Local Government Energy Audit:

Energy Audit Report

Lawrence Intermediate School

61 Eggert Crossing Road

Lawrenceville, New Jersey 08648

Lawrence Township BOE

December 6, 2018

Final Report by:

TRC Energy Services

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Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate saving are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services (TRC) and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

Table of Contents

Appendix A: Equipment Inventory & Recommendations

Appendix B: ENERGY STAR® Statement of Energy Performance

Table of Figures

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Lawrence Intermediate School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey public school districts in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Lawrence Intermediate School is a 101,000 square foot facility comprised of classrooms on two floors, a library, gymnasium, locker rooms, cafeteria, kitchen and offices. The intermediate school is in full operation September through June, Monday through Friday between 7:00 AM and 3:30 PM. However, the building remains open between the hours of 6:00 AM and 11:00 PM. Large areas such as the commons/cafeteria, gymnasium, pool and auditorium are occupied on weekday evenings between 3:00 PM and 11:00 PM. The intermediate school is utilized on Saturdays from November to April every year for sports and recreational activities between 7:00 AM to 4:00 PM. There is summer school in July and August when the library, cafeteria and classrooms are occupied. Summer school is typically from 8:00 AM to 12:00 noon. The kitchen serves lunch for every student each school day. The kitchen has walk-in refrigeration equipment.

The intermediate school is 100% heated and about 30% cooled. Roof top equipment serves the gymnasium, cafeteria, library, some classrooms and offices. There are unitary air-conditioning (AC) systems which serve many classrooms during summer school. The hydronic heating system boilers and existing HVAC controls are aging and inefficient. There are equipment and controls which are in need of replacement and/or upgrade. One of the large cast iron boilers operates throughout the entire year because it serves the domestic hot water needs of the facility. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC recommends eight high priority measures which together represent an opportunity for Lawrence Intermediate School to reduce annual energy costs by roughly $13,853 and annual greenhouse gas emissions by 121,986 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 5.0 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 3, respectively. Together these measures represent an opportunity to reduce Lawrence Intermediate School's annual energy use by 7%.

TRC evaluated a total of 18 measures which together represent an opportunity for Lawrence Intermediate School to reduce annual energy costs by roughly $30,527 and annual greenhouse gas emissions by 304,332 lbs CO_2e. We estimate that if all measures were implemented, the project would pay for itself in 13.1 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Lawrence High School's annual energy use by 22%.

Figure 1 – Previous 12 Month Utility Costs

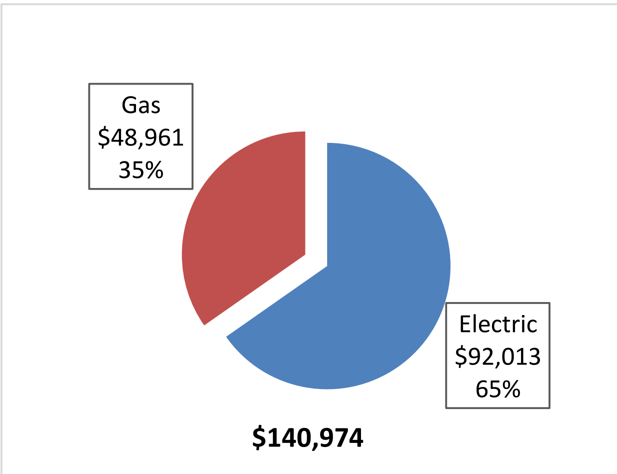


Figure 3 – Potential Post-Implementation Costs (High Priority Measures)

