Local Government Energy Audit Report

Intervale Elementary School

February 18, 2022

Prepared for:

Parsippany - Troy Hills Board of Education

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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 in order 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.

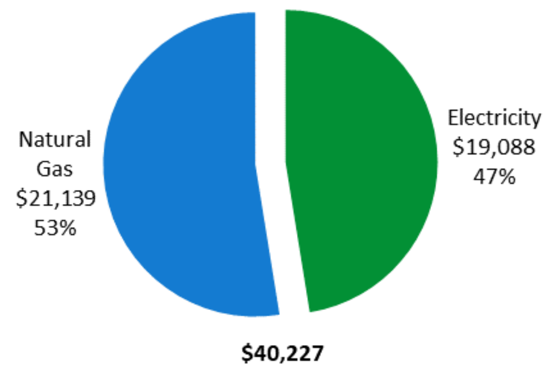
These "next generation" energy efficiency programs feature new ways of managing and delivering programs historically administered by New Jersey's Clean Energy Program™ (NJCEP). All of the investor-owned gas and electric utility companies will now also offer complementary energy efficiency programs and 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 expected to start rolling out in the spring and summer of 2021. 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 Intervale Elementary School. This report provides you with information about your facility's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in your facility. TRC conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and to help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $40,227 Electricity: 161,964 kWh Natural Gas: 17,884 Therms	
ENERGY STAR® Benchmarking Score	**73** *(1-100 scale)*	Congratulations, your building performs better than the national average. This report has suggestions about how to keep your building running efficiently, further improve performance, and lower your energy bills even more.

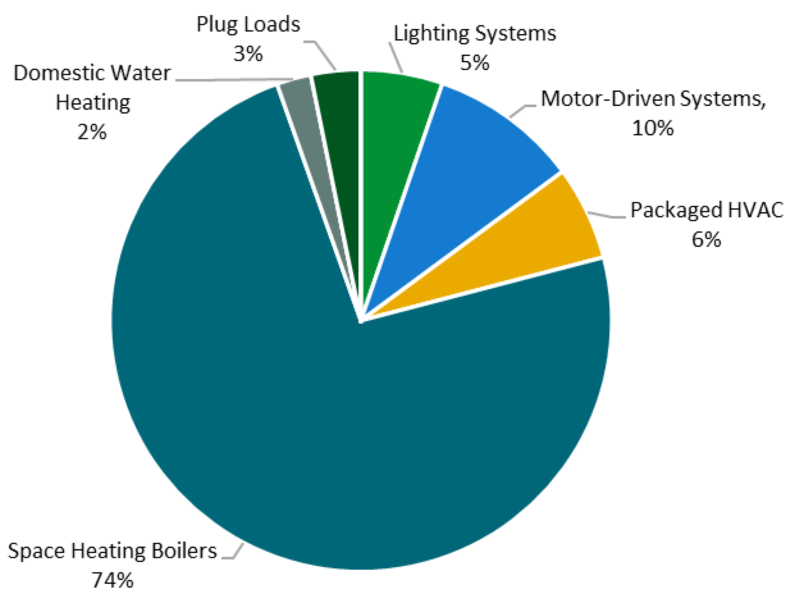


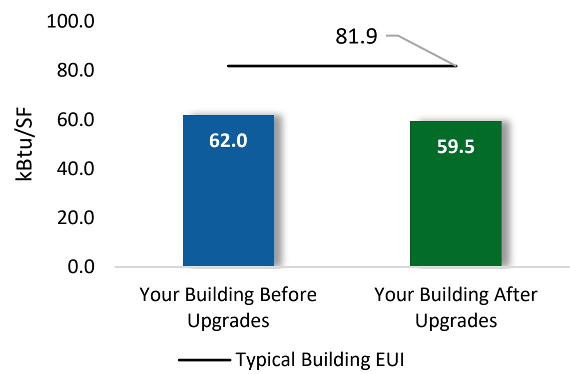
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

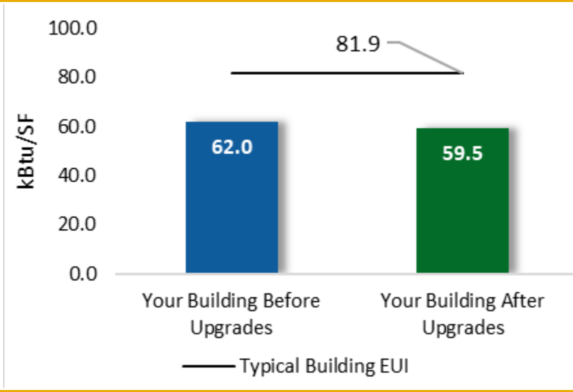
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$29,503
Potential Rebates & Incentives[1]	$6,331
Annual Cost Savings	$3,167
Annual Energy Savings	Electricity: 26,399 kWh Natural Gas: 47 Therms
Greenhouse Gas Emission Savings	14 Tons
Simple Payback	7.3 Years
Site Energy Savings (all utilities)	4%



Scenario 2: Cost Effective Package[2]

Installation Cost	$29,972
Potential Rebates & Incentives	$6,327
Annual Cost Savings	$3,164
Annual Energy Savings	Electricity: 26,375 kWh Natural Gas: 47 Therms
Greenhouse Gas Emission Savings	14 Tons
Simple Payback	7.3 Years
Site Energy Savings (all utilities)	4%



On-site Generation Potential

Photovoltaic	None
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			**882**	**0.0**	**0**	**$104**	**$594**	**$104**	**$490**	**4.7**	**888**
ECM 1	Install LED Fixtures	Yes	858	0.0	0	$101	$525	$100	$425	4.2	864
ECM 2	Retrofit Fixtures with LED Lamps	No	24	0.0	0	$3	$69	$4	$65	23.7	23
Lighting Control Measures			**10,017**	**3.1**	**-2**	**$1,156**	**$12,915**	**$3,955**	**$8,960**	**7.8**	**9,841**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	9,207	2.9	-2	$1,062	$9,990	$1,295	$8,695	8.2	9,046
ECM 4	Install High/Low Lighting Controls	Yes	810	0.3	0	$93	$2,925	$2,660	$265	2.8	795
Variable Frequency Drive (VFD) Measures			**15,500**	**1.8**	**0**	**$1,827**	**$15,920**	**$2,200**	**$13,720**	**7.5**	**15,609**
ECM 5	Install VFDs on Heating Water Pumps	Yes	15,500	1.8	0	$1,827	$15,920	$2,200	$13,720	7.5	15,609
HVAC System Improvements			**0**	**0.0**	**3**	**$31**	**$35**	**$12**	**$23**	**0.7**	**308**
ECM 6	Install Pipe Insulation	Yes	0	0.0	3	$31	$35	$12	$23	0.7	308
Domestic Water Heating Upgrade			**0**	**0.0**	**4**	**$49**	**$108**	**$60**	**$48**	**1.0**	**490**
ECM 7	Install Low-Flow DHW Devices	Yes	0	0.0	4	$49	$108	$60	$48	1.0	490
TOTALS (COST EFFECTIVE MEASURES)			**26,375**	**5.0**	**5**	**$3,164**	**$29,503**	**$6,327**	**$23,176**	**7.3**	**27,113**
TOTALS (ALL MEASURES)			**26,399**	**5.0**	**5**	**$3,167**	**$29,572**	**$6,331**	**$23,241**	**7.3**	**27,136**

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

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

Figure 2 – Evaluated Energy Improvements

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

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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

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.

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.

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

The CHP program provides incentives for combined heat and power (aka 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.

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.

2 Existing Conditions

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Parsippany - Troy Hills Board of Education. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs.

