Local Government Energy Audit Report

Carl H. Kumpf Middle School

March 15, 2023

Prepared for:
Clark Public School District
59 Mildred Terrace
Clark, New Jersey 07066

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 of previously run state efficiency programs. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. Please review all available utility program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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

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ENERGY EFFICIENCY INCENTIVE & REBATE TRANSITION

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

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

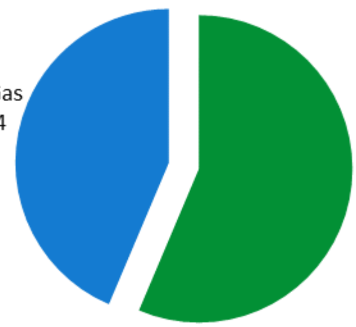
These next generation energy efficiency programs feature new ways of managing and delivering programs historically administered by New Jersey's Clean Energy Program™ (NJCEP). All the investor-owned gas and electric utility companies will now also offer complementary energy efficiency programs and incentives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

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

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Carl H. Kumpf Middle 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: $95,390 Electricity: 380,831 kWh Natural Gas: 43,530 Therms	
ENERGY STAR® Benchmarking Score	26 *(1-100 scale)*	This building performs at below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

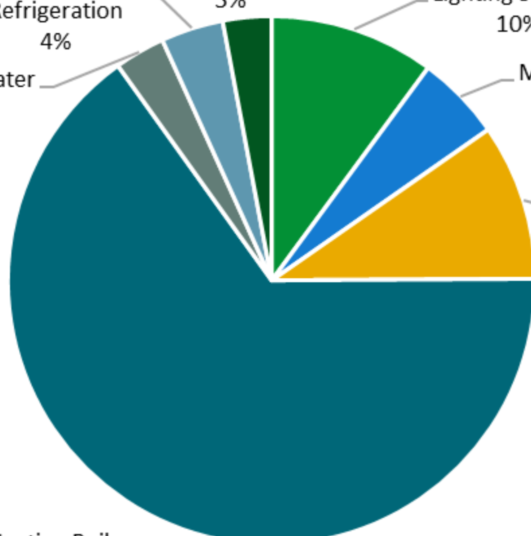


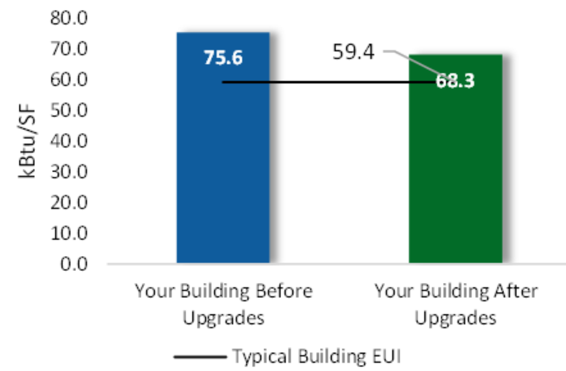
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

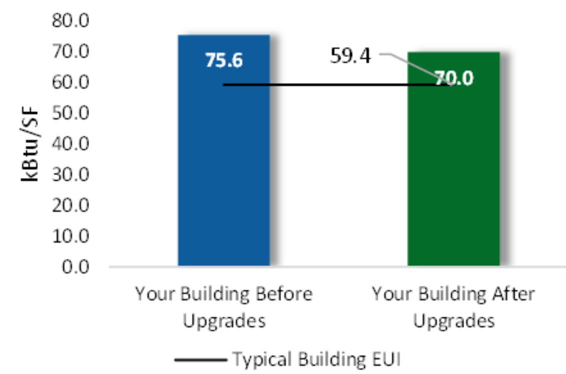
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$230,866
Potential Rebates & Incentives[1]	$26,530
Annual Cost Savings	$19,276
Annual Energy Savings	Electricity: 129,871 kWh Natural Gas: 974 Therms
Greenhouse Gas Emission Savings	71 Tons
Simple Payback	10.6 Years
Site Energy Savings (All Utilities)	10%



Scenario 2: Cost Effective Package[2]

Installation Cost	$107,974
Potential Rebates & Incentives	$20,640
Annual Cost Savings	$17,260
Annual Energy Savings	Electricity: 122,382 kWh Natural Gas: -28 Therms
Greenhouse Gas Emission Savings	61 Tons
Simple Payback	5.1 Years
Site Energy Savings (all utilities)	7%



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			**83,449**	**32.6**	**-17**	**$11,621**	**$55,000**	**$13,184**	**$41,816**	**3.6**	**81,989**
ECM 1	Install LED Fixtures	Yes	4,876	4.3	-1	$679	$9,314	$900	$8,414	12.4	4,790
ECM 2	Retrofit Fixtures with LED Lamps	Yes	78,573	28.3	-16	$10,942	$45,685	$12,284	$33,401	3.1	77,199
Lighting Control Measures			**7,545**	**2.5**	**-2**	**$1,051**	**$12,692**	**$3,850**	**$8,842**	**8.4**	**7,413**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	5,943	1.9	-1	$828	$8,642	$1,085	$7,557	9.1	5,839
ECM 4	Install High/Low Lighting Controls	Yes	1,602	0.5	0	$223	$4,050	$2,765	$1,285	5.8	1,574
Variable Frequency Drive (VFD) Measures			**20,704**	**5.4**	**0**	**$2,925**	**$30,548**	**$2,750**	**$27,798**	**9.5**	**20,849**
ECM 5	Install VFDs on Constant Volume (CV) Fans	Yes	12,467	3.9	0	$1,761	$21,071	$750	$20,321	11.5	12,554
ECM 6	Install VFDs on Heating Water Pumps	Yes	8,237	1.4	0	$1,164	$9,476	$2,000	$7,476	6.4	8,295
Unitary HVAC Measures			**7,274**	**10.1**	**0**	**$1,027**	**$97,103**	**$4,390**	**$92,713**	**90.2**	**7,325**
ECM 7	Install High Efficiency Air Conditioning Units	No	5,846	7.4	0	$826	$90,340	$3,990	$86,350	104.6	5,886
ECM 8	Install High Efficiency Heat Pumps	No	1,428	2.7	0	$202	$6,764	$400	$6,364	31.5	1,438
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**74**	**$706**	**$13,780**	**$1,000**	**$12,780**	**18.1**	**8,649**
ECM 9	Install High Efficiency Furnaces	No	0	0.0	74	$706	$13,780	$1,000	$12,780	18.1	8,649
HVAC System Improvements			**215**	**0.0**	**18**	**$206**	**$2,788**	**$24**	**$2,764**	**13.4**	**2,367**
ECM 10	Implement Demand Control Ventilation (DCV)	No	215	0.0	13	$156	$2,719	$0	$2,719	17.5	1,751
ECM 11	Install Pipe Insulation	Yes	0	0.0	5	$50	$69	$24	$45	0.9	617
Domestic Water Heating Upgrade			**0**	**0.0**	**11**	**$104**	**$165**	**$82**	**$82**	**0.8**	**1,278**
ECM 12	Install Low-Flow DHW Devices	Yes	0	0.0	11	$104	$165	$82	$82	0.8	1,278
Food Service & Refrigeration Measures			**10,684**	**1.2**	**13**	**$1,636**	**$18,790**	**$1,250**	**$17,540**	**10.7**	**12,310**
ECM 13	Food Service Equipment Replacement	No	0	0.0	13	$127	$9,290	$500	$8,790	69.4	1,551
ECM 14	Dishwasher Replacement	Yes	9,072	1.0	0	$1,282	$9,270	$700	$8,570	6.7	9,136
ECM 15	Vending Machine Control	Yes	1,612	0.2	0	$228	$230	$50	$180	0.8	1,623
TOTALS (COST EFFECTIVE MEASURES)			**122,382**	**41.7**	**-3**	**$17,260**	**$107,974**	**$20,640**	**$87,333**	**5.1**	**122,904**
TOTALS (ALL MEASURES)			**129,871**	**51.8**	**97**	**$19,276**	**$230,866**	**$26,530**	**$204,336**	**10.6**	**142,181**

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

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

Figure 2 – Evaluated Energy Improvements

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

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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

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

Options from Around the State

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

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

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

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

Successor Solar Incentive Program (SuSI)

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

Ongoing Electric Savings with Demand Response

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

Large Energy User Program (LEUP)

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

2 Existing Conditions

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Carl H. Kumpf Middle 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 August 25, 2022, TRC performed an energy audit at Carl H. Kumpf Middle School located in Clark, New Jersey. TRC met with Facility Staff to review the facility operations and help focus our investigation on specific energy-using systems.

Carl H. Kumpf Middle School located at 59 Mildred Terrace, is a public middle school serving students in sixth to eighth grades in Clark Township. The building is a one-story, 74,812 square foot structure built in 1962. Spaces include classrooms, administrative offices, gymnasiums, locker rooms, cafeteria/auditorium, library, kitchen, faculty room, corridors, restrooms, storage and mechanical spaces.

The facility lighting system consists of linear fluorescent lamps. The building is 100% heated by two hydronic boilers and gas-fired rooftop units and some spaces are cooled by various direct expansion split systems and window air conditioners.

Facility concerns include old rooftop units (RTUs) and various split ACs which are operating beyond their useful life and are in fair and poor condition, high maintenance costs, and high electric bills.

Building Aerial View

2.2 Building Occupancy

The school operates on a 10-month schedule, from September to June. The gymnasiums and locker rooms are used after classes for sports and other events. The entire facility is shut down around 11:00 PM after the cleaning process.

During a typical day, the facility is occupied by 558 students and 100 staff. 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 based on changes to building use patterns.

Building Name	Weekday/Weekend	Operating Schedule
Carl H. Kumpf Middle School - General Operating Hours	Weekday	6:00 AM - 11:00 PM
	Weekend	Closed
Carl H. Kumpf Middle School - Classes Hours	Weekday	7:30 AM - 2:35 PM
	Weekend	Closed

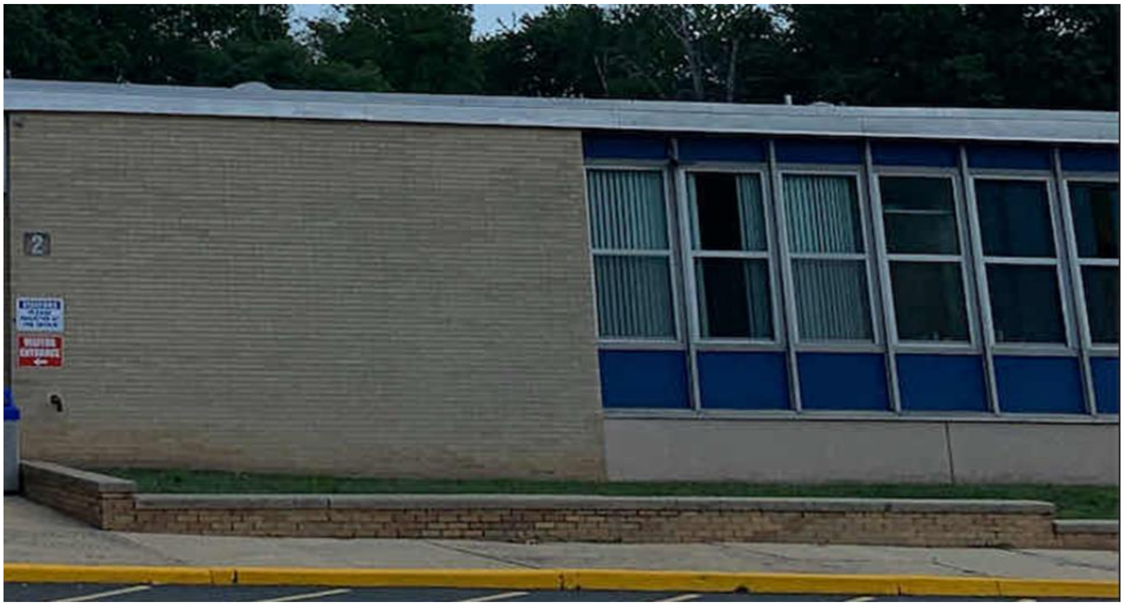
Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete masonry units (CMU) over structural steel with a brick veneer façade, with gypsum drywall painted CMU interior finish. The flat roof is supported with steel trusses and a reinforced concrete deck and finished with an insulated layer and a covering of a membrane that is in fair condition. Some sections of the roof are built up with gravel-pebble finish

Windows throughout the facility are double paned glass with aluminum frames. The glass-to-frame seals are in good condition. The operable window weather seals are in good condition, showing little signs of excessive wear. The main entrance doors are glass with aluminum frames. Exit doors are constructed of metal. Exterior doors are in good condition.