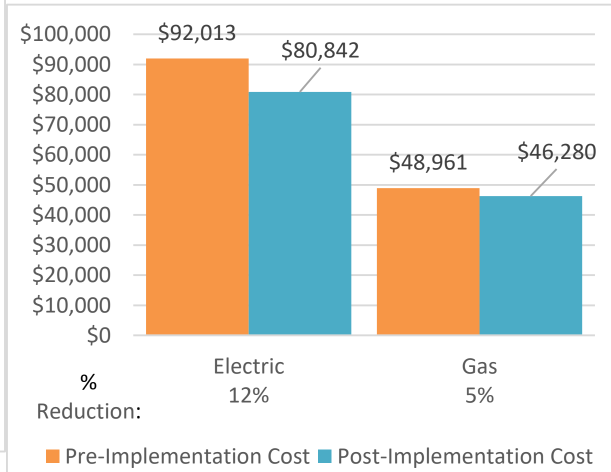
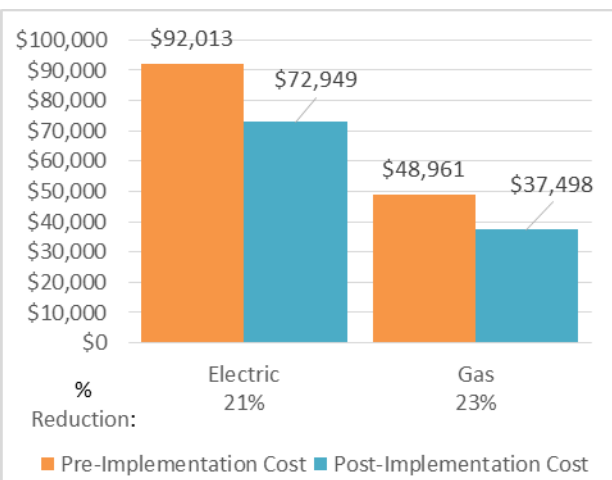


Figure 2 – Potential Post-Implementation Costs (All Evaluated Measures)



A detailed description of Lawrence Intermediate School's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 4. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 4 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**67,472**	**27.5**	**0.0**	**$8,978**	**$70,185**	**$14,060**	**$56,125**	**6.3**	**67,944**
ECM 1	Install LED Fixtures	Yes	9,264	1.1	0.0	$1,233	$19,319	$2,000	$17,319	14.0	9,329
ECM 2	Retrofit Fixtures with LED Lamps	Yes	58,208	26.4	0.0	$7,745	$50,865	$12,060	$38,805	5.0	58,615
Lighting Control Measures			**1,874**	**0.5**	**0.0**	**$249**	**$3,900**	**$315**	**$3,585**	**14.4**	**1,887**
	Install Occupancy Sensor Lighting Controls	No	769	0.3	0.0	$102	$2,430	$315	$2,115	20.7	774
ECM 3	Install Daylight Dimming Controls	Yes	394	0.0	0.0	$52	$270	$0	$270	5.1	397
ECM 4	Install High/Low Lighitng Controls	Yes	711	0.2	0.0	$95	$1,200	$0	$1,200	12.7	716
Motor Upgrades			**1,023**	**0.8**	**0.0**	**$136**	**$17,214**	**$0**	**$17,214**	**126.5**	**1,030**
	Premium Efficiency Motors	No	1,023	0.8	0.0	$136	$17,214	$0	$17,214	126.5	1,030
Variable Frequency Drive (VFD) Measures			**18,272**	**20.3**	**0.0**	**$2,431**	**$52,539**	**$4,800**	**$47,739**	**19.6**	**18,399**
	Install VFDs on Constant Volume (CV) HVAC	No	12,227	16.8	0.0	$1,627	$39,310	$4,800	$34,510	21.2	12,312
	Install VFDs on Hot Water Pumps	No	4,535	1.9	0.0	$603	$7,214	$0	$7,214	12.0	4,566
	Install Boiler Draft Fan VFDs	No	1,510	1.7	0.0	$201	$6,015	$0	$6,015	29.9	1,521
Electric Unitary HVAC Measures			**24,000**	**17.5**	**0.0**	**$3,193**	**$89,677**	**$3,836**	**$85,841**	**26.9**	**24,168**
	Install High Efficiency Electric AC	No	24,000	17.5	0.0	$3,193	$89,677	$3,836	$85,841	26.9	24,168
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**884.7**	**$7,419**	**$105,576**	**$7,891**	**$97,685**	**13.2**	**103,589**
	Install High Efficiency Hot Water Boilers	No	0	0.0	884.7	$7,419	$105,576	$7,891	$97,685	13.2	103,589
HVAC System Improvements			**25,317**	**2.6**	**0.0**	**$3,369**	**$6,719**	**$1,750**	**$4,969**	**1.5**	**25,494**
	Install Dual Enthalpy Outside Economizer Control	No	11,601	2.6	0.0	$1,544	$4,000	$1,750	$2,250	1.5	11,683
ECM 5	Implement Demand Control Ventilation	Yes	13,716	0.0	0.0	$1,825	$2,719	$0	$2,719	1.5	13,812
Domestic Water Heating Upgrade			**0**	**0.0**	**230.9**	**$1,936**	**$75,445**	**$1,400**	**$74,045**	**38.2**	**27,037**
	Install High Efficiency Gas Water Heater	No	0	0.0	162.5	$1,363	$75,165	$1,400	$73,765	54.1	19,026
ECM 6	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	68.4	$574	$280	$0	$280	0.5	8,011
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$214**	**$230**	**$50**	**$180**	**0.8**	**1,623**
ECM 7	Vending Machine Control	Yes	1,612	0.0	0.0	$214	$230	$50	$180	0.8	1,623
Custom Measures			**3,708**	**0.0**	**251.3**	**$2,601**	**$12,110**	**$0**	**$12,110**	**4.7**	**33,161**
ECM 8	Building Envelope Weatherization	Yes	57	0.0	251.3	$2,115	$8,200	$0	$8,200	3.9	29,484
	Computer Power Management Software	No	3,652	0.0	0.0	$486	$3,910	$0	$3,910	8.0	3,677
TOTALS FOR HIGH PRIORITY MEASURES			**83,962**	**27.7**	**319.7**	**$13,853**	**$83,083**	**$14,110**	**$68,973**	**5.0**	**121,986**
TOTALS FOR ALL EVALUATED MEASURES			**143,278**	**69.3**	**1,366.9**	**$30,527**	**$433,595**	**$34,102**	**$399,493**	**13.1**	**304,332**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