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

2.1 Site Overview

On June 3, 2021, TRC performed an energy audit at Intervale Elementary School located in Boonton, New Jersey. TRC met with facility staff to review the facility operations and help focus our investigation on specific energy-using systems.

The Intervale Elementary is a one-story, 37,731 square foot building built in 1965. Spaces include classrooms, gymnasium/multipurpose space, offices, corridors, stairwells, and mechanical space.

Over the last five years the facility has replaced the majority of its existing fluorescent fixtures with LED fixtures.

The site is interested in expanding the BMS control system as well as upgrading windows, improving lighting controls, and the installation of a photovoltaic solar system.

2.2 Building Occupancy

The facility is occupied year-round, from September through June, etc. Typical weekday occupancy is 56 staff and 144 students.

Summer occupancy includes continuing maintenance activities. There are no weekend activities.

Building Name	Weekday/Weekend	Operating Schedule
Intervale Elementary School	Weekday	6:30 AM - 4:00 PM

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

The walls are made of concrete masonry units (CMUs) with a brick veneer and painted CMU interior finish.

The flat roof is generally supported with steel trusses and a concrete deck and covered with gravel held in place with asphalt. Additionally, there is a section of pitched roof on the new administrative addition that is covered with asphalt shingles. The roof encloses conditioned space. The thermal barrier is at the roof.

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


School Exterior


Main Entrance Doors


Classroom Windows


Gravel and Asphalt Roof

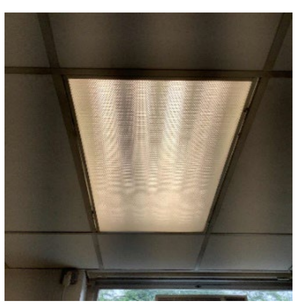
2.4 Lighting Systems

The primary interior lighting system uses 14.5-Watt LED T8 linear tubes. There are also LED general purpose lamps. Fixture types include 1-lamp, 2-lamp, 3-lamp, 4-lamp, and 6-lamp, 2-foot and 4-foot-long recessed fixtures. Most fixtures are in good condition. All interior lighting fixtures are controlled manually.

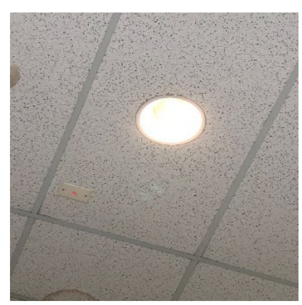
The gymnasium/multipurpose room is primarily illuminated with LED A19 and PAR30 screw-in Lamps, with some surface mounted troffers equipped with LED tubes.

All exit signs are LED, and interior lighting levels were generally sufficient.


Corridor LED Lighting


Conference Room LED Lamps in Troffer


Mechanical Room LED Lighting


Screw-in LED Lamp

Most lighting fixtures are controlled manually throughout the classrooms and common areas. The lighting in the new administrative addition is controlled by occupancy sensors.

Exterior fixtures include wall packs and flood lights and are either LED fixtures or have been retrofitted with LED lamps.

Exterior light fixtures are controlled by a time clock or photocell, depending on the fixture.

Exterior LED Wallpack

Exterior LED Screw-in Lamp

Exterior LED Flood

Exterior LED Wallpack

2.5 Air Handling Systems

Unit Ventilators

The school's heating and fresh air requirements are served by 45 unit ventilators throughout the building. Unit ventilators are equipped with 1/12 hp supply fan motors and hot water heating coils. This system is original to the building and appears to be in fair operating condition. There are three unit ventilators located in the main office equipped with both heating and cooling, with an estimated cooling capacity of 1 ton and an efficiency rating of 9.8 EER each.

Unitary Electric HVAC Equipment

Classrooms are cooled with window AC units which range in capacity from 1.54 tons to 1.96 tons. These units have EER values ranging from 9.8 to 10.7. These units are approximately ten years old and are generally in fair condition. They are not ENERGY STAR® labeled.

1.96 Ton Classroom Window AC

1.54 Ton Conference Room Window AC

2.6 Heating Hot Water Systems

Two Aerco Benchmark 2.0 1,860 MBh condensing hot water boilers serve the building heating load. The burners are fully modulating with a nominal efficiency of 93%. The boilers are configured in an automated lead-lag control scheme managed by the BMS. Only one boiler is required under high load conditions. Installed in 2007, they are in good condition. There is a service and inspection contract in place.

The hydronic distribution system is a two-pipe heating-only system. The hydronic distribution piping is well insulated and appears to be in good condition throughout the building. There is also a large, well-insulated Pressure-Tech hot water storage tank located in the mechanical room.

The boilers are configured with two, 5.0 hp Marathon and two Baldor 3.0 hp hot water pumps feeding the hot water supply to the building. These pumps are not equipped with variable frequency drives (VFD) and are controlled by the EMS. The boilers provide hot water to the unit ventilators.

Aerco HHW Boilers

5hp
HHW Supply Pump

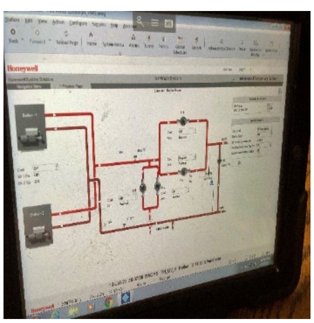
3 hp HHW Supply Pumps

Corridor Unit Ventilator

2.7 Building Energy Management Systems (EMS)

A Honeywell EMS controls the boilers and HHW circulation pumps. The EMS provides equipment scheduling control, and monitors the space and supply air temperatures, which are set by thermostats mounted in the spaces.

The site staff expressed an interest in expanding the level of control provided by the EMS. The HVAC systems are largely pneumatically controlled. Two. ¾ hp air compressors located in the mechanical room serve the pneumatic system.



Site EMS System

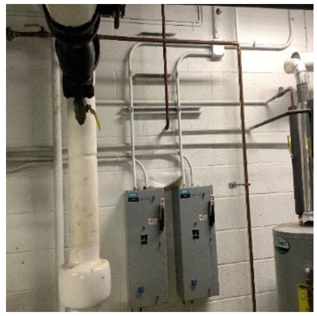
Air Compressor

2.8 Domestic Hot Water

Hot water is produced by an AO Smith 50 gallon 40 MBh gas-fired storage water heater installed in 2016. A 0.083 hp Bell & Gossett circulation pump distributes water to end uses. The circulation pump operates continuously; no circulation controls are present.

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

DHW Heater



Uninsulated DHW Piping

DHW Circulation Pump

2.9 Plug Load & Vending Machines

There are 15 computer workstations for teachers and 144 student laptops throughout the facility. Plug loads throughout the building also include general office equipment. There are classroom typical loads such as televisions, projectors, water coolers, and fans.

Several residential-style refrigerators and a freezer are used to store the school meals, which are prepared off-site. These systems vary in condition and efficiency.

Classroom Projector

Classroom Printer/ Copier

Residential-style Refrigerator

Student Laptop Cart

2.10 Water-Using Systems

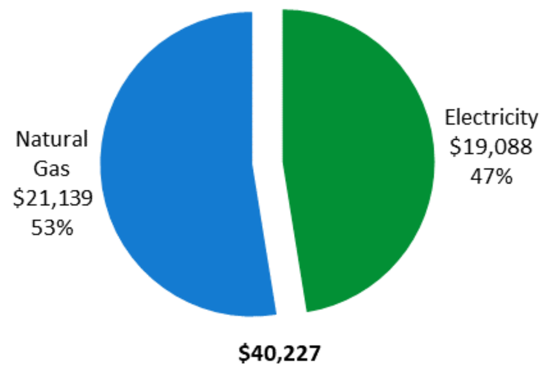
There are 15 restrooms with toilets, urinals, and sinks. Faucet flow rates are at 1.5 gallons per minute (gpm) or higher. Toilets are rated at 1.6 gallons per flush (gpf).