Building Walls



Windows

Flat Roof Sections

2.4 Lighting Systems

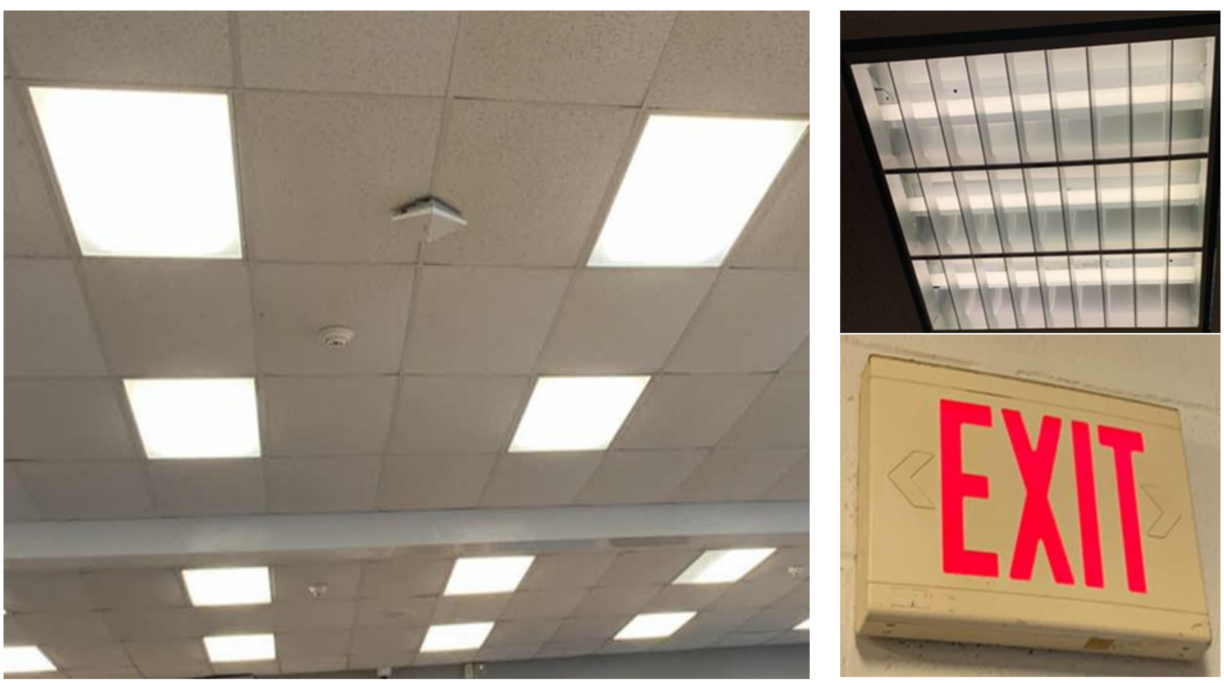
The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also some LED panel fixtures and a small number of incandescent lamps. Linear fluorescent fixture types include 2-lamp, 3-lamp, or 4-lamp, 4-foot-long troffer, recessed, and surfaced mounted fixtures.

Classroom 22 is lit LED panel fixtures. The stage has several incandescent or halogen lamps. The remaining interior spaces are lit with 32-Watt linear fluorescent T8 lamps.

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

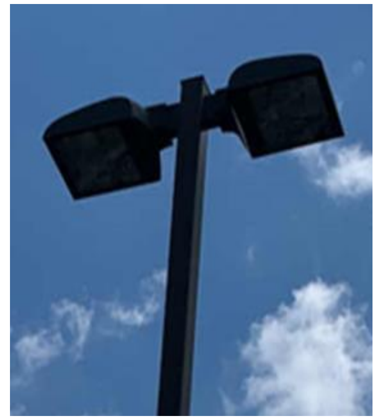
Exterior lighting consists of wall and pole mounted LED fixtures that are controlled by a timer and photocells.

Linear T8 and 2x4 LED Panel



Linear T8 Fixtures and LED Exit Sign





LED Wall and Pole Mounted Fixtures

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators are equipped with supply fan motors and pneumatically controlled outside air dampers and connected to the hot water distribution system. They provide heating and ventilation to classrooms. This system is original to the building and appears to be in fair operating condition.


Classroom Unit Ventilator

Unitary Electric HVAC Equipment

Some classrooms and offices use window AC units that appear in good condition. There are various split system ACs that serve various building spaces. These vary in capacity between 1 ton and 5 tons. The units are in poor condition except the Sanyo units serving the library. They have been evaluated for replacement.

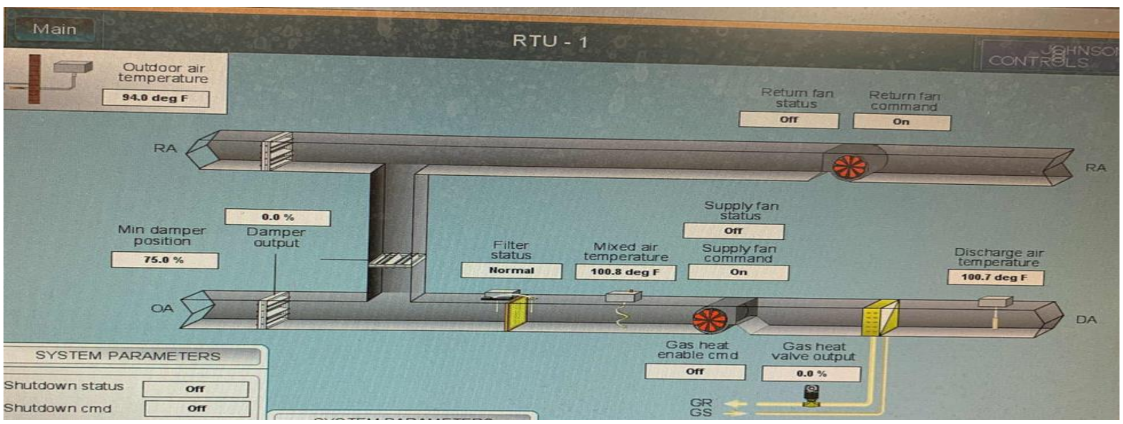
There are two split system air source heat pumps with cooling and heating capacities of 2 tons and 27.6 MBh. They serve classrooms and offices and are in poor condition. The split system units are controlled by programmable thermostats.

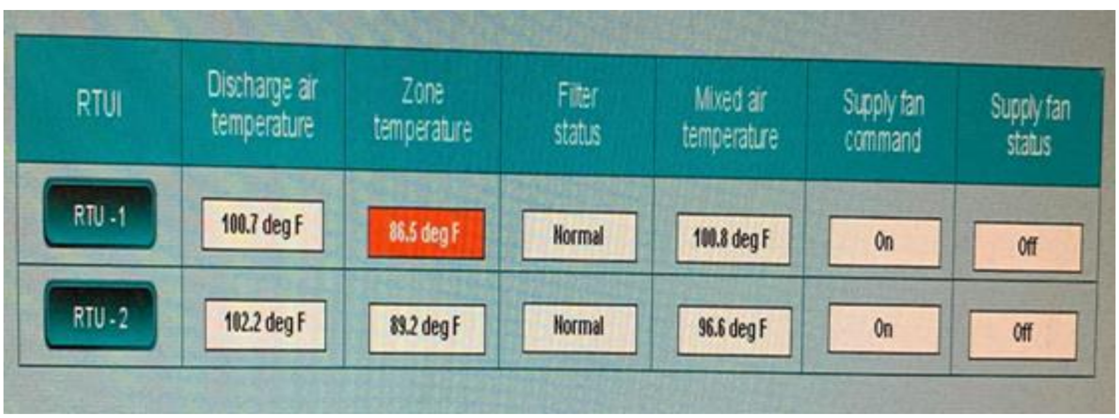
Split System ACs

Unitary Heating Equipment

The auxiliary gym and the cafeteria/auditorium are heated by two roof mounted gas-fired units (RTU-1 and RTU-2). Their output heating capacities are 200 MBh and 249.6 MBh, respectively. They have passed their useful live and have been evaluated for replacement. The two RTUs are controlled by a Johnson energy management system (EMS).

RTU-1 and RTU-2





RTUI	Discharge air temperature	Zone temperature	Filter status	Mixed air temperature	Supply fan command	Supply fan status
RTU -1	100.7 deg F	86.5 deg F	Normal	100.8 deg F	On	Off
RTU - 2	102.2 deg F	89.2 deg F	Normal	96.6 deg F	On	Off

EMS Screenshot – RTUs

Air Handling Units (AHUs)

The main gymnasium is heated by two AHUs. These units are equipped with supply fan motors and hot water heating coils. They are physically located above the ceiling and was inaccessible during the energy audit. The supply fan motors are assumed to be 3 hp, constant speed, and standard efficiency. They are controlled by a pneumatic system using two, 1.5 hp compressors that run alternatively.

AHU – Gymnasium

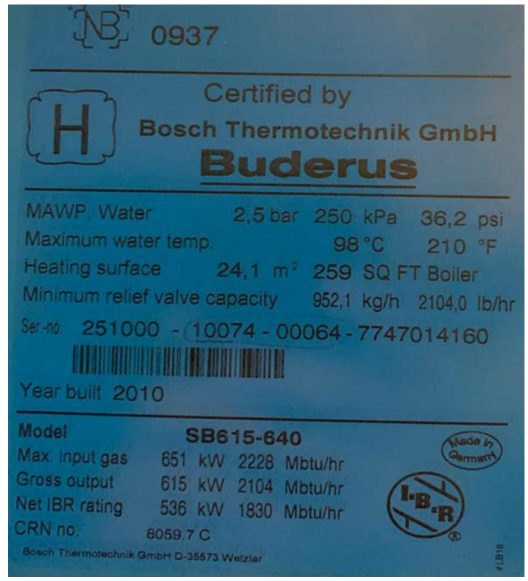
2.6 Building General Exhaust Air Systems

Motor driven exhaust fans serve the restrooms, hallways, and other areas. The equipment is in good condition and controlled by manual switches.

