	5	LED Lamps: (2) 11W Plug-In Lamps	Timeclock	22	2,000	0.0	0	0	$0	$0	$0	0.0
Exterior Jeff Primary Garden	1	Metal Halide: (1) 150W Lamp	Timeclock		190	2,000	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	45	2,000	0.0	290	0	$35	$346	$50	8.6
Exterior Old Building 102 window	4	Compact Fluorescent: (1) 55W T5 Circle line Fluorescent	Timeclock		55	2,000	3	Relamp	No	4	LED Lamps: 4-pin LED Circline Lamp	Timeclock	39	2,000	0.0	128	0	$15	$100	$20	5.2
Exterior Parking Lot Jeff Primary	5	Metal Halide: (1) 150W Lamp	Timeclock		190	2,000	1	Fixture Replacement	No	5	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	45	2,000	0.0	1,450	0	$173	$1,729	$250	8.6
Exterior Side Wall 103 Window	4	Compact Fluorescent: (1) 55W T5 Circle line Fluorescent	Timeclock		55	2,000	3	Relamp	No	4	LED Lamps: 4-pin LED Circline Lamp	Timeclock	39	2,000	0.0	128	0	$15	$100	$20	5.2
Exterior Wall 232 Window	2	High-Pressure Sodium: (1) 175W Lamp	Timeclock		175	2,000	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	53	2,000	0.0	490	0	$58	$764	$100	11.4
Foyer ball storage	1	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	2,200		None	No	1	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	2,200	0.0	0	0	$0	$0	$0	0.0
Girls Bath 5th Grade	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200		None	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	50	2,200	0.0	0	0	$0	$0	$0	0.0
Girls Bath 5th Grade	1	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	2,200		None	No	1	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	2,200	0.0	0	0	$0	$0	$0	0.0
Girls Bath First Grade	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Girls Bathroom	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,518		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,518	0.0	0	0	$0	$0	$0	0.0
Girls Bathroom Cafeteria Area	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,518		None	No	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,518	0.0	0	0	$0	$0	$0	0.0
Girls Bathroom Primary (1)	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Kitchen 1	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,200	3	Relamp	No	2	LED Lamps: LED Lamps	Wall Switch	9	2,200	0.1	247	0	$29	$34	$2	1.1
Kitchen 1	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	2,200	4	None	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.1	300	0	$35	$540	$70	13.4
Kitchen Janitor Closet	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,200		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,200	0.0	0	0	$0	$0	$0	0.0
Kitchen Restroom	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,200		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,200	0.0	0	0	$0	$0	$0	0.0
Kitchen Storage	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	800	4	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	552	0.0	14	0	$2	$116	$0	72.8
Link to Primary Center	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Link to Primary Center	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Main Office	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Main Office Break Room	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Main Office Closet	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,518		None	No	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,518	0.0	0	0	$0	$0	$0	0.0
Main Office Entrance	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Main Office Entrance	2	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	34	2,200	4	None	Yes	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,518	0.0	51	0	$6	$270	$35	39.5
Main Office Entrance	2	Linear Fluorescent - T5: 4' T5 (28W) - 1L	Wall Switch	S	30	2,200	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 4' T5 (14.5W) Lamp	Occupancy Sensor	15	1,518	0.0	95	0	$11	$66	$10	5.0
Main Office Foyer	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	38	2,200		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	38	2,200	0.0	0	0	$0	$0	$0	0.0
Main Office Lobby	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
Main Office Lobby	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	38	2,200	5	None	Yes	4	LED - Fixtures: Ambient 2x4 Fixture	High/Low Control	38	1,518	0.0	114	0	$13	$225	$140	6.4
Main Office Lobby	4	Linear Fluorescent - T5: 4' T5 (28W) - 1L	Occupancy Sensor	S	30	1,518	3	Relamp	No	4	LED - Linear Tubes: (1) 4' T5 (14.5W) Lamp	Occupancy Sensor	15	1,518	0.0	100	0	$12	$131	$20	9.5
Media Storage Office	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	38	800	4	None	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	552	0.0	21	0	$2	$116	$0	47.9
Mrs Robbins Learning Work shop	1	Compact Fluorescent: (1) 14W A19 Screw-In Lamp	Wall Switch	S	19	2,200	3	Relamp	No	1	LED Lamps: LED Lamps	Wall Switch	10	2,200	0.0	22	0	$3	$17	$1	6.4
Mrs Robbins Learning Work shop	6	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.1	225	0	$26	$270	$35	8.9
Nurses Office	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	25	1,518		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	1,518	0.0	0	0	$0	$0	$0	0.0
Original Building Boiler Room	2	LED Lamps: LED- 45W Lamp	Wall Switch	S	45	2,200		None	No	2	LED Lamps: LED- 45W Lamp	Wall Switch	45	2,200	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Original Building Boiler Room	3	Linear Fluorescent - T12HO: 8' T12HO (110W) - 2L	Wall Switch	S	252	2,200	2	Relamp & Reballast	No	3	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,200	0.4	1,307	0	$153	$386	$60	2.1
Peace Garden Area	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Principals Office	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	38	1,518		None	No	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Resource Center	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	38	2,200	4	None	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	86	0	$10	$270	$35	23.5
Rest Room in 239	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	S	50	1,518		None	No	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.0	0	0	$0	$0	$0	0.0
Restroom next to 104	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	38	1,518		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Room 100 Main office	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Room 101 Principal office	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	38	1,518		None	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	38	1,518	0.0	0	0	$0	$0	$0	0.0
Room 104 Electrical room	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	38	2,200		None	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	38	2,200	0.0	0	0	$0	$0	$0	0.0
Stage	2	Compact Fluorescent: (1) 42W A19 Screw-In Lamp	Wall Switch	S	42	2,200	3	Relamp	No	2	LED Lamps: LED Lamps	Wall Switch	30	2,200	0.0	58	0	$7	$34	$2	4.8
Stage	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,200		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,200	0.0	0	0	$0	$0	$0	0.0
Staircase Tara 1	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200		None	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	50	2,200	0.0	0	0	$0	$0	$0	0.0
Storage 2 in Multi Purpose Room	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	800		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	25	800	0.0	0	0	$0	$0	$0	0.0
Storage in Room 239	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	S	50	1,518		None	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.0	0	0	$0	$0	$0	0.0
Storage in Media Center Office	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	800	4	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	25	552	0.0	27	0	$3	$270	$0	84.8
Storage Inside Custodial Office	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	800		None	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	50	800	0.0	0	0	$0	$0	$0	0.0
Storage Office in Multi Purpose Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,518	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,518	0.1	165	0	$19	$110	$0	5.7
Storage Room	2	Compact Fluorescent: (1) 14W A19 Screw-In Lamp	Wall Switch	S	14	800	3, 4	Relamp	Yes	2	LED Lamps: LED Lamps	Occupancy Sensor	10	552	0.0	12	0	$1	$150	$2	101.8
Storage Room 106	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	800	4	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	552	0.0	16	0	$2	$116	$0	62.8
Storage Room 111	5	LED Lamps: LED- 45W Lamp	Wall Switch	S	45	800	4	None	Yes	5	LED Lamps: LED- 45W Lamp	Occupancy Sensor	45	552	0.1	61	0	$7	$270	$0	37.7
Classroom 300	12	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.1	450	0	$53	$270	$35	4.5
Classroom 301	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	2,200		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	25	2,200	0.0	0	0	$0	$0	$0	0.0
Classroom 301	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.1	300	0	$35	$270	$35	6.7
Classroom 302	2	Compact Fluorescent: (1) 14W A19 Screw-In Lamp	Wall Switch	S	14	2,200	3, 4	Relamp	Yes	2	LED Lamps: LED Lamps	Occupancy Sensor	10	1,518	0.0	34	0	$4	$34	$2	8.1
Classroom 302	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.0	75	0	$9	$270	$35	26.8