Restroom Faucet

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	161,964 kWh	$19,088
Natural Gas	17,884 Therms	$21,139
Total		**$40,227**



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

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

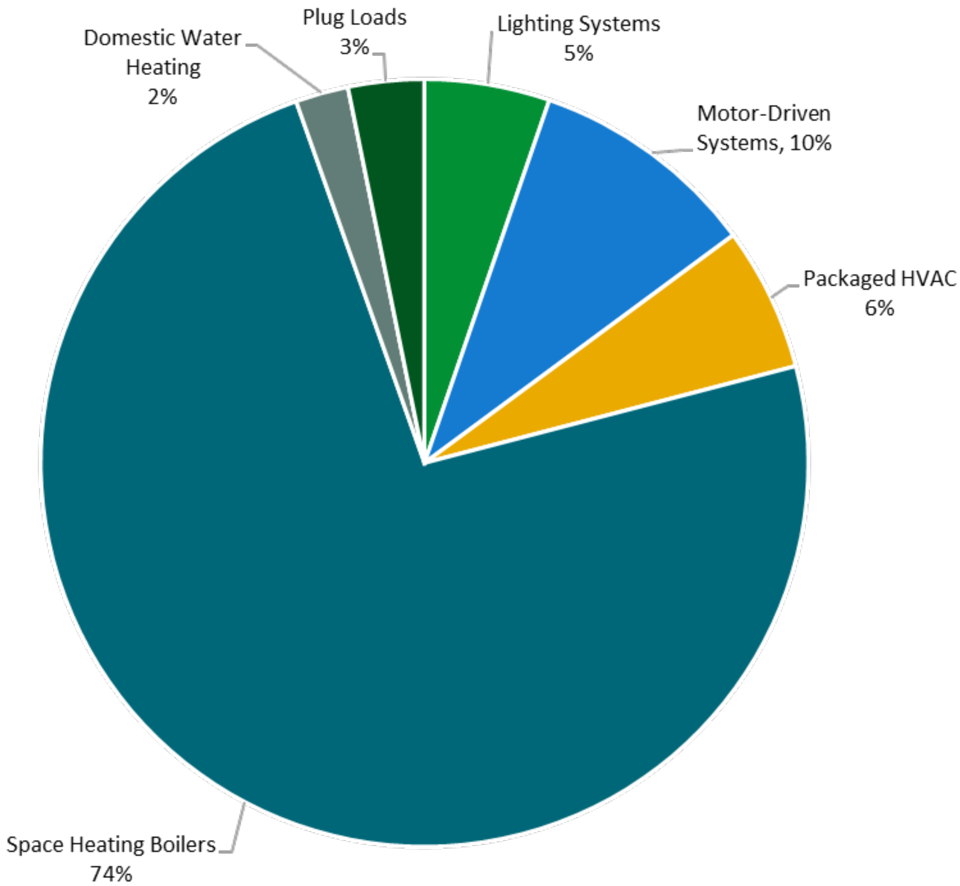
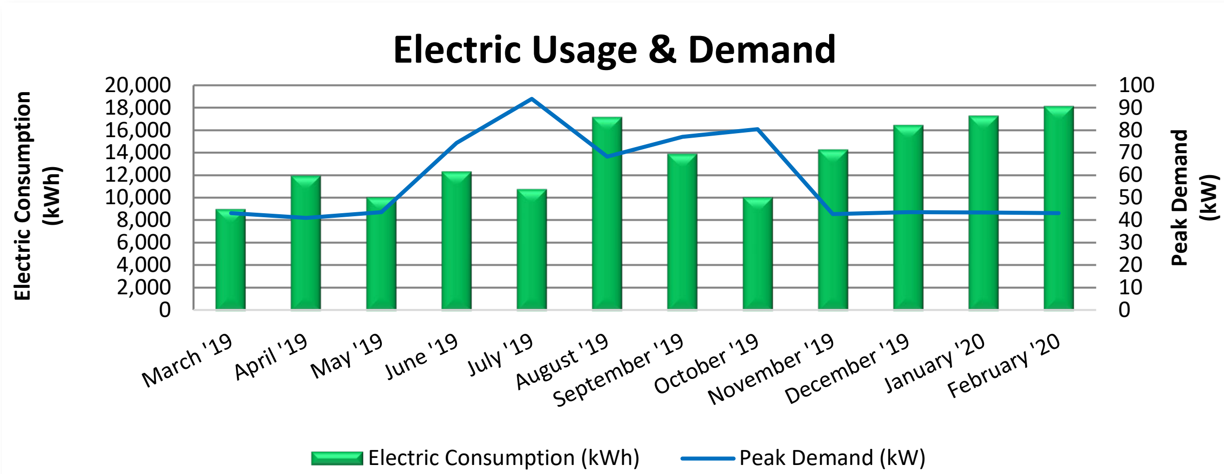


Figure 4 - Energy Balance

3.1 Electricity

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



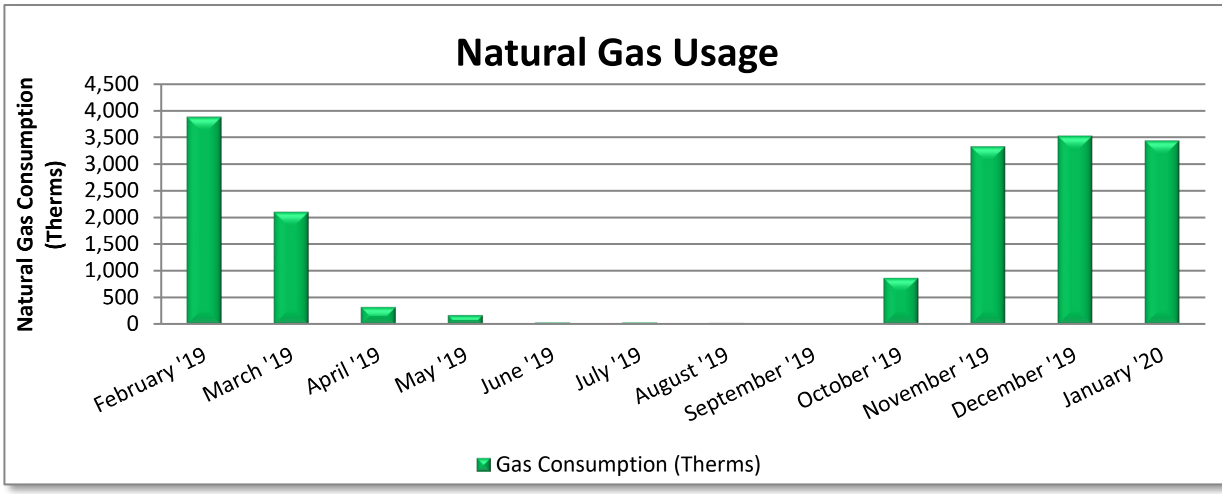
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
3/18/19	28	9,000	43	$281	$1,190
4/16/19	29	12,000	41	$281	$1,431
5/16/19	30	10,080	44	$280	$1,253
6/18/19	33	12,360	74	$426	$1,651
7/18/19	30	10,800	94	$557	$1,704
8/16/19	29	17,160	68	$387	$1,951
9/17/19	32	13,920	77	$444	$1,667
10/16/19	29	10,080	80	$434	$1,424
11/16/19	31	14,280	43	$434	$1,580
12/18/19	32	16,440	44	$434	$1,748
1/17/20	30	17,280	43	$212	$1,728
2/17/20	31	18,120	43	$212	$1,708
Totals	**364**	**161,520**	**94**	**$4,382**	**$19,036**
Annual	**365**	**161,964**	**94**	**$4,394**	**$19,088**