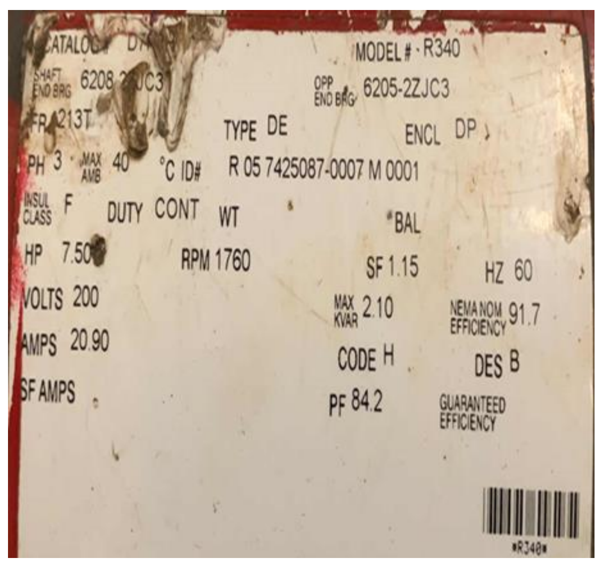
Typical Exhaust Fans

2.7 Heating Hot Water Systems

Two Boderus 1,830 MBh non-condensing hot water boilers (Boiler #1 and Boiler #2) serve most of the building's heating load. The burners are non-modulating with a nominal efficiency of 82%. The boilers are configured in a lead-lag scheme and controlled by a heat timer with an outdoor reset or set point control capabilities. Installed in 2004, the boilers are in good condition. The hydronic distribution system is a two-pipe, heating-only system. Two, 7.5 hp constant speed pumps distribute heating hot water to AHUs, UVs, hydronic baseboards, and unit heaters. The pumps run at lead-lag scheme. The hot water loop is controlled via a pneumatic control system.



Hydronic Boilers

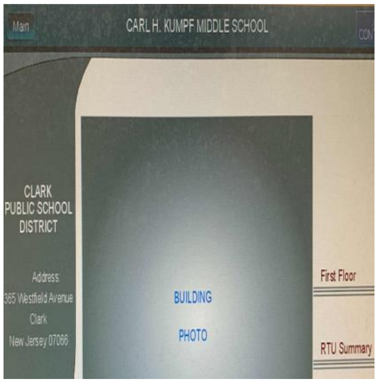


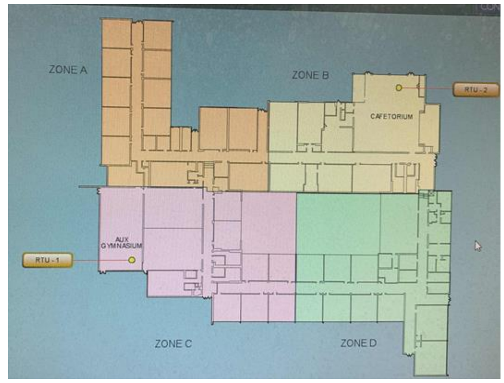
Heating Hot Water Pumps

2.8 Building Energy Management Systems (EMS)

A Johnson EMS controls the RTUs. The EMS provides RTUs scheduling control and monitors and controls space temperatures and supply air temperatures. The hot water loop is controlled by a pneumatic system

The site staff expressed an interest in expanding the level of control provided by the EMS.

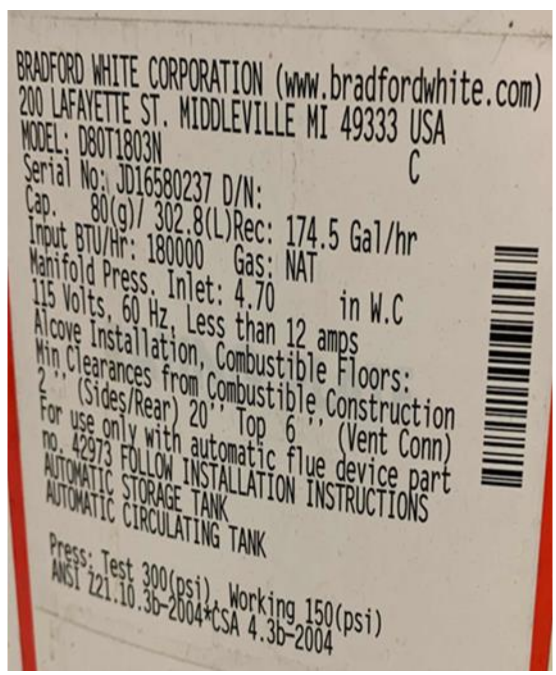




EMS Main Screenshot

2.9 Domestic Hot Water

Hot water is produced by an 80 gallon, 180 MBh gas-fired storage water heater rated at 80% efficiency. The water heater is in the boiler room and in good condition. A fractional horsepower circulating pump distributes water to end uses. The domestic hot water pipes are not insulated.



Domestic Storage Tank Water Heater

2.10 Food Service Equipment

The kitchen has two gas-fired cooking equipment and one electric insulated food holding cabinet that appear in good condition. The gas fired cooking equipment is used to prepare breakfast and lunch for students. The convection oven has been evaluated for replacement.

The dishwasher is a non-ENERGY STAR® high temperature, door type unit. The unit appears in fair condition and has been evaluated for replacement.

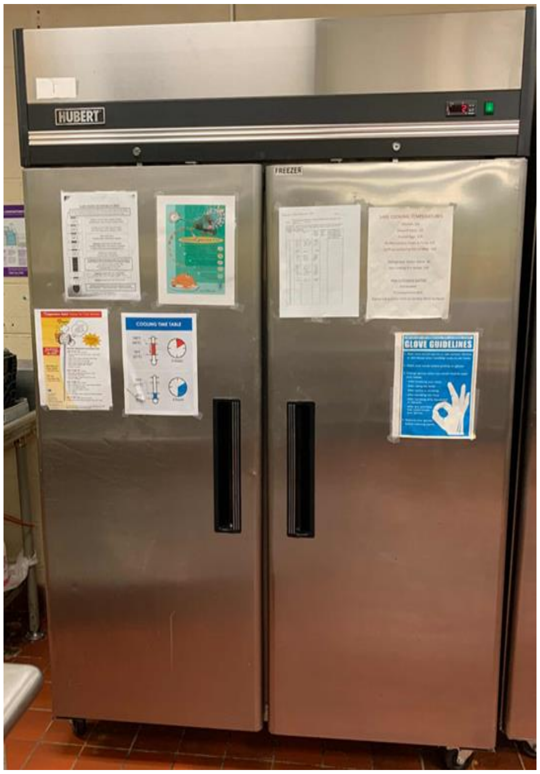
Visit https://www.energystar.gov/products/commercial_food_service_equipment for the latest information on high efficiency food service equipment.

Gas Fired Cooking Equipment

2.11 Refrigeration

The kitchen has a stand-up refrigerator and two stand-up freezers with solid doors. There are two refrigerator chests and stand-up refrigerators with glass doors. All equipment is standard 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 Refrigeration Equipment

2.12 Plug Load and Vending Machines

There are seven computer workstations throughout the facility. Plug loads throughout the building include general café and office equipment. There are classroom typical loads such as smart boards and projectors.

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

Copier/Scanner and Residential-Style Refrigerator

2.13 Water-Using Systems

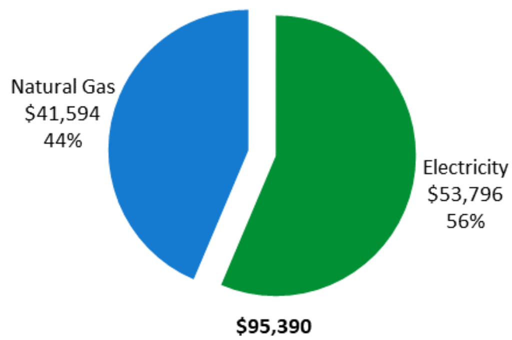
There are restrooms with toilets, urinals, and sinks throughout the building. Most of the faucet flows are rated for 2.2 gpm gallons per minute (gpm). Toilets and urinals vary in rated gallons per flush (gpf).

Typical Restroom Sink

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	380,831 kWh	$53,796
Natural Gas	43,530 Therms	$41,594
Total		**$95,390**



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

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

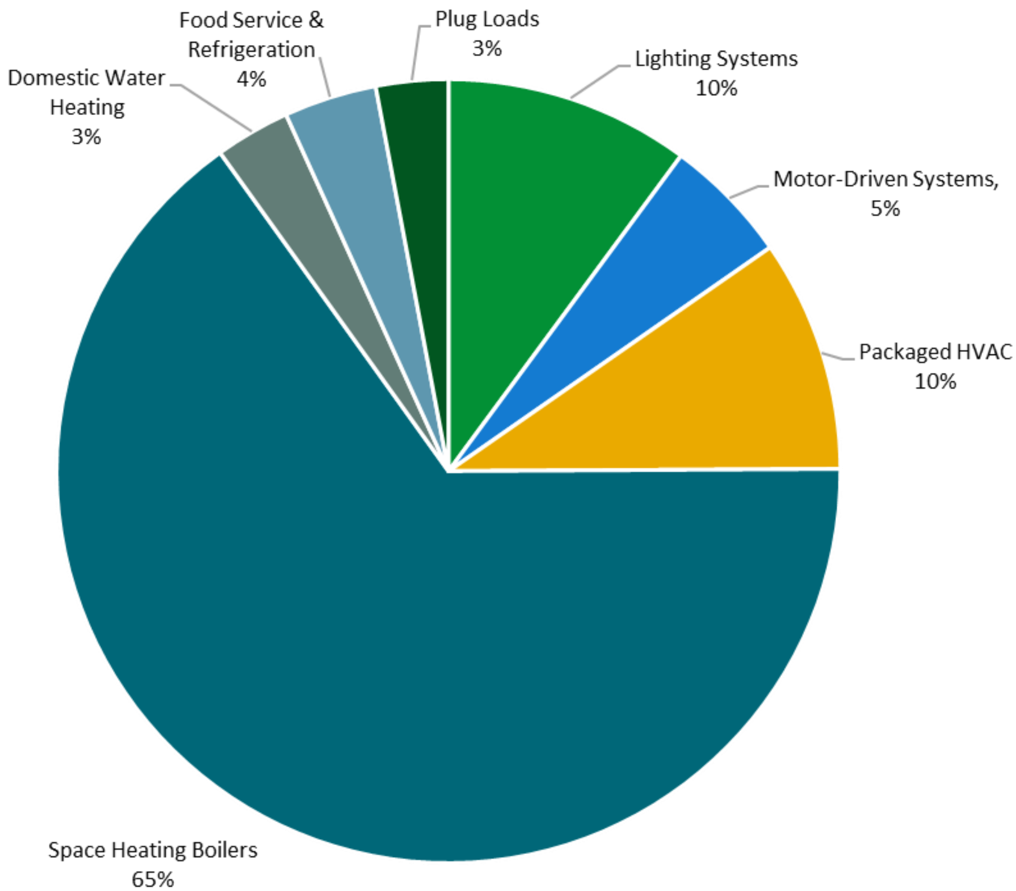
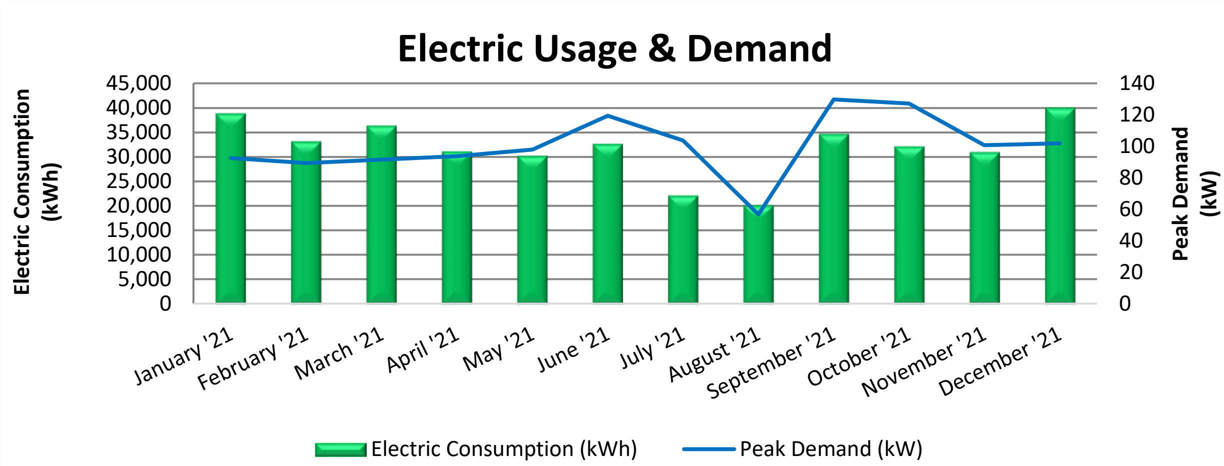