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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 303	6	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.1	225	0	$26	$270	$35	8.9
Classroom 304	6	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200	4	None	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	50	1,518	0.1	225	0	$26	$270	$35	8.9
Classroom 304	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,200	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.0	80	0	$9	$37	$10	2.8
Corridor 2nd Floor Near 304	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 2nd Floor Near Classroom 304	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200		None	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	50	2,200	0.0	0	0	$0	$0	$0	0.0
Literacy Coach Office	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	50	2,200		None	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	50	2,200	0.0	0	0	$0	$0	$0	0.0
Roof Top Access Door 2	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,200		None	No	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,200	0.0	0	0	$0	$0	$0	0.0
Roof Top Acess Closet	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,200		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,200	0.0	0	0	$0	$0	$0	0.0
Small Room above Staircase Tara 2	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	2,200		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	30	2,200	0.0	0	0	$0	$0	$0	0.0
Boys Bathroom	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	2,200	4	None	Yes	4	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,518	0.0	90	0	$11	$270	$35	22.4
Girls Bathroom	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	2,200		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	30	2,200	0.0	0	0	$0	$0	$0	0.0
Girls Bathroom	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	34	2,200		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	34	2,200	0.0	0	0	$0	$0	$0	0.0
Staircase Tara 2	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	2,200	5	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	25	1,518	0.0	75	0	$9	$225	$140	9.7
Elevator 1	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	25	2,200		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	25	2,200	0.0	0	0	$0	$0	$0	0.0