Notes:

- Peak demand of 94 kW occurred in July 2019.
- Average demand over the past 12 months was 58 kW.
- The average electric cost over the past 12 months was $0.118/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

NJ Natural Gas delivers natural gas under rate class Monthly 057M.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
3/14/19	31	3,885	$3,896
4/11/19	28	2,109	$2,313
5/13/19	32	331	$762
6/12/19	30	182	$633
7/13/19	31	43	$518
8/12/19	30	42	$516
9/10/19	29	30	$506
10/8/19	28	24	$428
11/7/19	30	876	$1,110
12/9/19	32	3,334	$3,388
1/9/20	31	3,535	$3,601
2/10/20	32	3,445	$3,411
Totals	**364**	**17,835**	**$21,081**
Annual	**365**	**17,884**	**$21,139**

Notes:

- The average gas cost for the past 12 months is $1.182/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	73

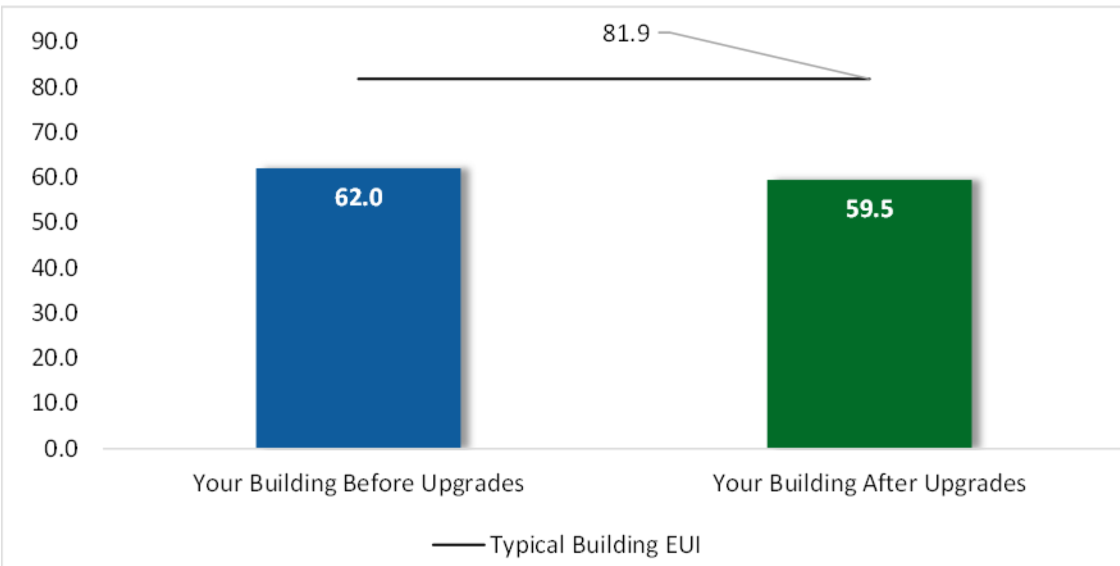


Figure 5 - Energy Use Intensity Comparison[3]

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

Energy use intensity (EUI) measures energy consumption per square foot and is the standard metric for comparing buildings' energy performance. A lower EUI means better performance and less energy consumed. A number of factors can cause a building to vary from the "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].

[4] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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			**882**	**0.0**	**0**	**$104**	**$594**	**$104**	**$490**	**4.7**	**888**
ECM 1	Install LED Fixtures	Yes	858	0.0	0	$101	$525	$100	$425	4.2	864
ECM 2	Retrofit Fixtures with LED Lamps	No	24	0.0	0	$3	$69	$4	$65	23.7	23
Lighting Control Measures			**10,017**	**3.1**	**-2**	**$1,156**	**$12,915**	**$3,955**	**$8,960**	**7.8**	**9,841**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	9,207	2.9	-2	$1,062	$9,990	$1,295	$8,695	8.2	9,046
ECM 4	Install High/Low Lighting Controls	Yes	810	0.3	0	$93	$2,925	$2,660	$265	2.8	795
Variable Frequency Drive (VFD) Measures			**15,500**	**1.8**	**0**	**$1,827**	**$15,920**	**$2,200**	**$13,720**	**7.5**	**15,609**
ECM 5	Install VFDs on Heating Water Pumps	Yes	15,500	1.8	0	$1,827	$15,920	$2,200	$13,720	7.5	15,609
HVAC System Improvements			**0**	**0.0**	**3**	**$31**	**$35**	**$12**	**$23**	**0.7**	**308**
ECM 6	Install Pipe Insulation	Yes	0	0.0	3	$31	$35	$12	$23	0.7	308
Domestic Water Heating Upgrade			**0**	**0.0**	**4**	**$49**	**$108**	**$60**	**$48**	**1.0**	**490**
ECM 7	Install Low-Flow DHW Devices	Yes	0	0.0	4	$49	$108	$60	$48	1.0	490
TOTALS			**26,399**	**5.0**	**5**	**$3,167**	**$29,572**	**$6,331**	**$23,241**	**7.3**	**27,136**

* - All incentives presented in this table are included as placeholders 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		**858**	**0.0**	**0**	**$101**	**$525**	**$100**	**$425**	**4.2**	**864**
ECM 1	Install LED Fixtures	858	0.0	0	$101	$525	$100	$425	4.2	864
ECM 2	Retrofit Fixtures with LED Lamps	0	0.0	0	$0	$0	$0	$0	0.0	0
Lighting Control Measures		**10,017**	**3.1**	**-2**	**$1,156**	**$12,915**	**$3,955**	**$8,960**	**7.8**	**9,841**
ECM 3	Install Occupancy Sensor Lighting Controls	9,207	2.9	-2	$1,062	$9,990	$1,295	$8,695	8.2	9,046
ECM 4	Install High/Low Lighting Controls	810	0.3	0	$93	$2,925	$2,660	$265	2.8	795
Variable Frequency Drive (VFD) Measures		**15,500**	**1.8**	**0**	**$1,827**	**$15,920**	**$2,200**	**$13,720**	**7.5**	**15,609**
ECM 5	Install VFDs on Heating Water Pumps	15,500	1.8	0	$1,827	$15,920	$2,200	$13,720	7.5	15,609
HVAC System Improvements		**0**	**0.0**	**3**	**$31**	**$35**	**$12**	**$23**	**0.7**	**308**
ECM 6	Install Pipe Insulation	0	0.0	3	$31	$35	$12	$23	0.7	308
Domestic Water Heating Upgrade		**0**	**0.0**	**4**	**$49**	**$108**	**$60**	**$48**	**1.0**	**490**
ECM 7	Install Low-Flow DHW Devices	0	0.0	4	$49	$108	$60	$48	1.0	490
TOTALS		**26,375**	**5.0**	**5**	**$3,164**	**$29,503**	**$6,327**	**$23,176**	**7.3**	**27,113**

* - All incentives presented in this table are included as placeholders 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		**882**	**0.0**	**0**	**$104**	**$594**	**$104**	**$490**	**4.7**	**888**
ECM 1	Install LED Fixtures	858	0.0	0	$101	$525	$100	$425	4.2	864
ECM 2	Retrofit Fixtures with LED Lamps	24	0.0	0	$3	$69	$4	$65	23.7	23

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 are proposed, we suggest converting all of a specific lighting type (e.g., linear fluorescent) to LED lamps to minimize the number of lamp types in use at the facility, which should help reduce future maintenance costs.

ECM 1: Install LED Fixtures

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

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

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

Affected building areas: exterior wallpacks.