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

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Motor Upgrades generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium®). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

Gas Heating (HVAC/Process) measures generally involve replacing older inefficient hydronic heating systems with modern energy efficient systems. Gas heating systems can provide equivalent heating compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel demands for heating, due to improved combustion and heat transfer efficiency.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperature conditions. These measures save energy by reducing the demand on HVAC systems and the amount of time systems operate.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlet when not in use.

Energy Efficient Practices

TRC also identified 14 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Lawrence Intermediate School include:

- Reduce Air Leakage
- Close Doors and Windows
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Ensure Economizers are Functioning Properly
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these energy efficient practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Lawrence Intermediate School. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

For details on our evaluation and on-site generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- Direct Install
- Pay for Performance - Existing Building (P4P EB)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 4 are based on the SmartStart program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated Direct Install contractor and, in most cases, they will perform the installation work.

Larger facilities with an interest in a more comprehensive whole building approach to energy conservation should consider participating in the Pay for Performance (P4P) program. Projects eligible for this project program must meet minimum savings requirements. Final incentives are calculated based on actual measured performance achieved at the end of the project. The application process is more involved, and it requires working with a qualified P4P contractor, but the process may result in greater energy savings overall and more lucrative incentives, up to 50% of project’s total cost.

There is a potential for the intermediate school to qualify for the P4P program. However, this requires total source savings for measures to be greater than 15% and limits the contribution lighting savings can be to 50% of the total source savings. The energy and economic results provided demonstrate that the recommended project including only high priority measures would not meet these requirements, however the total project including all evaluated measures would. Additional opportunities may also be identified by an ESCO moving forward**.**

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (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. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce 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. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage 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 DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 Facility Information and Existing Conditions

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
James Alberti	Director of Facilities	JAlberti@ltps.org	609-847-9605
Tom Eldridge	Business Administrator	TEldridge@ltps.org	609-649-9109
TRC Energy Services			
Aimee Lalonde	Auditor	ALalonde@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On July 18, 2018, TRC performed an energy audit at Lawrence Intermediate School located in Lawrenceville, New Jersey. TRC's team met with the head custodian to review the facility operations and help focus our investigation on specific energy-using systems.