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
Boiler Room Primary Center	Boiler Room Primary Center	1	Exhaust Fan	0.3	65.0%	No			W	2,500		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Addition Roof	Various Spaces	6	Exhaust Fan	0.2	65.0%	No			W	2,500		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Addition Roof	Various Spaces	13	Exhaust Fan	0.3	65.0%	No			W	2,500		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Addition Roof	Various Spaces	2	Exhaust Fan	0.3	65.0%	No			W	2,500		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
New Addition Roof	Various Spaces	1	Exhaust Fan	0.5	70.0%	No			W	2,500		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
New Addition Roof	Various Spaces	2	Exhaust Fan	0.8	70.0%	No			W	2,500		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Rooms	Boiler Rooms - Hydronic Heaters	3	Fan Coil Unit	0.1	65.0%	No			W	2,500		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room Primary Center	Hot Water Pumps P1P2	2	Heating Hot Water Pump	15.0	93.0%	Yes			W	1,904		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Original Building Boiler Room	Hot Water Pumps P1P2	2	Heating Hot Water Pump	10.0	91.7%	Yes			W	1,904		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Original Building Boiler Room	Sump Pump	1	Other	0.8	70.0%	No			W	300		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room Primary Center	Sump Pumps P1P2	2	Other	0.8	70.0%	No			W	300		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Room 104 Electrical room	Sump Pumps P1P2	2	Other	0.8	70.0%	No			W	300		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Elevator Room	Hydraulic Elevator Pump	1	Other	30.0	80.0%	No			W	300		No	80.0%	No		0.0	0	0	$0	$0	$0	0.0
New Addition Roof	HV-1 - Gym	1	Supply Fan	3.0	89.5%	No			W	2,500	8	No	89.5%	Yes	1	0.9	2,344	0	$279	$4,555	$200	15.6
New Addition Roof	HV-2 - Gym	1	Supply Fan	3.0	89.5%	No			W	2,500	8	No	89.5%	Yes	1	0.9	2,344	0	$279	$4,555	$200	15.6
New Addition Roof	RTU-1 - Rooms 207-210	1	Supply Fan	3.0	87.5%	Yes			W	2,500		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
New Addition Roof	RTU-1 - Rooms 207-210	1	Exhaust Fan	0.8	70.0%	No			W	2,500		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
New Addition Roof	RTU-2 - Room-171A	1	Supply Fan	3.0	87.5%	No			W	2,500	8	No	89.5%	Yes	1	0.9	2,494	0	$297	$4,555	$200	14.6
New Addition Roof	RTU-2 - Room-171A	1	Exhaust Fan	0.8	70.0%	No			W	2,500		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
New Addition Roof	RTU-3 - Room-171B	1	Supply Fan	3.0	87.5%	No			W	2,500	8	No	89.5%	Yes	1	0.9	2,494	0	$297	$4,555	$200	14.6

Location	Area(s)/System(s) Served	Existing Conditions: Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	Proposed Conditions: ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Energy Impact & Financial Analysis: Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
New Addition Roof	RTU-3 - Room-171B	1	Exhaust Fan	0.8	70.0%	No			W	2,500		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
New Addition Roof	RTU-4 - Library	1	Supply Fan	3.0	87.5%	No			W	2,500	8	No	89.5%	Yes	1	0.9	2,494	0	$297	$4,555	$200	14.6
New Addition Roof	RTU-4 - Library	1	Exhaust Fan	0.8	70.0%	No			W	2,500		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
New Addition Roof	RTU-5 - Rooms 200-204	1	Supply Fan	3.0	87.5%	Yes			W	2,500		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
New Addition Roof	RTU-6 - Corridors	1	Supply Fan	3.0	87.5%	Yes			W	2,500		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
Primary Center Various Spaces	Primary Center Various Spaces	28	Fan Coil Unit	0.3	65.0%	No			W	2,500	6	Yes	80.0%	No		0.8	2,824	0	$337	$8,492	$0	25.2
Various Spaces	Cabinet Heaters	8	Other	0.1	65.0%	No			W	2,500		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Various Spaces	Ceiling Mounted Electric Resistance Heaters	6	Supply Fan	0.1	65.0%	No			W	2,500		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Original Building	AHU-2 - Lunch Room	1	Supply Fan	0.8	70.0%	No			W	2,500		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Various Spaces	Split Systems	8	Supply Fan	1.0	85.0%	No			B	2,500		No	85.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	HRU-1	1	Supply Fan	3.0	87.5%	No			W	2,745	7	No	89.5%	Yes	1	0.9	2,739	0	$326	$4,555	$200	13.3
Roof	HRU-1	1	Exhaust Fan	1.5	84.0%	No			W	2,745	7	No	86.5%	Yes	1	0.5	1,443	0	$172	$3,887	$75	22.2