ECM 2: Retrofit Fixtures with LED Lamps

Evaluate replacing CFL lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies.

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: storage rooms.

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		**10,017**	**3.1**	**-2**	**$1,156**	**$12,915**	**$3,955**	**$8,960**	**7.8**	**9,841**
ECM 3	Install Occupancy Sensor Lighting Controls	9,207	2.9	-2	$1,062	$9,990	$1,295	$8,695	8.2	9,046
ECM 4	Install High/Low Lighting Controls	810	0.3	0	$93	$2,925	$2,660	$265	2.8	795

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.

<u>ECM 3: Install Occupancy Sensor Lighting Controls</u>

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: classrooms, offices, library, and multipurpose space.

<u>ECM 4: Install High/Low Lighting Controls</u>

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.

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

Affected building areas: corridors.

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 an occupant approaches.

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		**15,500**	**1.8**	**0**	**$1,827**	**$15,920**	**$2,200**	**$13,720**	**7.5**	**15,609**
ECM 5	Install VFDs on Heating Water Pumps	15,500	1.8	0	$1,827	$15,920	$2,200	$13,720	7.5	15,609

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 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: all heating water pumps.

4.4 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		**0**	**0.0**	**3**	**$31**	**$35**	**$12**	**$23**	**0.7**	**308**
ECM 6	Install Pipe Insulation	0	0.0	3	$31	$35	$12	$23	0.7	308

ECM 6: Install Pipe Insulation

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

Affected Systems: domestic hot water piping.

4.5 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**	**4**	**$49**	**$108**	**$60**	**$48**	**1.0**	**490**
ECM 7	Install Low-Flow DHW Devices	0	0.0	4	$49	$108	$60	$48	1.0	490

ECM 7: 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.

4.6 Measures for Future Consideration

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

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

- evaluate these measures further
- develop firm costs
- determine measure savings
- prepare detailed implementation plans.

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

Window Replacements

Energy efficient windows are an important consideration when improving the building envelope. The heat transfer through the glass panes is responsible for a significant portion of the facility's heating and cooling energy consumption. We recommend replacing single pane windows with double pane windows and considering models that are gas-filled with low-e coatings to reduce heat loss. Windows should be selected with low- U-factors to maximize energy savings. The U-factor is the rate at which the window conducts non-solar heat flow and is a key indicator of performance. The lower the U-factor, the higher the efficiency of the window. Window frames and sashes should be efficient as well. If metal frames are specified or required by code, the frame extrusions should have a thermal break to reduce conduction through the frame. As part of the installation, the window frames should be properly sealed with caulk materials to ensure the mitigation of air infiltration. Building envelopes that limit air infiltration and that have adequate fenestrations play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort. Window system replacement is an expensive upgrade that generally involves architectural elements. We recommend this as a measure for further study.

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 between 5% to 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, planned capital upgrades, and 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 will 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 can't manage what you don't 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 and thus providing energy savings and increased occupant comfort.

Window Treatments/Coverings

Use high-reflectivity films or cover windows with shades or shutters to reduce solar heat gain and reduce the load on cooling and heating systems. Older, single pane windows and east or west-facing windows are especially prone to solar heat gain. In addition, use shades or shutters at night during cold weather to reduce heat loss.

[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.

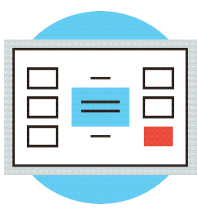
Motor Maintenance

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.

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.

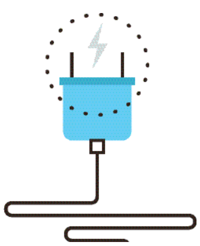
Water Heater Maintenance

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

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

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

Plug Load Controls



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

Computer Power Management Software

Many computers consume power during nights, weekends, and holidays. Screen savers are commonly confused as a power management strategy. This contributes to avoidable, excessive electrical energy consumption. There are innovative power management software packages available that are designed to deliver significant energy saving and provide ongoing tracking measurements. A central power management platform helps enforce energy savings policies as well as identify and eliminate underutilized devices.

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[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.

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 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.

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

[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 no potential for installing a PV array.

This facility does not appear to meet the minimum criteria for a cost-effective solar PV installation. To be cost-effective, a solar PV array needs certain minimum criteria, such as sufficient and sustained electric demand and sufficient flat or south-facing rooftop or other unshaded space on which to place the PV panels.

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.

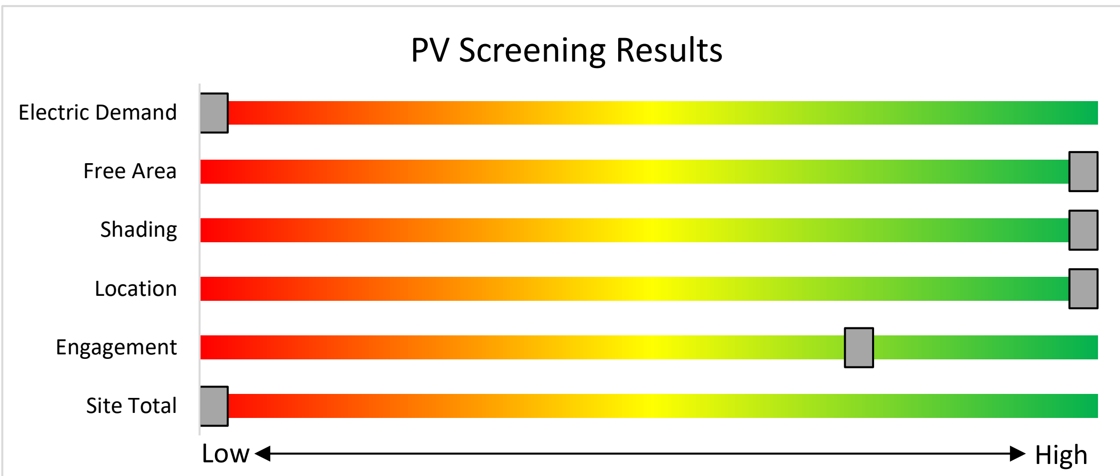

Figure 8 - Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

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

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

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

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

6.2 Combined Heat and Power

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

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

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

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

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

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

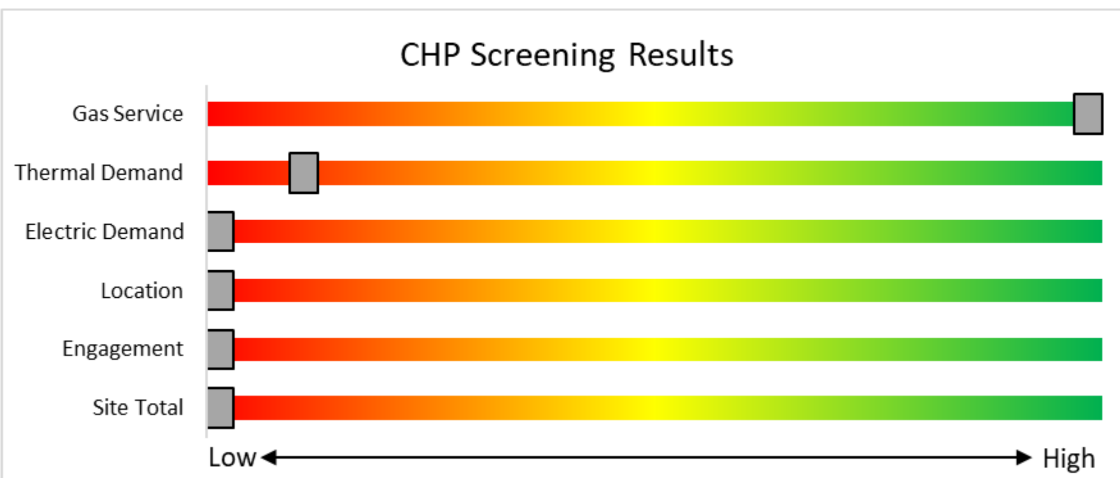

Figure 9 - Combined Heat and Power Screening

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

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](#).