Lawrence Intermediate School is a 101,000 square foot facility comprised of classrooms on two floors, a library, gymnasium, locker rooms, cafeteria, kitchen and offices. The kitchen serves lunch for every student each school day. The kitchen has walk-in refrigeration equipment.

The building was constructed in 1970. The intermediate school is 100% heated and about 30% cooled. Roof top equipment serves the gymnasium, cafeteria, library, some classrooms and offices. There are unitary air-conditioning (AC) systems which serve many classrooms during summer school. Cooling equipment varies in condition. However, the site is interested in a new boilers and HVAC controls. The hydronic heating system boilers and existing HVAC controls are aging and inefficient. One of the large cast iron boilers operates throughout the entire year because it serves the domestic hot water needs of the facility. The unit ventilators throughout the building vary in condition. HVAC equipment and controls are in need of replacement and have been evaluated within this energy audit report.

2.3 Building Occupancy

The intermediate school is in full operation September through June, Monday through Friday between 7:00 AM and 3:30 PM. However, the building remains open between the hours of 6:00 AM and 11:00 PM. Large areas such as the commons/cafeteria, gymnasium, pool and auditorium are occupied on weekday evenings between 3:00 PM and 11:00 PM. The intermediate school is utilized on Saturdays from November to April every year for sports and recreational activities between 7:00 AM to 4:00 PM. There is summer school in July and August when the library, cafeteria and classrooms are occupied. Summer school operates typically from 8:00 AM to 12:00 PM. The typical schedule is presented in the table below. During a typical day, the facility is occupied by approximately 119 staff and 903 students.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Intermediate School	Weekday	7:00 AM to 3:30 PM
Sports/Recreation	Weekend	7:00 AM to 4:00 PM
Intermediate School (Custodial Staff)	Weekday	6:00 AM to 11:00 PM
Summer School		
Summer School (Classrooms, Library, Cafe)	Weekday	8:00 AM to 12:00 PM
Summer School (Classrooms, Library, Cafe)	Weekend	8:00 AM to 12:00 PM

2.4 Building Envelope

The building is constructed of concrete block, and structural steel with a stone or brick facade. The building has flat roof sections which are covered with stone or a black membrane and appear to be in fair condition. The building has double pane, metal framed windows which are operable and in good condition. The frames of the windows, skylights and wall cracks show signs of excessive air infiltration. The exterior doors are constructed of aluminum and/or glass with metal frames and in good condition, except that the door seals have worn out which increases the level of outside air infiltration.

Building Envelope Deficiencies

2.5 On-Site Generation

Lawrence Intermediate School had previously implemented a solar energy project. The project included photovoltaic (PV) arrays which cover a significant amount of the roof space. Based on conversations with facility personnel, the system is said to produce approximately 350,000 kWh/year and is owned by the Lawrence Township Board of Education. The system provides approximately 50% of the electricity required by the facility and generates an excess of about 8%.

Refer to Section 3.2 for more information and the graphical representation of estimated electrical consumption for the intermediate school.