Figure 4 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class GLP, with electric production provided by Direct Energy, a third-party supplier.



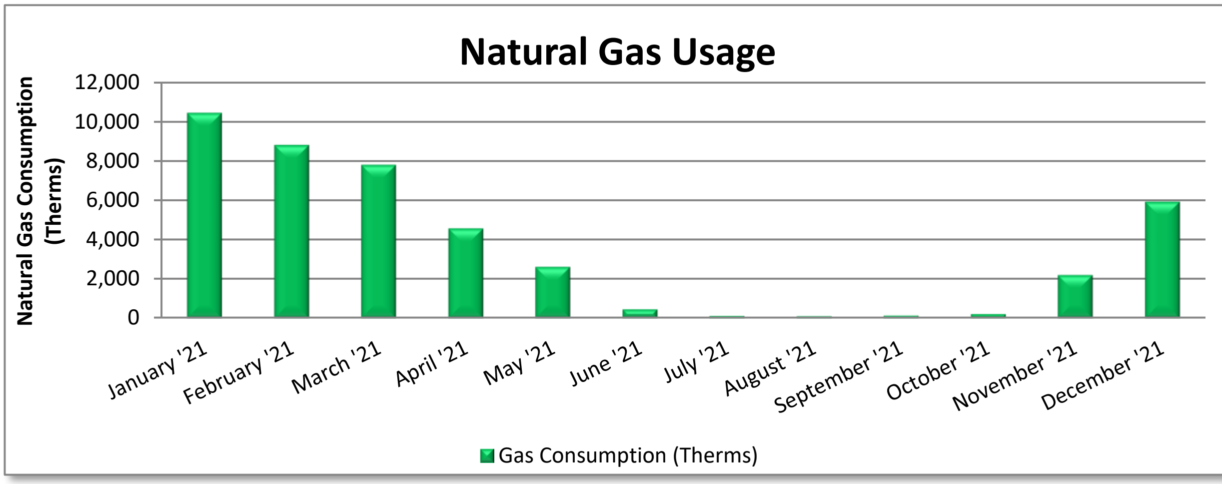
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
1/21/21	34	38,866	93	$348	$5,061
2/19/21	29	33,192	89	$336	$4,509
3/22/21	31	36,374	92	$345	$4,874
4/21/21	30	31,143	94	$352	$4,325
5/20/21	29	30,260	98	$370	$4,256
6/21/21	32	32,684	120	$452	$5,682
7/21/21	30	22,200	104	$393	$4,209
8/19/21	29	20,205	57	$215	$3,519
9/20/21	32	34,741	130	$491	$6,012
10/19/21	29	32,189	127	$481	$4,397
11/17/21	29	31,026	101	$381	$3,432
12/20/21	33	40,038	102	$386	$3,814
Totals	**367**	**382,918**	**130**	**$4,551**	**$54,091**
Annual	**365**	**380,831**	**130**	**$4,526**	**$53,796**

Notes:

- Peak demand of 130 kW occurred in September 2021.
- Average demand over the past 12 months was 100 kW.
- The average electric cost over the past 12 months was $0.141/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

Elizabethtown Gas delivers natural gas under rate class General Delivery Service-Transportation, 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**
1/20/21	33	10,451	$8,784
2/17/21	28	8,824	$7,516
3/22/21	33	7,813	$6,754
4/21/21	30	4,568	$4,147
5/20/21	29	2,611	$2,616
6/21/21	32	454	$974
7/21/21	30	114	$719
8/20/21	30	102	$711
9/21/21	32	129	$731
10/20/21	29	210	$796
11/17/21	28	2,198	$2,381
12/17/21	30	5,937	$5,350
Totals	**364**	**43,411**	**$41,480**
Annual	**365**	**43,530**	**$41,594**

Notes:

- The average gas cost for the past 12 months is $0.956/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	26

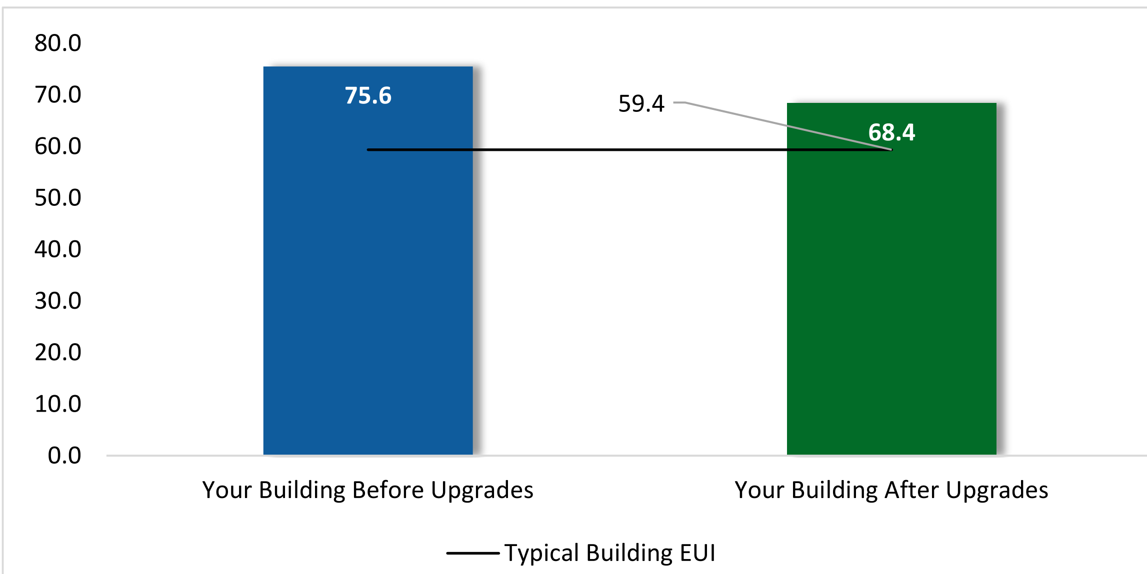


Figure 5 - Energy Use Intensity Comparison[3]

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

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

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

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

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

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

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

4 Energy Conservation Measures

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

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

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

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

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**83,449**	**32.6**	**-17**	**$11,621**	**$55,000**	**$13,184**	**$41,816**	**3.6**	**81,989**
ECM 1	Install LED Fixtures	Yes	4,876	4.3	-1	$679	$9,314	$900	$8,414	12.4	4,790
ECM 2	Retrofit Fixtures with LED Lamps	Yes	78,573	28.3	-16	$10,942	$45,685	$12,284	$33,401	3.1	77,199
Lighting Control Measures			**7,545**	**2.5**	**-2**	**$1,051**	**$12,692**	**$3,850**	**$8,842**	**8.4**	**7,413**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	5,943	1.9	-1	$828	$8,642	$1,085	$7,557	9.1	5,839
ECM 4	Install High/Low Lighting Controls	Yes	1,602	0.5	0	$223	$4,050	$2,765	$1,285	5.8	1,574
Variable Frequency Drive (VFD) Measures			**20,704**	**5.4**	**0**	**$2,925**	**$30,548**	**$2,750**	**$27,798**	**9.5**	**20,849**
ECM 5	Install VFDs on Constant Volume (CV) Fans	Yes	12,467	3.9	0	$1,761	$21,071	$750	$20,321	11.5	12,554
ECM 6	Install VFDs on Heating Water Pumps	Yes	8,237	1.4	0	$1,164	$9,476	$2,000	$7,476	6.4	8,295
Unitary HVAC Measures			**7,274**	**10.1**	**0**	**$1,027**	**$97,103**	**$4,390**	**$92,713**	**90.2**	**7,325**
ECM 7	Install High Efficiency Air Conditioning Units	No	5,846	7.4	0	$826	$90,340	$3,990	$86,350	104.6	5,886
ECM 8	Install High Efficiency Heat Pumps	No	1,428	2.7	0	$202	$6,764	$400	$6,364	31.5	1,438
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**74**	**$706**	**$13,780**	**$1,000**	**$12,780**	**18.1**	**8,649**
ECM 9	Install High Efficiency Furnaces	No	0	0.0	74	$706	$13,780	$1,000	$12,780	18.1	8,649
HVAC System Improvements			**215**	**0.0**	**18**	**$206**	**$2,788**	**$24**	**$2,764**	**13.4**	**2,367**
ECM 10	Implement Demand Control Ventilation (DCV)	No	215	0.0	13	$156	$2,719	$0	$2,719	17.5	1,751
ECM 11	Install Pipe Insulation	Yes	0	0.0	5	$50	$69	$24	$45	0.9	617
Domestic Water Heating Upgrade			**0**	**0.0**	**11**	**$104**	**$165**	**$82**	**$82**	**0.8**	**1,278**
ECM 12	Install Low-Flow DHW Devices	Yes	0	0.0	11	$104	$165	$82	$82	0.8	1,278
Food Service & Refrigeration Measures			**10,684**	**1.2**	**13**	**$1,636**	**$18,790**	**$1,250**	**$17,540**	**10.7**	**12,310**
ECM 13	Food Service Equipment Replacement	No	0	0.0	13	$127	$9,290	$500	$8,790	69.4	1,551
ECM 14	Dishwasher Replacement	Yes	9,072	1.0	0	$1,282	$9,270	$700	$8,570	6.7	9,136
ECM 15	Vending Machine Control	Yes	1,612	0.2	0	$228	$230	$50	$180	0.8	1,623
TOTALS			**129,871**	**51.8**	**97**	**$19,276**	**$230,866**	**$26,530**	**$204,336**	**10.6**	**142,181**