8 New Jersey's Clean Energy Programs

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

8.1 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 Fuel Cells with Heat Recovery	>3 MW	$350		
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 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.

8.2 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 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 (ESP) 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 description 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.

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.

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. 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 includes the review of multiple bids for project work, incorporate potential operational & maintenance (O&M) cost savings and maximize your incentive potential.

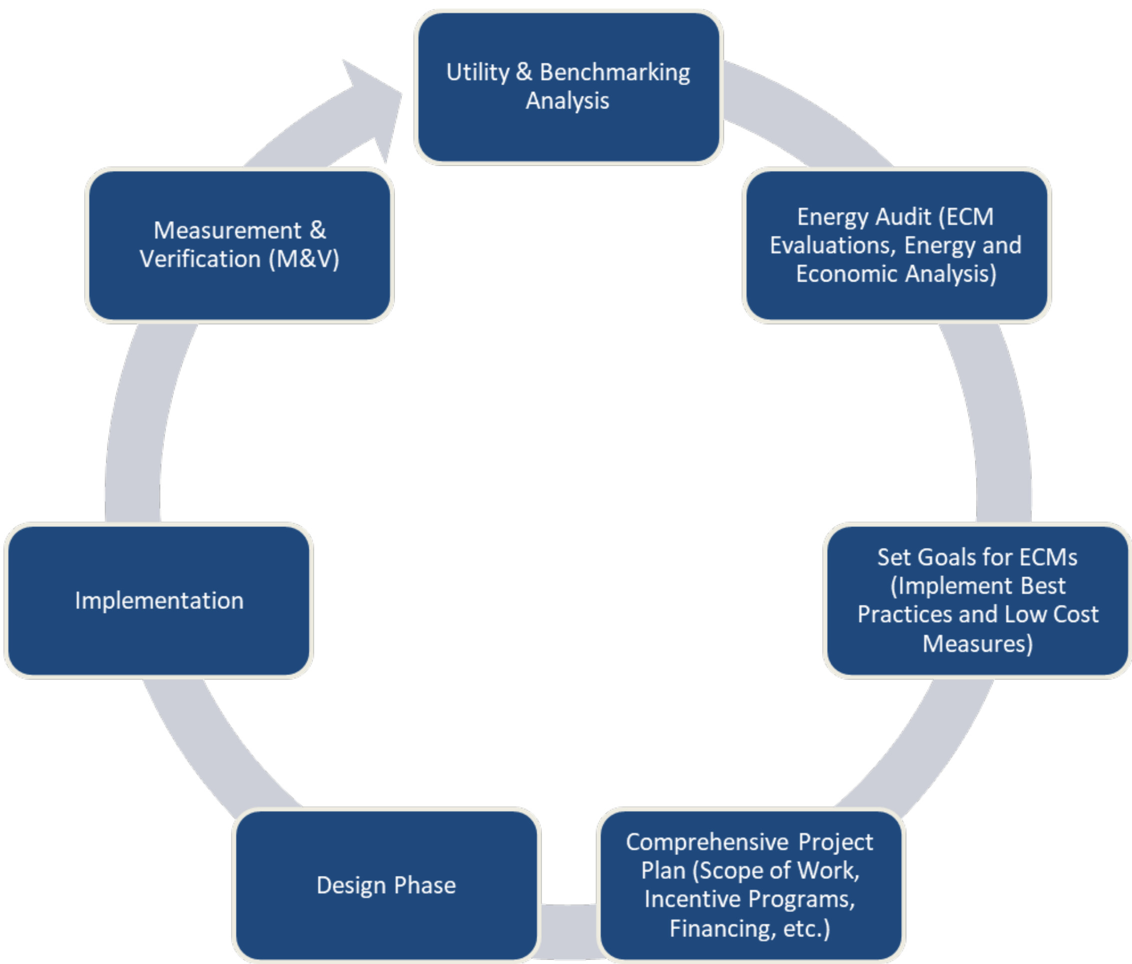

Figure 30 – Project Development Cycle

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. So, 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 that fluctuate monthly. The utility provides basic gas supply service (BGSS) 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].

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[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
Classroom 1	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 1	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Wall Switch	S	20	2,090	3	None	Yes	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Occupancy Sensor	20	1,442	0.0	14	0	$2	$0	$0	0.0
Classroom 1	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 10	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 11	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 12	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 13	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 14	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 15	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 16	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 16	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 17	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 18	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	1,442		None	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.0	0	0	$0	$0	$0	0.0
Classroom 2	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Wall Switch	S	20	2,090	3	None	Yes	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Occupancy Sensor	20	1,442	0.0	14	0	$2	$0	$0	0.0
Classroom 2	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 20	1	LED Lamps: (1) 6W G25 Screw-In Lamp	Wall Switch	S	6	2,090	3	None	Yes	1	LED Lamps: (1) 6W G25 Screw-In Lamp	Occupancy Sensor	6	1,442	0.0	4	0	$0	$0	$0	0.0
Classroom 20	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090		None	No	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.0	0	0	$0	$0	$0	0.0
Classroom 21	1	LED Lamps: (1) 6W G25 Screw-In Lamp	Wall Switch	S	6	2,090	3	None	Yes	1	LED Lamps: (1) 6W G25 Screw-In Lamp	Occupancy Sensor	6	1,442	0.0	4	0	$0	$0	$0	0.0
Classroom 21	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	331	0	$38	$270	$35	6.2
Classroom 22	1	LED Lamps: (1) 6W G25 Screw-In Lamp	Wall Switch	S	6	2,090	3	None	Yes	1	LED Lamps: (1) 6W G25 Screw-In Lamp	Occupancy Sensor	6	1,442	0.0	4	0	$0	$0	$0	0.0
Classroom 22	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	331	0	$38	$270	$35	6.2
Classroom 23	1	LED Lamps: (1) 6W G25 Screw-In Lamp	Wall Switch	S	6	2,090	3	None	Yes	1	LED Lamps: (1) 6W G25 Screw-In Lamp	Occupancy Sensor	6	1,442	0.0	4	0	$0	$0	$0	0.0
Classroom 23	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	331	0	$38	$270	$35	6.2
Classroom 24	1	LED Lamps: (1) 6W G25 Screw-In Lamp	Wall Switch	S	6	2,090	3	None	Yes	1	LED Lamps: (1) 6W G25 Screw-In Lamp	Occupancy Sensor	6	1,442	0.0	4	0	$0	$0	$0	0.0
Classroom 24	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	331	0	$38	$270	$35	6.2