Packaged HVAC Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions: 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	Proposed Conditions: 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	Energy Impact & Financial Analysis: Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
New Addition Roof	RTU-1 - Rooms 207-210	1	Package Unit	8.50	96.00	12.20	0.8 AFUE	York	ZJ102N12R	W		No							0.0	0	0	$0	$0	$0	0.0
New Addition Roof	RTU-2 - Room-171A	1	Package Unit	8.50		11.50		York	ZH102C00	B	9	Yes	1	Package Unit	8.50		14.00		0.8	570	0	$68	$11,299	$672	156.4
New Addition Roof	RTU-3 - Room-171B	1	Package Unit	8.50		11.50		York	ZH102C00	B	9	Yes	1	Package Unit	8.50		14.00		0.8	570	0	$68	$11,299	$672	156.4
New Addition Roof	RTU-4 - Library	1	Package Unit	10.00		12.20		York	ZJ120COO	W		No							0.0	0	0	$0	$0	$0	0.0
New Addition Roof	RTU-5 - Rooms 200-204	1	Package Unit	12.50	284.00	11.00	0.811428571428571 AFUE	Trane	YHD150F	W		No							0.0	0	0	$0	$0	$0	0.0

New Addition Roof	RTU-6 - Corridors	1	Package Unit	10.00	180.00	11.00	0.81142857142 8571 AFUE	Trane	YHC120E3	W		No							0.0	0	0	$0	$0	$0	0.0
New Addition Roof	Primary Center	1	Split-System	4.00		9.00		York	Unknown	B	9	Yes	1	Split-System	4.00		16.00		1.2	840	0	$100	$7,415	$420	69.9
New Addition Roof	Primary Center	1	Split-System	6.00		10.00		York	H1RA076S 25H	B	9	Yes	1	Split-System	6.00		14.00		1.0	741	0	$88	$11,005	$474	119.3
Peace Garden	Primary Center	1	Split-System	4.00		10.00		York	H2R00480 060	B	9	Yes	1	Split-System	4.00		16.00		0.9	648	0	$77	$7,415	$420	90.6
New Addition Roof	CU-1 Master - Classrooms	1	Split-System Air-Source HP	6.00	77.00	11.30	2.65 COP	Daikin	RXYQ72PB TJ	B	10	Yes	1	Split-System Air-Source HP	6.00	77.00	12.80	3.5 COP	1.4	269	0	$32	$12,591	$462	378.6
New Addition Roof	CU-1 Backup - Classrooms	1	Split-System Air-Source HP	8.00	103.00	11.30	2.85 COP	Daikin	RXYQ96PB TJ	B	10	Yes	1	Split-System Air-Source HP	8.00	103.00	12.80	3.5 COP	1.5	0	0	$0	$15,358	$616	0.0
New Addition Roof	CU-2 Master - Classrooms	1	Split-System Air-Source HP	10.00	129.00	11.30	3.3 COP	Daikin	RXYQ120P BTJ	B	10	Yes	1	Split-System Air-Source HP	10.00	129.00	12.80	3.5 COP	1.0	448	0	$53	$19,406	$770	349.0
New Addition Roof	CU-2 Backup - Classrooms	1	Split-System Air-Source HP	6.00	77.00	11.30	2.65 COP	Daikin	RXYQ72PB TJ	B	10	Yes	1	Split-System Air-Source HP	6.00	77.00	12.80	3.5 COP	1.4	0	0	$0	$12,591	$462	0.0
New Addition Roof	CU - Main Office & Atrium	1	Split-System Air-Source HP	14.00	180.00	10.60	3.5 COP	Daikin	RXYQ168T TJU	B	10	Yes	1	Split-System Air-Source HP	14.00	180.00	15.00	3.3 COP	2.3	1,674	0	$199	$27,775	$1,148	133.5
Various Spaces	Unit Ventilators-Classrooms	28	Unit Ventilator		45.00			Unknown	Unknown	B		No							0.0	0	0	$0	$0	$0	0.0
Various Spaces	Ceiling Mounted Electric Resistance Heaters	6	Electric Resistance Heat		17.06		1 COP	Unknown	Unknown	W		No							0.0	0	0	$0	$0	$0	0.0
Various Spaces	Classrooms	19	Window AC	2.00		10.30		Various	Various	W	9	Yes	19	Window AC	2.00		12.00		3.1	2,258	0	$269	$30,057	$0	111.7
Classrooms 160 & 233	Classrooms 160 & 233	2	Window AC	2.00		10.10		Various	Various	B	9	Yes	2	Window AC	2.00		12.00		0.4	271	0	$32	$3,164	$0	98.0