* - 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		**83,449**	**32.6**	**-17**	**$11,621**	**$55,000**	**$13,184**	**$41,816**	**3.6**	**81,989**
ECM 1	Install LED Fixtures	4,876	4.3	-1	$679	$9,314	$900	$8,414	12.4	4,790
ECM 2	Retrofit Fixtures with LED Lamps	78,573	28.3	-16	$10,942	$45,685	$12,284	$33,401	3.1	77,199
Lighting Control Measures		**7,545**	**2.5**	**-2**	**$1,051**	**$12,692**	**$3,850**	**$8,842**	**8.4**	**7,413**
ECM 3	Install Occupancy Sensor Lighting Controls	5,943	1.9	-1	$828	$8,642	$1,085	$7,557	9.1	5,839
ECM 4	Install High/Low Lighting Controls	1,602	0.5	0	$223	$4,050	$2,765	$1,285	5.8	1,574
Variable Frequency Drive (VFD) Measures		**20,704**	**5.4**	**0**	**$2,925**	**$30,548**	**$2,750**	**$27,798**	**9.5**	**20,849**
ECM 5	Install VFDs on Constant Volume (CV) Fans	12,467	3.9	0	$1,761	$21,071	$750	$20,321	11.5	12,554
ECM 6	Install VFDs on Heating Water Pumps	8,237	1.4	0	$1,164	$9,476	$2,000	$7,476	6.4	8,295
HVAC System Improvements		**0**	**0.0**	**5**	**$50**	**$69**	**$24**	**$45**	**0.9**	**617**
ECM 11	Install Pipe Insulation	0	0.0	5	$50	$69	$24	$45	0.9	617
Domestic Water Heating Upgrade		**0**	**0.0**	**11**	**$104**	**$165**	**$82**	**$82**	**0.8**	**1,278**
ECM 12	Install Low-Flow DHW Devices	0	0.0	11	$104	$165	$82	$82	0.8	1,278
Food Service & Refrigeration Measures		**10,684**	**1.2**	**0**	**$1,509**	**$9,500**	**$750**	**$8,750**	**5.8**	**10,759**
ECM 14	Dishwasher Replacement	9,072	1.0	0	$1,282	$9,270	$700	$8,570	6.7	9,136
ECM 15	Vending Machine Control	1,612	0.2	0	$228	$230	$50	$180	0.8	1,623
TOTALS		**122,382**	**41.7**	**-3**	**$17,260**	**$107,974**	**$20,640**	**$87,333**	**5.1**	**122,904**

* - 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		**83,449**	**32.6**	**-17**	**$11,621**	**$55,000**	**$13,184**	**$41,816**	**3.6**	**81,989**
ECM 1	Install LED Fixtures	4,876	4.3	-1	$679	$9,314	$900	$8,414	12.4	4,790
ECM 2	Retrofit Fixtures with LED Lamps	78,573	28.3	-16	$10,942	$45,685	$12,284	$33,401	3.1	77,199

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 halogen incandescent flood 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: cafeteria/auditorium and the stage.

ECM 2: Retrofit Fixtures with LED Lamps

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

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

Affected Building Areas: all areas with fluorescent fixtures with T8 tubes and A19 incandescent lamps for the stage.

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		**7,545**	**2.5**	**-2**	**$1,051**	**$12,692**	**$3,850**	**$8,842**	**8.4**	**7,413**
ECM 3	Install Occupancy Sensor Lighting Controls	5,943	1.9	-1	$828	$8,642	$1,085	$7,557	9.1	5,839
ECM 4	Install High/Low Lighting Controls	1,602	0.5	0	$223	$4,050	$2,765	$1,285	5.8	1,574

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

ECM 3: Install Occupancy Sensor Lighting Controls

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

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

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

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

Affected Building Areas: copy room, cafeteria/auditorium, locker room, kitchen, library work room, restrooms, offices, and faculty room.

ECM 4: Install High/Low Lighting Controls

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

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

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

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

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

Affected Building Areas: corridors.

TRC

New Jersey's cleanenergy program

4.3 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**20,704**	**5.4**	**0**	**$2,925**	**$30,548**	**$2,750**	**$27,798**	**9.5**	**20,849**
ECM 5	Install VFDs on Constant Volume (CV) Fans	12,467	3.9	0	$1,761	$21,071	$750	$20,321	11.5	12,554
ECM 6	Install VFDs on Heating Water Pumps	8,237	1.4	0	$1,164	$9,476	$2,000	$7,476	6.4	8,295

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

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

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

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

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

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

Affected Air Handlers: RTU-1 & 2, AHUs.

ECM 6: Install VFDs on Heating Water Pumps

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

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

Affected Pumps: heating hot water pumps.

4.4 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**7,274**	**10.1**	**0**	**$1,027**	**$97,103**	**$4,390**	**$92,713**	**90.2**	**7,325**
ECM 7	Install High Efficiency Air Conditioning Units	5,846	7.4	0	$826	$90,340	$3,990	$86,350	104.6	5,886
ECM 8	Install High Efficiency Heat Pumps	1,428	2.7	0	$202	$6,764	$400	$6,364	31.5	1,438

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 is eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 7: Install High Efficiency Air Conditioning Units

We evaluated replacing standard efficiency split system air conditioning units with high efficiency and split system 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: various split system ACs.

ECM 8: Install High Efficiency Heat Pumps

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

Affected Units: 2-ton air source heat pumps.

4.5 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**74**	**$706**	**$13,780**	**$1,000**	**$12,780**	**18.1**	**8,649**
ECM 9	Install High Efficiency Furnaces	0	0.0	74	$706	$13,780	$1,000	$12,780	18.1	8,649

ECM 9: Install High Efficiency Furnaces

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

Note: These units produce acidic condensate that require proper drainage.

Affected Units: RTU-1 and RTU-2.

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		**215**	**0.0**	**18**	**$206**	**$2,788**	**$24**	**$2,764**	**13.4**	**2,367**
ECM 10	Implement Demand Control Ventilation (DCV)	215	0.0	13	$156	$2,719	$0	$2,719	17.5	1,751
ECM 11	Install Pipe Insulation	0	0.0	5	$50	$69	$24	$45	0.9	617

ECM 10: Implement Demand Control Ventilation (DCV)

(DCV 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.

Affected Building Areas: cafeteria/auditorium.

ECM 11: Install Pipe Insulation

Install insulation on domestic hot water system piping. Distribution system losses are dependent on system fluid temperature, the size of the distribution system, and the level of insulation of the piping.

Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is exposed to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Affected Systems: domestic hot water system.

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		**0**	**0.0**	**11**	**$104**	**$165**	**$82**	**$82**	**0.8**	**1,278**
ECM 12	Install Low-Flow DHW Devices	0	0.0	11	$104	$165	$82	$82	0.8	1,278

ECM 12: 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 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**10,684**	**1.2**	**13**	**$1,636**	**$18,790**	**$1,250**	**$17,540**	**10.7**	**12,310**
ECM 13	Food Service Equipment Replacement	0	0.0	13	$127	$9,290	$500	$8,790	69.4	1,551
ECM 14	Dishwasher Replacement	9,072	1.0	0	$1,282	$9,270	$700	$8,570	6.7	9,136
ECM 15	Vending Machine Control	1,612	0.2	0	$228	$230	$50	$180	0.8	1,623

ECM 13: Food Service Equipment Replacement

Buildings that use a lot of food service equipment are often among the most energy-intensive commercial buildings. Replace existing food service equipment with new, high-efficiency equipment. Consider replacing the following equipment with high efficiency or ENERGY STAR® labeled versions:

Location	Quantity	Equipment Type	Manufacturer	Model
Kitchen	1	Gas Convection Oven (Full Size)	US Range	NA

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

ECM 14: Dishwasher Replacement

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

ECM 15: Vending Machine Control

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

4.9 Measures for Future Consideration

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

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

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

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

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.

Installation of an Energy Management System

Most larger facilities have some type of energy management system (EMS), which provides for centralization, remote control, and monitoring of HVAC equipment and sometimes lighting or other building systems. An EMS utilizes a system of temperature and pressure sensors that obtain feedback about field conditions and provide signals to control systems that adjust HVAC system operation for optimal functioning. Thirty years ago, most control systems were pneumatic systems driven by compressed air, with pneumatic thermostats and air driven actuators for valves and dampers. Pneumatics controls have largely been replaced by direct digital control (DDC) systems, but many pneumatic systems remain. Contemporary DDC systems afford tighter controls and enhanced monitoring and trending capabilities as compared to the older systems.

Often smaller facilities are not equipped with central controls. For many small sites, it has been less costly to install distributed local controls, such as programmable thermostats and timeclocks, rather than centralized DDC. Local controls do a reasonably good job of scheduling equipment and maintaining operating conditions by relying on controls integral to HVAC units, such as logic for compressor staging, to manage the equipment operating algorithms.

Even for smaller sites, inefficiencies arise when temperature sensors and thermostat schedules are not maintained, when there are separate systems for heating and cooling, and especially when equipment is added, or the facility is reconfigured or repurposed.

Based on our survey, it appears that the installation of an EMS at your site could increase the efficiency of your building HVAC system operation.

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

It is recommended that an HVAC engineer or contractor who specializes in EMS be contacted for a detailed evaluation and implementation costs. For the purposes of this report, the potential energy savings and measure costs were estimated based on industry standards and previous project experience. Further analysis should be conducted for the feasibility of this measure. This is not an investment grade analysis nor should be used as a basis for design and construction.

VRF Systems

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

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

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

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

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

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

Replace Smooth V-Belts with Notched or Synchronous Belts

This measure is for the replacement of smooth V-belts in non-residential package and split HVAC systems with notched V-belts or for the installation of new equipment with synchronous belts instead of smooth V-belts. Typically, there is a V-belt between the motor and the supply air fan and/or return air fan in larger package and split HVAC systems.