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 25	1	LED Lamps: (1) 6W G25 Screw-In Lamp	Wall Switch	S	6	2,090	3	None	Yes	1	LED Lamps: (1) 6W G25 Screw-In Lamp	Occupancy Sensor	6	1,442	0.0	4	0	$0	$0	$0	0.0
Classroom 25	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	331	0	$38	$270	$35	6.2
Classroom 3	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Wall Switch	S	20	2,090	3	None	Yes	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Occupancy Sensor	20	1,442	0.0	14	0	$2	$0	$0	0.0
Classroom 3	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 4	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Wall Switch	S	20	2,090	3	None	Yes	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Occupancy Sensor	20	1,442	0.0	14	0	$2	$0	$0	0.0
Classroom 4	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 5	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Wall Switch	S	20	2,090	3	None	Yes	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Occupancy Sensor	20	1,442	0.0	14	0	$2	$0	$0	0.0
Classroom 5	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 6	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Wall Switch	S	20	2,090	3	None	Yes	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Occupancy Sensor	20	1,442	0.0	14	0	$2	$0	$0	0.0
Classroom 6	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 8	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Classroom 9	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.1	310	0	$36	$270	$35	6.6
Conference 1	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	2,090	3	None	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,442	0.1	165	0	$19	$270	$35	12.3
Conference 2	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	2,090	3	None	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,442	0.1	165	0	$19	$270	$35	12.3
Corridor 1	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 1	76	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,090	4	None	Yes	76	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,442	0.2	785	0	$91	$2,925	$2,660	2.9
Corridor 1	1	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	2,090	4	None	Yes	1	LED - Linear Tubes: (4) 2' Lamps	High/Low Control	34	1,442	0.0	24	0	$3	$0	$0	0.0
Corridor 2 new wing	8	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	8	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 2 new wing	2	LED Lamps: (1) 6W G25 Screw-In Lamp	Occupancy Sensor	S	6	1,442		None	No	2	LED Lamps: (1) 6W G25 Screw-In Lamp	Occupancy Sensor	6	1,442	0.0	0	0	$0	$0	$0	0.0
Corridor 2 new wing	6	LED Lamps: (2) 6W G25 Screw-In Lamps	Occupancy Sensor	S	6	1,442		None	No	6	LED Lamps: (2) 6W G25 Screw-In Lamps	Occupancy Sensor	6	1,442	0.0	0	0	$0	$0	$0	0.0
Corridor 2 new wing	16	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	1,442		None	No	16	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,442	0.0	0	0	$0	$0	$0	0.0
Corridor 2 new wing	25	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	1,442		None	No	25	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.0	0	0	$0	$0	$0	0.0
Exterior 2	1	Metal Halide: (1) 100W Lamp	Timeclock		128	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	30	4,380	0.0	429	0	$51	$263	$50	4.2
Exterior 2	1	Metal Halide: (1) 100W Lamp	Timeclock		128	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	30	4,380	0.0	429	0	$51	$263	$50	4.2
Exterior 2	3	LED Lamps: (1) 10W A19 Screw-In Lamp	Timeclock		10	4,380		None	No	3	LED Lamps: (1) 10W A19 Screw-In Lamp	Timeclock	10	4,380	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior 2	2	LED - Fixtures: Cobrahead Pole Mount	Timeclock		120	4,380		None	No	2	LED - Fixtures: Cobrahead Pole Mount	Timeclock	120	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior 2	3	LED Lamps: (1) 15W PAR30 Screw-In Lamp	Timeclock		15	4,380		None	No	3	LED Lamps: (1) 15W PAR30 Screw-In Lamp	Timeclock	15	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior 2	2	LED - Fixtures: Wall Pack	Timeclock		15	4,380		None	No	2	LED - Fixtures: Wall Pack	Timeclock	15	4,380	0.0	0	0	$0	$0	$0	0.0
Garage 1	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,090		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,090	0.0	0	0	$0	$0	$0	0.0
Janitorial 1	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,090		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,090	0.0	0	0	$0	$0	$0	0.0
Janitorial 2	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,090		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,090	0.0	0	0	$0	$0	$0	0.0
Janitorial 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
Janitorial 3	3	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	2,090	3	None	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,442	0.0	124	0	$14	$270	$35	16.4
Library 1	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
Library 1	24	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.2	496	0	$57	$540	$70	8.2
Library 1	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	2,090	3	None	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,442	0.1	279	0	$32	$270	$35	7.3
Library 1	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	2,090	3	None	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,442	0.0	83	0	$10	$270	$35	24.6
Mechanical 1	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
Mechanical 1	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	800		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	800	0.0	0	0	$0	$0	$0	0.0
Multipurpose 1	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Multipurpose 1	4	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,090	3	None	Yes	4	LED Lamps: (1) 10W A19 Screw-In Lamp	Occupancy Sensor	10	1,442	0.0	29	0	$3	$0	$0	0.0
Multipurpose 1	8	LED Lamps: (1) 15W PAR30 Screw-In Lamp	Wall Switch	S	15	2,090	3	None	Yes	8	LED Lamps: (1) 15W PAR30 Screw-In Lamp	Occupancy Sensor	15	1,442	0.0	86	0	$10	$270	$35	23.8
Multipurpose 1	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.0	21	0	$2	$0	$0	0.0
Multipurpose 1	1	LED - Linear Tubes: (6) 4' Lamps	Wall Switch	S	87	2,090	3	None	Yes	1	LED - Linear Tubes: (6) 4' Lamps	Occupancy Sensor	87	1,442	0.0	62	0	$7	$270	$35	32.8
Office - Enclosed 1	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,090	3	None	Yes	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Occupancy Sensor	10	1,442	0.0	7	0	$1	$0	$0	0.0
Office - Enclosed 1	6	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	2,090	3	None	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,442	0.1	248	0	$29	$270	$35	8.2
Office - Enclosed 2	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	2,090	3	None	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,442	0.0	83	0	$10	$270	$35	24.6
Office - Open Plan 1	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.0	21	0	$2	$0	$0	0.0
Office - Open Plan 1	6	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	2,090	3	None	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,442	0.1	248	0	$29	$270	$35	8.2
Restroom - Female 1	5	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	2,090	3	None	Yes	5	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	1,442	0.0	121	0	$14	$270	$35	16.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Restroom - Female 1 (1)	5	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	2,090	3	None	Yes	5	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	1,442	0.0	121	0	$14	$270	$35	16.8
Restroom - Female 2	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.0	62	0	$7	$270	$35	32.8
Restroom - Male 2	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.0	62	0	$7	$270	$35	32.8
Restroom - Unisex 1	2	LED - Fixtures: Ceiling Mount	Wall Switch	S	15	2,090		None	No	2	LED - Fixtures: Ceiling Mount	Wall Switch	15	2,090	0.0	0	0	$0	$0	$0	0.0
Restroom - Unisex 1	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,090		None	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,090	0.0	0	0	$0	$0	$0	0.0
Storage 1	2	Compact Fluorescent: (1) 32W Spiral Plug-In Lamp	Wall Switch	S	32	600	2	Relamp	No	2	LED Lamps: Plug-In Lamp	Wall Switch	23	600	0.0	12	0	$1	$34	$2	23.7
Storage 1	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	600		None	No	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	600	0.0	0	0	$0	$0	$0	0.0
Storage 1	2	Compact Fluorescent: (1) 32W Spiral Plug-In Lamp	Wall Switch	S	32	600	2	Relamp	No	2	LED Lamps: Plug-In Lamp	Wall Switch	23	600	0.0	12	0	$1	$34	$2	23.7
Storage 1	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	600		None	No	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	600	0.0	0	0	$0	$0	$0	0.0
Storage 3	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	600		None	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	600	0.0	0	0	$0	$0	$0	0.0
Storage 4	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	600		None	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	600	0.0	0	0	$0	$0	$0	0.0
Storage 5	4	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	600		None	No	4	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	600	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
Restroom - Female 1 (1)	5	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	2,090	3	None	Yes	5	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	1,442	0.0	121	0	$14	$270	$35	16.8
Restroom - Female 2	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.0	62	0	$7	$270	$35	32.8
Restroom - Male 2	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,090	3	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,442	0.0	62	0	$7	$270	$35	32.8
Restroom - Unisex 1	2	LED - Fixtures: Ceiling Mount	Wall Switch	S	15	2,090		None	No	2	LED - Fixtures: Ceiling Mount	Wall Switch	15	2,090	0.0	0	0	$0	$0	$0	0.0
Restroom - Unisex 1	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,090		None	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,090	0.0	0	0	$0	$0	$0	0.0
Storage 1	2	Compact Fluorescent: (1) 32W Spiral Plug-In Lamp	Wall Switch	S	32	600	2	Relamp	No	2	LED Lamps: Plug-In Lamp	Wall Switch	23	600	0.0	12	0	$1	$34	$2	23.7
Storage 1	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	600		None	No	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	600	0.0	0	0	$0	$0	$0	0.0
Storage 1	2	Compact Fluorescent: (1) 32W Spiral Plug-In Lamp	Wall Switch	S	32	600	2	Relamp	No	2	LED Lamps: Plug-In Lamp	Wall Switch	23	600	0.0	12	0	$1	$34	$2	23.7
Storage 1	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	600		None	No	2	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	600	0.0	0	0	$0	$0	$0	0.0
Storage 3	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	600		None	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	600	0.0	0	0	$0	$0	$0	0.0
Storage 4	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	600		None	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	600	0.0	0	0	$0	$0	$0	0.0
Storage 5	4	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	600		None	No	4	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	600	0.0	0	0	$0	$0	$0	0.0