Space Heating Boiler Inventory & Recommendations

		Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room Primary Center	Hydronic Heating System	2	Condensing Hot Water Boiler	1,720	Aerco	BMK2.0	W		No						0.0	0	0	$0	$0	$0	0.0
Original Building Boiler Room	Hydronic Heating System	3	Condensing Hot Water Boiler	1,290	Aerco	BMK1.5	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
Roof	Gym HV1&2	11	2.00	0.00	0.00	3,370.00	0.0	0	67	$775	$2,719	$0	3.5
Roof	Multipurpose RTU2&3	11	4.00	17.00	0.00	0.00	0.0	432	0	$51	$5,438	$0	105.6
Roof	Library RTU4	11	2.00	10.00	0.00	0.00	0.0	177	0	$21	$2,719	$0	128.9
Roof	Corridor RTU6	11	2.00	10.00	0.00	180.00	0.0	196	4	$67	$2,719	$0	40.4

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Primary Center Boiler Room	Heating Hot Water	12	90	0.75	0.0	0	33	$381	$1,199	$180	2.7
235 mechanical closet	Domestic Hot Water	12	8	0.50	0.0	548	0	$65	$95	$8	1.3

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
Room 170 Closet	New Addition	1	Storage Tank Water Heater (≤ 50 Gal)	Rheem	PROE38S2RH92	W		No						0.0	0	0	$0	$0	$0	0.0
Room 223 Service Closet	New Addition	1	Storage Tank Water Heater (≤ 50 Gal)	Bradford White	LE240S3	W		No						0.0	0	0	$0	$0	$0	0.0
Room 235 Mechanical Closet	New Addition	1	Storage Tank Water Heater (≤ 50 Gal)	Rheem	PROE402RH92	W		No						0.0	0	0	$0	$0	$0	0.0
Original Boiler Room	Original Building	1	Storage Tank Water Heater (> 50 Gal)	AO Smith	BTR200118	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommendation 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	13	20	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	19	$221	$143	$72	0.3
Restrooms	13	8	Faucet Aerator (Lavatory)	2.20	0.50	0.0	2,224	0	$265	$57	$29	0.1

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	Twanis	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Refrigerator Chest	Powers Equiptment Company	B086312	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	Everest Refrigeration	EBRF3	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	Hoshizaki	R1A-FS(L)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Glass Door (16 - 30 cu. ft.)	Traulsen	Unknown	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Traulsen	G22010	Yes		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	Gas Convection Oven (Full Size)	Blodgett	GB/25SC	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (1/2 Size)	Metro	C535-CLFS-U	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (Full Size)	Cres-Cor	CrescorH-138-183D	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Electric Steamer	Unknown	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0