In general, there are two styles of grooved V-belts: notched and synchronous. The U.S. Department of Energy (DOE) compares these two types as follows[4]

[4] https://www.nrel.gov/docs/fy13osti/56012.pdf US DOE Motor Systems Tip Sheet #5

Characteristic	Notched V-Belts	Synchronous Belts
Description	A notched belt has grooves or notches that run perpendicular to the belt's length, which reduces the bending resistance of the belt.	They are also called cogged, timing, positive-drive, or high-torque drive belts, and are "toothed".
Pulleys/Sprockets	Can use the same pulleys as cross-section standard V-belts	Require the installation of mating grooved sprockets.
Typical Efficiency	Run cooler, last longer, and are about 2% more efficient than standard V-belts.	Operate with a consistent efficiency of 98% and maintain their efficiency over a wide load range.
Constraints	Have a sharp reduction in efficiency at high torque due to increased slippage.	Noisier than V-belts, less suited for use on shock-loaded applications, and transfer more vibration due to their stiffness.
Other Benefits	Lower cost than synchronous belts, overall.	Require minimal maintenance and re-tensioning. Operate in wet and oily environments, and run slip-free

The DOE offers the following suggested actions with respect to investigating the applicability of notched or synchronous V belts:

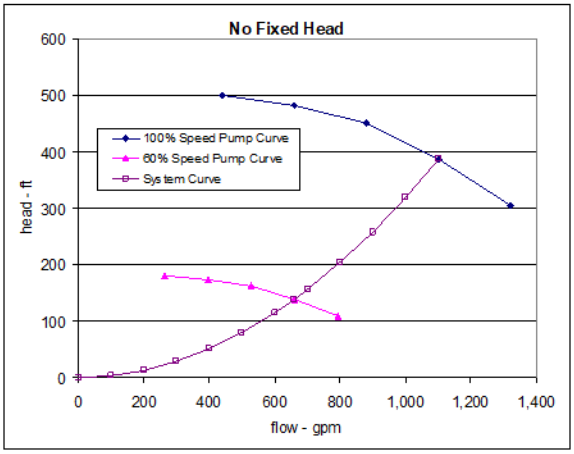
- Conduct a survey of belt-driven equipment. Gather application and operating-hour data. Then determine the cost effectiveness of replacing existing V-belts with notched belts or synchronous belts and sprockets.
- Consider synchronous belts for all new installations; the price premium is minimal due to the avoidance of conventional pulley costs.
- Consider having a power transmission specialist determine the energy and cost savings potential from retrofitting all V-belt drives with synchronous belts. Synchronous belts rely on tooth grip instead of friction to efficiently transfer power and provide a constant speed ratio.
- Install notched belts where the retrofit of a synchronous belt is not cost effective.

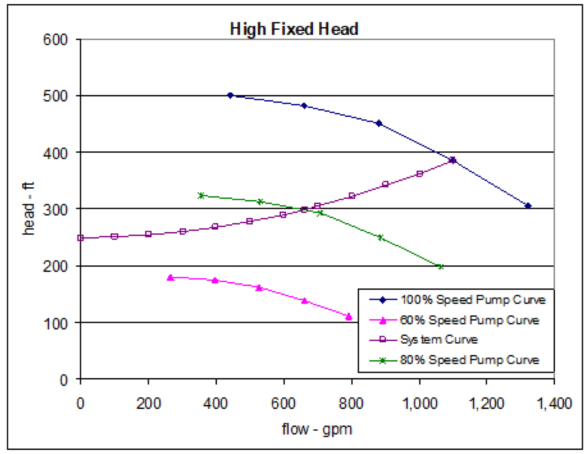
Variable Frequency Drives to Control Fixed Head Pump Motors

The site has several pumps that operate with fixed head. Investigation of potential energy savings measures for these pumps is beyond the scope of this study. Site staff may want to conduct further investigation of potential savings for variable speed pumping controls.

Variable frequency drives (VFDs) regulate pump flow by regulating the speed of the drive motor. This is a more efficient way of regulating a pump than throttling the discharge of the pump. In systems with minimal fixed system head (for example a closed loop circulation system) pump power follows the affinity laws. This means that the required pump power varies approximately with the cube of the motor speed. As a result, a small change in pump speed will produce a significant reduction in motor power. In pumping systems with a fixed head that must be overcome regardless of the flow rate, the affinity laws no longer apply. Examples of fixed head systems are well and lift pumps. The lift required to move the water out of a well or sump to the surface is such a fixed head.

The figures below demonstrate the differences between a system with no fixed head and high fixed head. A pump will always operate at the intersection of the pump curve and the system curve. The pump curve is dictated by the pump design and operating speed, while the system curve is dictated by the physical system the pump is distributing water through such as the length of pipe, flow restrictions, and fixed head.





With no fixed head as the pump speed is reduced the pump operation follows the system curve. In the No fixed head example above, reducing the pump speed from 100% to 60% reduces the flow from 1,100 gpm to 660 gpm with an associated head of approximately 140 ft. In addition, the pump efficiency will remain the same at the two different flows. The reduced speed operation requires significantly less power than throttling the pump to 660 gpm, which would require 480 ft of head.

With the high fixed head condition, the system curve does not intersect the 60% speed curve. As a result, the pump cannot operate at 60% speed with this level of fixed head. Reducing the pump speed to 60% in this case would result in no flow and the pump would overheat. In order to achieve 660 gpm by reducing the pump speed the pump must operate at 80% speed now (see the intersection of the system curve and the 80% speed curve). In this case, the pump will produce 300 ft of head to achieve the 660-gpm flow. The pump will also most likely be operating at a different efficiency than when it was producing 1,100 gpm. The pump efficiency at the new operation at 80% speed will be a function of the pump design and may be higher or lower than at the full speed, 1,100 gpm operation. However, if the pump was sized for optimal performance at full speed and 1,100 gpm, it is likely that the pump efficiency will be lower when it is operating at 80% speed.

The following information is required to determine if installing a VFD to control a fixed head pump is feasible. The pump curves for the associated pump, the full speed flow and head, and the system fixed head. With that information the minimum feasible pump speed and associated power draw can be determined. To determine the potential energy savings the typical flow pattern of the system is required. With well or sump systems reducing the pump flow will increase the pump operating hours. Some system configurations will work with the pump operating at lower flow for longer hours. An example would be a well pump with excess flow capacity that is used to fill a large tank or reservoir. Other systems cannot function at significant reduced flows. An example would be a pump transferring fluid between two holding tanks if there are time constraints to the fluid transfer. If any of the pump systems at this site with motor capacities of 5 hp or more and a space to locate a VFD can operate for longer hours at reduced flow, then the feasibility of installing a VFD could be evaluated.

5 ENERGY EFFICIENT BEST PRACTICES

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

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

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

Energy Tracking with ENERGY STAR® Portfolio Manager®

You've heard it before—you cannot manage what you do not measure. ENERGY STAR® Portfolio Manager® is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions[5]. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Weatherization

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

Doors and Windows

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

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

Lighting Maintenance

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

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

Lighting Controls

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

Motor 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.

Boiler Maintenance

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

Label HVAC Equipment

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

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

Optimize HVAC Equipment Schedules

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

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

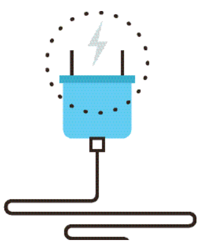
Compressed Air System Maintenance

Compressed air systems require periodic maintenance to operate at peak efficiency. A maintenance plan for compressed air systems should include:

- Inspection, cleaning, and replacement of inlet filter cartridges.
- Cleaning of drain traps.
- Daily inspection of lubricant levels to reduce unwanted friction.
- Inspection of belt condition and tension.
- Check for leaks and adjust loose connections.
- Overall system cleaning.

Contact a qualified technician for help with setting up periodic maintenance schedule.

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips[6]. Your local utility may offer incentives or rebates for this equipment.

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[7] or download a copy of EPA's "WaterSense™ at Work: Best Management

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

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

Practices for Commercial and Institutional Facilities"[8] 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.

[8] 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.

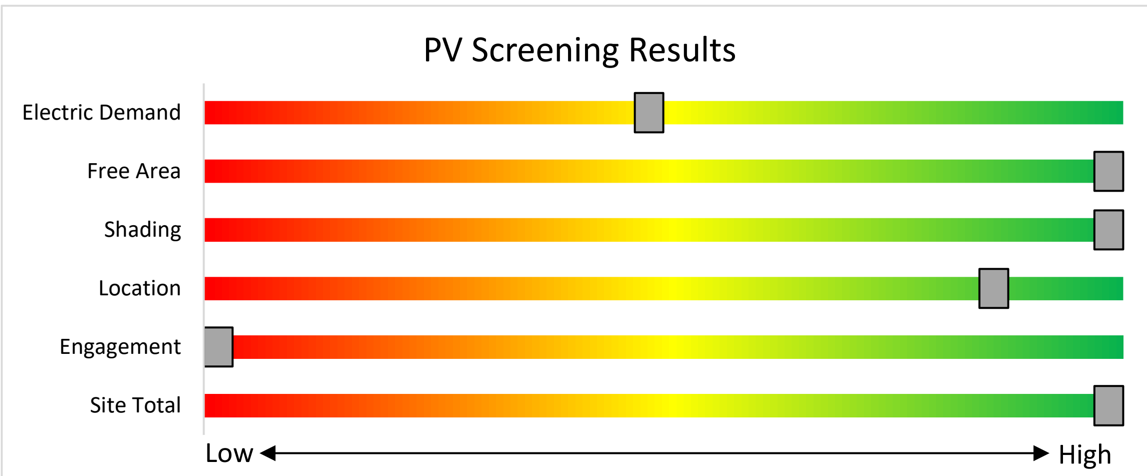
6.1 Solar Photovoltaic

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	100	kW DC STC
Electric Generation	119,137	kWh/yr
Displaced Cost	$16,830	/yr
Installed Cost	$286,000	

Figure 8 - Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

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

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

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

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

6.2 Combined Heat and Power

Combined heat and power (CHP) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

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

The key criteria used for screening is the amount of time that the CHP system would operate at full load and the facility's ability to use the recovered heat. Facilities with a continuous need for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has no potential for installing a cost-effective CHP system.