Motor Inventory & Recommendations

Existing Conditions											Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical 1	1	1	Exhaust Fan	0.5	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 1	Roof	5	Exhaust Fan	0.3	65.0%	No	Fantech	5DDU18CA	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 1	Roof	6	Exhaust Fan	0.3	65.0%	No	Dayton	4HX83A	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 1	Roof	12	Exhaust Fan	0.2	65.0%	No	Cook	80ACE-80C2B	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior 1	Roof	2	Exhaust Fan	0.3	65.0%	No	Cook		W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical 1	1	2	Heating Hot Water Pump	3.0	82.5%	No	Baldor	JMM3211T	W	2,745	5	No	89.5%	Yes	2	0.8	6,371	0	$751	$7,768	$400	9.8
Mechanical 1	1	2	Heating Hot Water Pump	5.0	87.5%	No	Marathon	184TTDB4026BR	B	2,745	5	No	89.5%	Yes	2	1.1	9,129	0	$1,076	$8,152	$1,800	5.9
Mechanical 1	1-DHW	1	DHW Circulation Pump	0.1	65.0%	No	Bell & Gossett	MRP58JV-758	W	8,760		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Interior	Classrooms and common areas	45	Ventilation Fan	0.2	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical 1	Controls	2	Air Compressor	0.8	70.0%	No				800		No	70.0%	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
Classrooms	Classroom Cooling	25	Window AC	1.96		9.80		Freidrich	CP24G30A	W		No							0.0	0	0	$0	$0	$0	0.0
Classrooms	Classroom Cooling	2	Window AC	1.54		10.70		Frigidaire	FAS186N2A2	W		No							0.0	0	0	$0	$0	$0	0.0
Offices	Office Conditioning	3	Unit Ventilator	1.00	3.14	9.80	1 COP			W		No							0.0	0	0	$0	$0	$0	0.0

Space Heating Boiler Inventory & Recommendations

Existing Conditions								Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical 1	Whole Building	2	Condensing Hot Water Boiler	1,860	Aerco	BMK2.0	W		No						0.0	0	0	$0	$0	$0	0.0

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical 1	DHW System	6	6	1.00	0.0	0	3	$31	$35	$12	0.7

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
Mechanical 1	Whole Building	1	Storage Tank Water Heater (≤ 50 Gal)	AO Smith	GCG 50 400	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	7	15	Faucet Aerator (Lavatory)	1.50	0.50	0.0	0	4	$49	$108	$60	1.0

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Classroom 8	1	Coffee Machine	900	No		
Conference 1	1	Desktop	270	No		
Conference 2	1	Desktop	270	No		
Library 1	2	Desktop	270	No		
Office - Open Plan 1	2	Desktop	270	No		
Multipurpose 1	4	Fan (Large)	500	No		
Storage 3	1	Fan (Portable)	200	No		
Classroom 1	1	Laptop	75	Yes		
Classroom 2	1	Laptop	75	Yes		
Classroom 3	1	Laptop	75	Yes		
Classroom 4	1	Laptop	75	Yes		
Classroom 5	1	Laptop	75	Yes		
Classroom 6	1	Laptop	75	Yes		
Conference 2	1	Laptop	75	Yes		
Office - Enclosed 2	1	Laptop	75	Yes		
Classroom 8	2	Microwave	1,000	No		
Office - Open Plan 1	1	Paper Shredder	200	No		
Classroom 8	2	Printer (Medium/Small)	600	No		
Conference 1	1	Printer (Medium/Small)	600	No		
Conference 2	1	Printer (Medium/Small)	600	No		
Library 1	1	Printer (Medium/Small)	600	No		
Office - Open Plan 1	2	Printer (Medium/Small)	600	No		
Storage 3	1	Printer/Copier (Large)	2,400	No		
Storage 4	1	Printer/Copier (Large)	2,400	No		
Classroom 1	1	Projector	350	No		
Classroom 10	1	Projector	350	No		
Classroom 11	1	Projector	350	No		
Classroom 12	1	Projector	350	No		
Classroom 13	1	Projector	350	No		
Classroom 14	1	Projector	350	No		
Classroom 15	1	Projector	350	No		
Classroom 16	1	Projector	350	No		
Classroom 17	1	Projector	350	No		
Classroom 2	1	Projector	350	No		
Classroom 20	1	Projector	350	No		

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Classroom 21	1	Projector	350	No		
Classroom 22	1	Projector	350	No		
Classroom 23	1	Projector	350	No		
Classroom 24	1	Projector	350	No		
Classroom 25	1	Projector	350	No		
Classroom 3	1	Projector	350	No		
Classroom 4	1	Projector	350	No		
Classroom 5	1	Projector	350	No		
Classroom 6	1	Projector	350	No		
Classroom 9	1	Projector	350	No		
Library 1	2	Projector	350	No		
Classroom 8	1	Refrigerator (Residential)	463	No		
Storage 1	1	Refrigerator (Residential)	463	No		
Office - Enclosed 2	1	Television	133	No		
Classroom 8	1	Toaster Oven	1,500	No		
Office - Open Plan 1	1	Water Cooler	600	No		
Corridor 1	1	Water Fountain	120	No		
Corridor 2 new wing	1	Water Fountain	120	No		
Classrooms	144	Student Laptops	37	No		

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

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]

Intervale Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 37,731
Built: 1965

For Year Ending: January 31, 2020
Date Generated: June 11, 2021

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
Intervale Elementary School 60 Pitt Road PO Box 52 Boonton, New Jersey 07005	Parsippany - Troy Hills Board of Education 292 Parsippany Road Parsippany, NJ 07054 (973) 263-7200	Dr. Alfred Savio 292 Parsippany Road Parsippany, NJ 07054 (973) 263-7200 x 7212 asavio@pthsd.net

Property ID: 16057043

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
63 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	553,101 (23%)
Natural Gas (kBtu)	1,825,742 (77%)

Source EUI
91.9 kBtu/ft²

National Median Comparison

National Median Site EUI (kBtu/ft²)	81.9
National Median Source EUI (kBtu/ft²)	119.3
% Diff from National Median Source EUI	-23%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	150

Signature & Stamp of Verifying Professional

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

LP Signature: ____________________Date: __________

Licensed Professional

____ ________
,
(____)____-______
____

Professional Engineer or Registered Architect Stamp (if applicable)

APPENDIX C: GLOSSARY

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

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

SEER	*Seasonal energy efficiency ratio:* a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	*Statement of energy performance:* a summary document from the ENERGY STAR® Portfolio Manager®.
Simple Payback	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
SREC	*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.