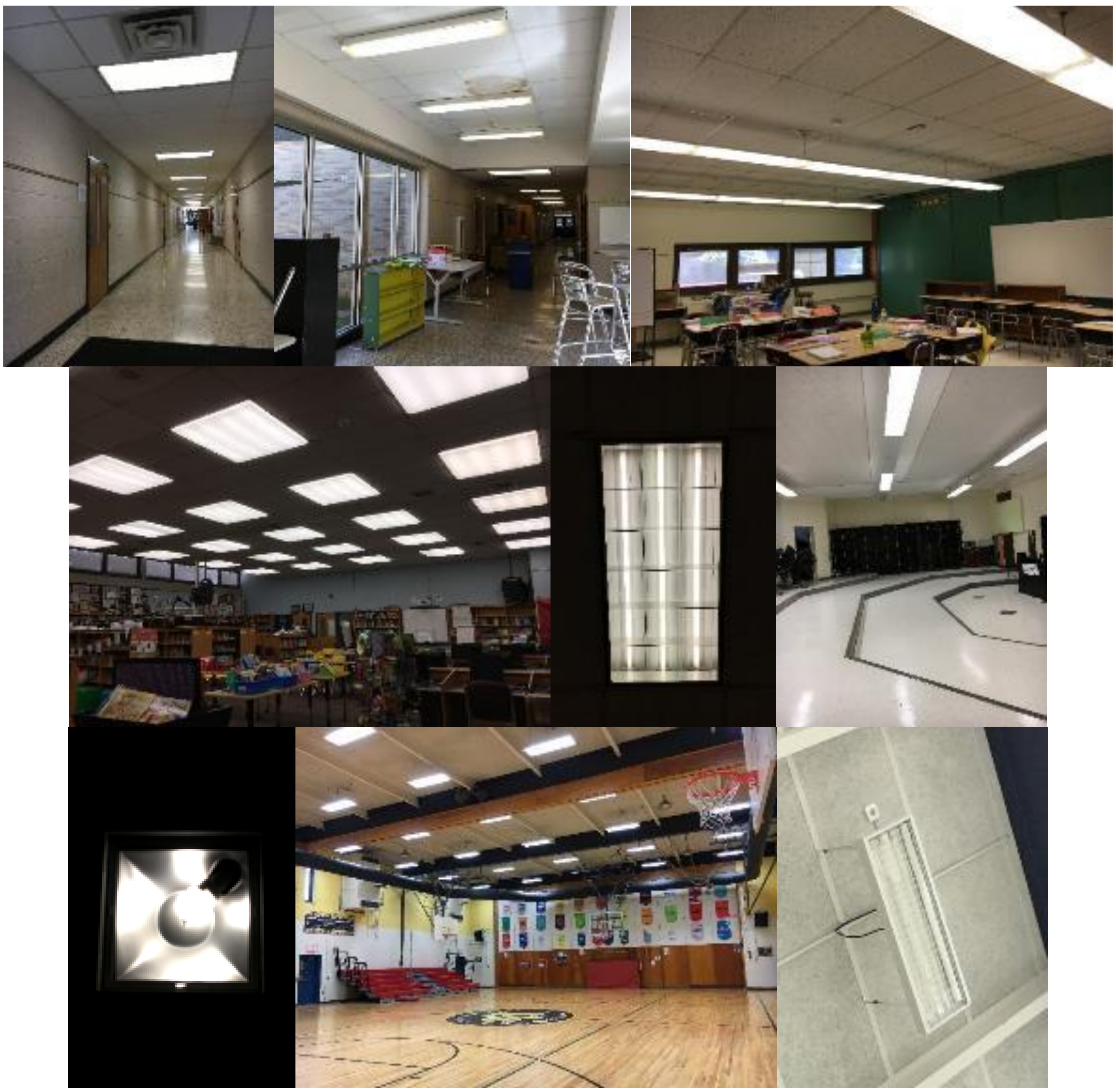
Roof Mounted Photovoltaic (PV) System

2.6 Energy-Using Systems

Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

Lighting System

Lighting at the facility is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some incandescent and compact fluorescent lamps (CFL). Most of the fixtures are 2-lamp or 3-lamp, 2x4 recessed troffer fixtures with prismatic lenses. There are also other styles of linear fluorescent fixtures such as surface mounted and pendant mounted wrap fixtures. There are also classrooms with 2x2 T8 fixtures, some with U-lamps and others with 2-foot long lamps. The library is lit by 4x4 recessed troffer fixtures with 4-lamps each. The gymnasium and multipurpose room are lit by 54-Watt linear fluorescent T5 high output lamps and electronic ballasts in high bay fixtures with occupancy sensor controls. Majority of the fixtures in classrooms, offices, hallways, the gym, multipurpose room and the library are controlled by occupancy-based sensors. The remaining areas and rooms have manual wall switch lighting controls.