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

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

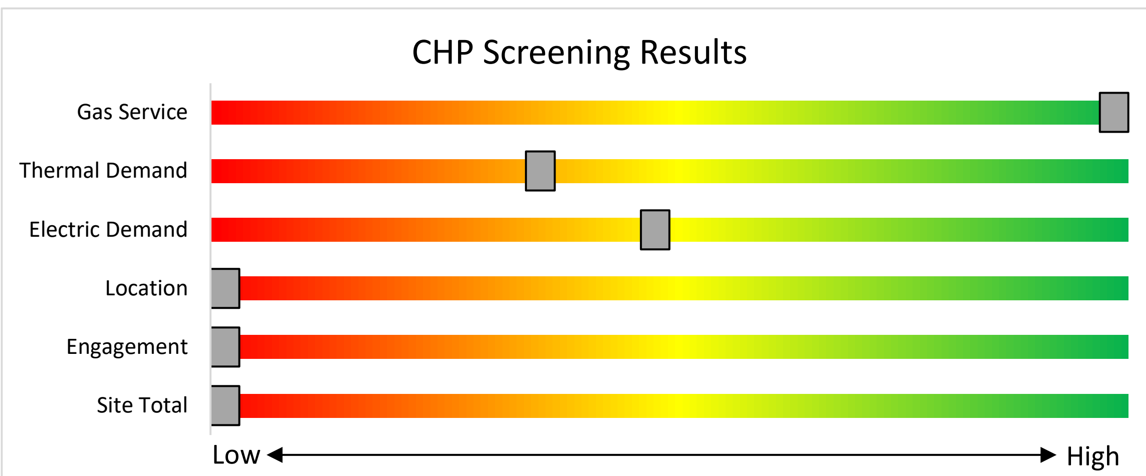


Figure 9 - Combined Heat and Power Screening

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

7 Project Funding and Incentives

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

7.1 Utility Energy Efficiency Programs

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

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

https://www.njcleanenergy.com/transition

8 New Jersey's Clean Energy Programs

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

8.1 Large Energy Users

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

Incentives

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

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

How to Participate

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

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

8.2 Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

8.3 Successor Solar Incentive Program (SuSI)

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

Administratively Determined Incentive (ADI) Program

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

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

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

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

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

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

Competitive Solar Incentive Program

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

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

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

8.4 Energy Savings Improvement Program

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

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

How to Participate

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

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

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

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

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

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

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

9 PROJECT DEVELOPMENT

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

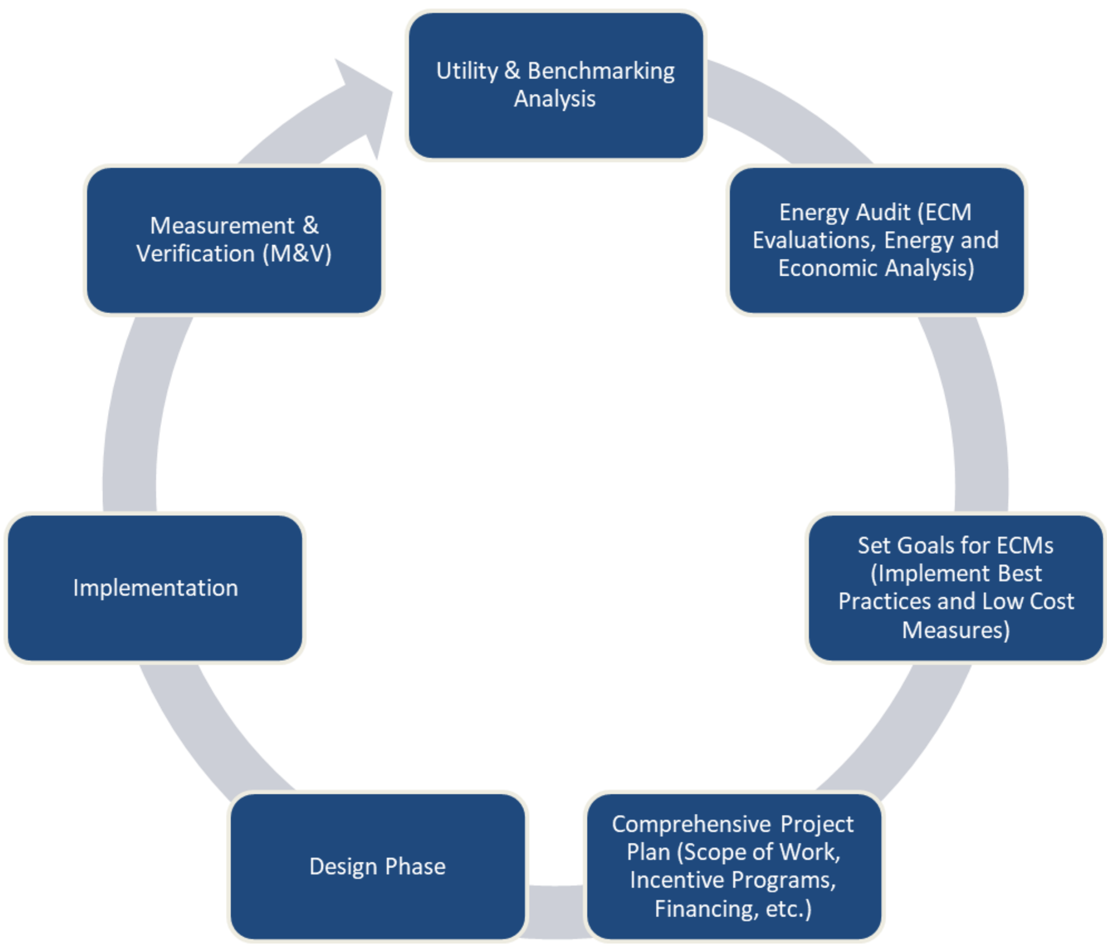


Figure 10 – Project Development Cycle

10 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

10.1 Retail Electric Supply Options

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

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

A list of licensed third-party electric suppliers is available at the NJBPU website[9].

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[10].

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	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
Boiler Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.2	726	0	$101	$365	$100	2.6
Book Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.4	1,109	0	$154	$708	$155	3.6
Cafeteria/Auditorium	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/Auditorium	6	Halogen Incandescent: Stage Spot Luminaire	Wall Switch	S	500	750	1	Fixture Replacement	No	6	LED - Fixtures: Architectural Flood/Spot Luminaire	Wall Switch	75	750	1.8	2,104	0	$293	$3,105	$300	9.6
Cafeteria/Auditorium	27	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,000	2, 3	Relamp	Yes	27	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,380	1.4	4,394	-1	$612	$2,512	$610	3.1
Classroom 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.0	117	0	$16	$73	$20	3.3
Classroom 10	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 11	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 12	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 13	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 14	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 15	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 16	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 17	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.6	1,873	0	$261	$1,168	$320	3.3
Classroom 18	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.6	1,873	0	$261	$1,168	$320	3.3
Classroom 18	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 19	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.6	1,873	0	$261	$1,168	$320	3.3
Classroom 2	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.8	2,341	0	$326	$1,461	$400	3.3
Classroom 20	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.1	234	0	$33	$146	$40	3.3
Classroom 21	18	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	18	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.7	2,107	0	$293	$1,315	$360	3.3
Classroom 22	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 22	12	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	40	1,900		None	No	12	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	40	1,900	0.0	0	0	$0	$0	$0	0.0
Classroom 23	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 24	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 25	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 26	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 27	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 28	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 29	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 3	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.0	117	0	$16	$73	$20	3.3
Classroom 30	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 31	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 4	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 5	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 6	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 7	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Classroom 9	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.5	1,404	0	$196	$876	$240	3.3
Copy room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.1	277	0	$39	$380	$65	8.2
Corridor - Guidance	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor - Guidance	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,380	0.1	185	0	$26	$298	$90	8.1
Corridor A	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor A	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 4	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,380	0.8	2,402	-1	$334	$2,074	$1,170	2.7
Corridor B	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 B	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 4	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,380	0.3	1,016	0	$142	$852	$495	2.5
Corridor C	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor C	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 4	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,380	0.5	1,478	0	$206	$1,259	$720	2.6
Corridor D	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 D	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.0	73	0	$10	$37	$10	2.6
Corridor E	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

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Corridor E	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,380	0.1	185	0	$26	$298	$90	8.1
Corridor inside library	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,000	2, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	1,380	0.1	326	0	$45	$371	$110	5.8
Corridor kitchen next to Janitorial	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.0	73	0	$10	$37	$10	2.6
Corridor Leading to Exit 2	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
Corridor Leading to Exit 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,380	0.1	370	0	$51	$371	$180	3.7
Corridor Leading to Exit 3	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor Leading to Exit 3	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,380	0.1	370	0	$51	$371	$180	3.7
Corridor leading to exit 4	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 leading to exit 4	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,380	0.3	924	0	$129	$815	$450	2.8
Corridor Main Office	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	2,000	2	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,000	0.0	61	0	$8	$49	$9	4.7
Corridor Main Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,380	0.1	185	0	$26	$298	$90	8.1
Exit 11 Foyer	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Exit 11 Foyer	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.1	218	0	$30	$110	$30	2.6
Exit 2 Foyer	2	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	20	2,000		None	No	2	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	20	2,000	0.0	0	0	$0	$0	$0	0.0
Exit 9 Foyer	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Exit 9 Foyer	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.0	73	0	$10	$37	$10	2.6
Exterior Envelop lighting	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	S	16	4,380		None	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	16	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Envelop lighting	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	S	37	4,380		None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	37	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Envelop lighting	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	S	26	4,380		None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	26	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Parking lit	2	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Photocell	S	200	4,380		None	No	2	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Photocell	200	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Parking lit	18	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Photocell	S	200	4,380		None	No	18	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Photocell	200	4,380	0.0	0	0	$0	$0	$0	0.0
Girls locker Room Corridor	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
Girls locker Room Corridor	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,000	2, 3	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,380	0.0	145	0	$20	$325	$50	13.6
Gymnasium 1	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Gymnasium 1	32	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	32	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	1.3	3,745	-1	$522	$2,337	$640	3.3

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Gymnasium 2	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Gymnasium 2	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,900	2	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,900	0.1	234	0	$33	$146	$40	3.3
Handicapped lift room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,000	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,380	0.1	277	0	$39	$226	$50	4.5
Janitorial - Corridor A	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,900	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,900	0.0	69	0	$10	$37	$10	2.8
Janitorial Kitchen	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,900	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,900	0.0	69	0	$10	$37	$10	2.8
Kitchen	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
Kitchen	4	Incandescent: 250W A Lamp	Wall Switch	S	250	500		None	No	4	Incandescent: 250W A Lamp	Wall Switch	250	500	0.0	0	0	$0	$0	$0	0.0
Kitchen	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.6	1,940	0	$270	$1,307	$280	3.8
Library	36	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,000	2, 3	Relamp	Yes	36	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,380	1.6	4,988	-1	$695	$2,782	$645	3.1
Library work room	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,000	2, 3	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,380	0.3	814	0	$113	$635	$135	4.4
Locker Room Boys	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.4	1,293	0	$180	$781	$175	3.4
Locker Room Girls	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.0	73	0	$10	$37	$10	2.6
Nurse Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,000	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,380	0.3	831	0	$116	$599	$125	4.1
Office - Assistant Principal	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.1	370	0	$51	$416	$75	6.6
Office - Boys locker room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.1	185	0	$26	$189	$40	5.8
Office - Faculty Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,380	0.5	1,663	0	$232	$927	$215	3.1
Office - Girls locker room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.1	185	0	$26	$189	$40	5.8
Office - Guidance 1	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,900	2	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,900	0.1	414	0	$58	$219	$60	2.8
Office - Guidance 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,900	2	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,900	0.1	414	0	$58	$219	$60	2.8
Office - Main Office	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,900	2	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,900	0.4	1,241	0	$173	$657	$180	2.8
Office - Main office break room	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,900	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,900	0.0	103	0	$14	$55	$15	2.8
Office - Principal	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,000	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,380	0.3	831	0	$116	$599	$125	4.1
Office - School Psycholgist	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,000	2, 3	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,380	0.2	651	0	$91	$562	$115	4.9
Office - VicePrincipal	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,000	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,380	0.2	554	0	$77	$489	$95	5.1
Office - Work room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,900	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,900	0.0	138	0	$19	$73	$20	2.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Random room between kitchen and cafeteria	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,000	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,000	0.0	109	0	$15	$55	$15	2.6
Restroom - Boys Corridor A	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.1	370	0	$51	$416	$75	6.6
Restroom - Boys Corridor Exit	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.2	462	0	$64	$453	$85	5.7
Restroom - Boys Staff Corridor A	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.1	370	0	$51	$416	$75	6.6
Restroom - Female Staff Corridor A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.1	185	0	$26	$189	$40	5.8
Restroom - Female Faculty	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.0	73	0	$10	$37	$10	2.6
Restroom - Female Staff Corridor Exit 4	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.1	185	0	$26	$189	$40	5.8
Restroom - Girls Corridor A	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.1	370	0	$51	$416	$75	6.6
Restroom - Girls Corridor Exit 4	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.2	462	0	$64	$453	$85	5.7
Restroom - Girls Staff Corridor A	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.1	370	0	$51	$416	$75	6.6
Restroom - Inside classroom 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.0	73	0	$10	$37	$10	2.6
Restroom - Inside classroom 2	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.0	73	0	$10	$37	$10	2.6
Restroom - Male Faculty	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.0	73	0	$10	$37	$10	2.6
Restroom - Male Staff Corridor A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.1	185	0	$26	$189	$40	5.8
Restroom - Male Staff Corridor Exit 4	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.1	185	0	$26	$189	$40	5.8
Restroom - Nurse office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.0	73	0	$10	$37	$10	2.6
Server Room IDF	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,000	2, 3	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,380	0.2	488	0	$68	$489	$95	5.8
Storage - Custodian	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,900	2	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,900	0.1	207	0	$29	$110	$30	2.8
Storage - Instruments	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.2	739	0	$103	$562	$80	4.7
Storage Gym 2	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.2	554	0	$77	$489	$60	5.6
Storage Library	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	None	S	114	2,000	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	None	58	2,000	0.0	123	0	$17	$73	$20	3.1
Supply Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,000	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,380	0.3	831	0	$116	$599	$125	4.1
Theater - Stage	60	Incandescent: 65W A Lamp	Wall Switch	S	65	500	2	Relamp	No	60	LED Lamps: LED Lamp	Wall Switch	10	500	2.4	1,815	0	$253	$1,034	$60	3.9
Theater - Stage	6	Halogen Incandescent: Stage Spot Luminaire	Wall Switch	S	400	750	1	Fixture Replacement	No	6	LED - Fixtures: Architectural Flood/Spot Luminaire	Wall Switch	120	750	1.2	1,386	0	$193	$3,105	$300	14.5
Theater - Stage	6	Halogen Incandescent: Stage Spot Luminaire	Wall Switch	S	400	750	1	Fixture Replacement	No	6	LED - Fixtures: Architectural Flood/Spot Luminaire	Wall Switch	120	750	1.2	1,386	0	$193	$3,105	$300	14.5