Dishwasher Inventory & Recommendations

	Existing Conditions							Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Manufacturer	Model	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Payback w/ Incentives in Years
Storage in room 239	1	Under Counter (Low Temp)	Frigidaire	Unknown	Natural Gas	N/A	Yes		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Jefferson Primary-Elementary	46	Desktop	191	No		
Jefferson Primary-Elementary	3	Coffee Machine	900	No		
Jefferson Primary-Elementary	7	Printer (Medium/Small)	192	No		
Jefferson Primary-Elementary	5	Printer/Copier (Large)	600	No		
Jefferson Primary-Elementary	35	Projector	200	No		
Jefferson Primary-Elementary	4	Refrigerator (Residential)	199	No		
Jefferson Primary-Elementary	1	Refrigerator (Mini)	207	No		
Jefferson Primary-Elementary	4	Television	120	No		
Jefferson Primary-Elementary	1	Toaster	850	No		
Jefferson Primary-Elementary	1	Toaster Oven	850	No		
Jefferson Primary-Elementary	1	Paper Shredder	150	No		
Jefferson Primary-Elementary	4	Microwave	1,000	No		
Jefferson Primary-Elementary	1	Ceiling Fan	50	No		
Jefferson Primary-Elementary	2	Fan (Large)	120	No		
Jefferson Primary-Elementary	1	Fan (Portable)	45	No		
Jefferson Primary-Elementary	2	Electric Space Heater	1,500	No		
Jefferson Primary-Elementary	1	Server	2,000	No		

Custom (High Level) Measure Analysis

Retro-Commissioning Study

Building Square Footage	74,890	Fuel Utility Rate	$11.627 MMBtu
Percent of Conditioned Area Impacted	100%	Blended Electric Utility Rate	$0.119 kWh

Existing Conditions						Proposed Conditions					Energy Impact & Financial Analysis										
Description	Area(s)/System(s) Served	Remaining Useful Life	Total HVAC Motor Usage kWh	Total HVAC Electric Usage kWh	Total HVAC Fuel Usage MMBtu	Description	% Savings HVAC Motor Usage kWh	% Savings HVAC Electric Usage kWh	% Savings HVAC Fuel Usage MMBtu	Estimated Cost per Sqft	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Base Incentives	Enhanced Incentives	Total Incentives	Total Net Cost	Payback w/o Incentives in Years	Simple Payback w/ Incentives in Years
HVAC Controls Not Currently Optimized	HVAC Equipment & Systems	3	145,459	67,827	3,125	Retro-Commissioning Study	5%	3%	3%	$0.40	0.00	9,308	94	$2,199	$30,000	$0	$0	$0	$30,000	13.64	13.64

Electric Tank Water Heater to HPWH

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

Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis										
Description	Area(s)/System(s) Served	SF of Area Served	Fuel Type	Input Capacity per Unit (kW)	Tank Capacity per Unit (Gal)	Description	COP	Tank Capacity per Unit (Gal)	Estimated Unit Cost	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Base Incentives	Enhanced Incentives	Total Incentives	Total Net Cost	Payback w/o Incentives in Years	Payback w/ Incentives in Years
Storage Tank Water Heater (≤50 Gal)	Room 235 Mechanical Closet	2,500	Electric	4.5	40	Heat Pump Water Heater	2.5	40	$2,069.90	0.00	3,077	0	$367	$2,070	$0	$0	$0	$2,070	5.64	5.64
			Electric																	
			Electric																	

APPENDIX B: ENERGY STAR STATEMENT OF ENERGY PERFORMANCE

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

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ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Summit Primary Center at Jefferson School / Jefferson Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 74,890

For Year Ending: April 30, 2022
Date Generated: February 26, 2023

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Summit Primary Center at Jefferson School / Jefferson Elementary School 110 Ashwood Avenue Summit, New Jersey 07901	Summit Public Schools 14 Beekman Terrace Summit, NJ 07901-1702 (908) 918-2100	Summit Schools 14 Beekman Terrace Summit, NJ 07901-1702 (908) 918-2100 rrodri81@asu.edu

Property ID: 21960040

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
62.5 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	3,449,503 (74%)
Electric - Grid (kBtu)	1,231,741 (26%)

Source EUI
94.4 kBtu/ft²

National Median Comparison

National Median Site EUI (kBtu/ft²)	65.5
National Median Source EUI (kBtu/ft²)	98.9
% Diff from National Median Source EUI	-5%

Annual Emissions

Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	290

Signature & Stamp of Verifying Professional

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

LP Signature: ____________________Date: __________

Licensed Professional

____ ________
,
(___)____-______
____

Professional Engineer or Registered Architect Stamp (if applicable)

APPENDIX C: GLOSSARY

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

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

SEER	*Seasonal energy efficiency ratio:* a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	*Statement of energy performance:* a summary document from the ENERGY STAR Portfolio Manager.
Simple Payback	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
SREC (II)	*Solar renewable energy credit*: a credit you can earn from the state for energy produced from a photovoltaic array.
T5, T8, T12	A reference to a linear lamp diameter. The number represents increments of 1/8th 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.