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Theater - Stage	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2, 3	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,380	0.2	647	0	$90	$526	$105	4.7

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	DHW Loop	1	DHW Circulation Pump	0.3	65.0%	No			W	5,000		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU-1,2 - Aux Gym/Cafetorium	2	Supply Fan	2.0	84.0%	No	Baldor	EM3157T-8	W	2,745	5	No	86.5%	Yes	2	1.2	3,847	0	$543	$6,522	$200	11.6
Roof	RTU-1,2 - Aux Gym/Cafetorium	2	Return Fan	1.5	84.0%	No	Baldor	EM3154T-8	W	2,745	5	No	86.5%	Yes	2	0.9	2,885	0	$408	$6,781	$150	16.3
Boiler Room	Combustion Air Fan	2	Combustion Air Fan	1.0	80.4%	No	Marathon	5K38PN47	W	2,745		No	80.4%	No		0.0	0	0	$0	$0	$0	0.0
Gymnasium	AHUs - Gymnasium	2	Supply Fan	3.0	86.0%	No	NA	NA	B	2,745	5	No	89.5%	Yes	2	1.8	5,735	0	$810	$7,768	$400	9.1
Storage room	Main Office	1	Supply Fan	1.0	84.0%	No	NA	NA	B	2,745		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Various	Various Spaces	36	Fan Coil Unit	0.3	65.0%	No	NA	NA	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Various Spaces	3	Exhaust Fan	0.2	65.0%	No	NA	NA	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Classroom 23	1	Exhaust Fan	0.3	65.0%	No	NA	NA	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Various Spaces	2	Exhaust Fan	0.3	65.0%	No	NA	NA	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Various Spaces	8	Exhaust Fan	0.5	70.0%	No	NA	NA	W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Various Spaces	3	Exhaust Fan	0.8	70.0%	No	NA	NA	W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Heating Hot Water Loop	2	Heating Hot Water Pump	7.5	91.7%	No	NA	NA	W	1,800	6	No	91.7%	Yes	2	1.4	8,237	0	$1,164	$9,476	$2,000	6.4
Boiler Room	Compressed Air System	2	Air Compressor	1.5	84.0%	No	NA	NA	W	500		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0

Packaged HVAC Inventory & Recommendations

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/ EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/ EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Classrooms and Offices	1	Split-System	1.50		10.00		RUUD	UAKB-018JAZ	B	7	Yes	1	Split-System	1.50		16.00		0.3	266	0	$38	$5,678	$158	146.9
Roof	Middle School Spaces	2	Split-System	1.00		16.00		Fujitsu	AOU12C1	B	7	Yes	2	Split-System	1.00		16.00		0.0	0	0	$0	$10,785	$210	0.0
Roof	Middle School Space	1	Split-System	1.00		10.00		Sanyo	C1211	B	7	Yes	1	Split-System	1.00		16.00		0.2	177	0	$25	$5,392	$105	211.1
Roof	Mr. Acosta Office	1	Split-System	2.50		10.00		AmericAir	Not Legible	B	7	Yes	1	Split-System	2.50		16.00		0.6	443	0	$63	$6,124	$263	93.6
Roof	Classrooms and Offices	4	Split-System	2.50		10.00		RUUD	UAND-030JAZ	B	7	Yes	4	Split-System	2.50		16.00		2.3	1,773	0	$250	$24,498	$1,050	93.6
Roof	Classrooms and Offices	2	Split-System Air-Source HP	2.00	27.60	19.50	6.5 HSPF	Fujitsu	AOU24RLXFW	B	8	Yes	2	Split-System Air-Source HP	2.00	27.60	15.50	8.5 HSPF	2.7	1,428	0	$202	$6,764	$400	31.5
Roof	Classrooms and Offices	2	Split-System	3.00		10.00		RUUD	UAKA-037CAZ	B	7	Yes	2	Split-System	3.00		16.00		1.4	1,064	0	$150	$12,572	$630	79.5
Roof	Middle School Spaces	1	Split-System	5.00		11.00		RUUD	UAND-060JAZ	B	7	Yes	1	Split-System	5.00		16.00		0.9	672	0	$95	$6,521	$525	63.2
Roof	Middle School Spaces	1	Split-System	5.00		11.00		York	H2DB060S25A	B	7	Yes	1	Split-System	5.00		16.00		0.9	672	0	$95	$6,521	$525	63.2
Courtyard	Middle School Spaces	1	Split-System	2.50		11.00		Williamson - Thermoflo	WT2AC14030ASM	B	7	Yes	1	Split-System	2.50		16.00		0.4	336	0	$47	$6,124	$263	123.6
Courtyard	Library	3	Split-System	3.00		12.00		Sanyo	C3622	W		No							0.0	0	0	$0	$0	$0	0.0
Courtyard	Library	1	Split-System	2.50		10.00		Hamilton	BRCS0301BU	B	7	Yes	1	Split-System	2.50		16.00		0.6	443	0	$63	$6,124	$263	93.6
Courtyard	Classroom	1	Split-System	2.50		16.50		Fujitsu	AOU30CLX1	W		No							0.0	0	0	$0	$0	$0	0.0
Various	Various	17	Window AC	0.70		10.00		NA	NA	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU-1 - Aux Gymnasium	1	Forced Air Furnace		200.00		0.8 AFUE	McQuay	RDS800CYA	B	9	Yes	1	Forced Air Furnace		200.00		0.97 AFUE	0.0	0	33	$314	$6,709	$500	19.8
Roof	RTU-1 - Cafetorium	1	Forced Air Furnace		249.60		0.8 AFUE	McQuay	RDS800CYA	B	9	Yes	1	Forced Air Furnace		249.60		0.97 AFUE	0.0	0	41	$392	$7,072	$500	16.8

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	Heating Hot Water Loop	2	Non-Condensing Hot Water Boiler	1,830	Buderus	SB615-640	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	RTU-2 - Cafetorium	10	2.00	10.00	0.00	249.60	0.0	215	13	$156	$2,719	$0	17.5

DHW Inventory & Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Domestic Hot Water System	11	12	1.00	0.0	0	5	$50	$69	$24	0.9

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
Boiler Room	DHW Loop	1	Storage Tank Water Heater (> 50 Gal)	Bradford White	D80T1803N	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	11	23	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	11	$104	$165	$82	0.8

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Freezer Chest	Excellence Commercial	VB-4L	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Freezer Chest	Crosley	WCC22/F	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	Hubert	NA	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Freezer, Solid Door (>50 cu. ft.)	Beverage Air	Horizon Series	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Migali	NA	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (≤15 cu. ft.)	Federal Industries	RSSM378SC-3	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Omcan	RS-CN-0250	No		No	0.0	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	Manufacturer	Model	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	NA	NA	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (3/4 Size)	Win-Holt	NHPL-1836CA/L/ECOC	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Gas Convection Oven (Full Size)	US Range	NA	No	12	Yes	0.0	0	13	$127	$9,290	$500	69.4

Dishwasher Inventory & Recommendations

	Existing Conditions							Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Manufacturer	Model	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Door Type (High Temp)	Jackson/Alco	150-B	Electric	N/A	No	13	Yes	1.0	9,072	0	$1,282	$9,270	$700	6.7

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Classrooms	35	Projector	200	No	Various	Various
Various	28	Television	240	No	Various	Various
Copy Room	1	Dehumidifier	480	No	NA	NA
Various	7	Desktop Computer	270	Yes	Various	Various
Various	31	Fan	100	No	NA	NA
Classroom 17	1	Kiln	11,000	No	Skutt	KM-1027-3
Various	5	Microwave	1,000	No	Various	Various
Various	2	Printer (Medium)	192	No	Various	Various
Offices	3	Printer (Large)	600	No	Xerox	Various
Various	4	Refrigerator (Mini)	126	No	Various	Various
Various	4	Refrigerator (Large)	572	No	Various	Various
Faculty Room	1	Toaster	1,500	No	Various	Various
Classroom 1	1	Range - Large Surface Unit	2,400	No	NA	NA
Middle School	1	Server	2,000	No	NA	NA

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Various	1	Refrigerated	14	Yes	0.2	1,612	0	$228	$230	$50	0.8

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]

Carl H. Kumpf Middle School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 74,812
Built: 1970

For Year Ending: November 30, 2021
Date Generated: November 01, 2022

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Carl H. Kumpf Middle School 59 Mildred Terrace Clark, New Jersey 07066	Clark Public School District 365 Westfield Ave Clark, NJ 07066 (732) 574-9600	Paul Vizzuso 365 Westfield Ave Clark, NJ 07066 (732) 574-9600 ext 3354 pvizzuso@clarkschools.org

Property ID: 21589155

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
75.7 kBtu/ft²

Source EUI
107.7 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	1,208,358 (21%)
Natural Gas (kBtu)	4,454,493 (79%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	59.4
National Median Source EUI (kBtu/ft²)	84.5
% Diff from National Median Source EUI	28%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	342

Signature & Stamp of Verifying Professional

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

LP Signature: ______________________Date: __________

Licensed Professional

____ ________

,
(____)____-______

____

Professional Engineer or Registered Architect Stamp
(if applicable)

Appendix C: Glossary

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

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

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