Interior Lighting Systems

The building's exterior lighting includes building mounted, under canopy and pole mounted area light fixtures. The building mounted wall pack fixtures contain metal halide (MH) lamps and ballasts and the pole mounted fixtures are already LED and these areas are controlled by timeclocks. There are also fluorescent lamp fixtures around the exterior of the building as well as a few LED fixtures. The building mounted and pole mounted fixtures are set to operate 11 hours a night and the under canopy exterior light fixtures are set to operate 15 hours a night. There were three building mounted fixtures which were noted to be operating during a sunny day.

Exterior Lighting Systems

Exterior Timeclock Controls

Hot Water Heating System

The hot water system consists of two HB Smith 3,035 MBH output, forced draft non-condensing cast iron sectional gas fired boilers. The boilers are very old and are past the end of their useful life. They are about 49 years old and in poor condition. They serve the hydronic heating system and also provide domestic water heating via a heat exchanger located in the boiler room. The boilers operate in a lead/lag configuration. Both boilers may be required during cold weather and one is always required for domestic water heating throughout the year. The boilers have an estimated combustion efficiency of 66% based on the original efficiency, age and condition. Each boiler has a boiler burner motor, forced draft fan and feed water pump motor.

The boilers are configured in a constant flow primary distribution with two 7.5 HP hot water pumps. The pumps are about 25 years old, with low efficiency motors. There are also fractional horsepower hot water pump and domestic water pump motors. They are all constant speed motors. Hot water is generally supplied at 180°F when the outside air temperature is below 50°F. The boilers provide hot water to air handling units, perimeter heaters and unit ventilators. Each of the heating-ventilation (HV) units have supply fans and motors which were inaccessible during the audit. The HV units in the gym and multipurpose room also have fractional horsepower hot water circulators. They are assumed to be in fair condition and of standard efficiency.

Cast Iron Boilers in Poor Condition

Boiler Burner Mechanical Linkage Type and Motor

Boiler Controls and Winter Boiler Status Notes

Hot Water Pumps and Motors

Baseboard Radiators and Unit Ventilators

Heating and Ventilating (HV) Units in Gymnasium and Multi-Purpose Room

Direct Expansion Air Conditioning System (DX)

The majority of the building cooling is provided by packaged roof top units (RTUs) which utilize direct expansion (DX) coils for cooling in the summer. There are two new Daikin 20 ton packaged air-conditioning (AC) units serving the gym and multipurpose room. These two units are in good condition and are rated for an 18 SEER (seasonal energy efficiency ratio). These RTUs are controlled by programmable thermostats.

The remaining RTUs are about 30 years old and are low in efficiency. Nameplates were worn and therefore manufacturers are unknown. These range in capacity between 3 and 8 ton and serve the guidance offices, classrooms and the library. Based on the original efficiency, age and condition of equipment, the existing cooling efficiency is assumed to be about 8.0 EER (energy efficiency ratio). These units are controlled by manual dial thermostats.

Roof Top Units

There are also split AC systems serving two classrooms and an IT server room. These are about 3 tons in capacity and are of standard efficiency, estimated at 10 EER. These units are manually controlled by remote controllers. The remainder of offices and classrooms are cooled by window AC units from various manufacturers. These are approximately 2 tons in capacity and range in efficiency from 10 EER to 12 EER.

Split Air-Conditioning (AC) Systems

Window AC Units

HVAC Controls

Unitary HVAC equipment are controlled by manual dial thermostats located in the zones they serve. The unit ventilators throughout the building have supply fan motors, dampers, and valves which operate through the use of a pneumatic control system. This system is original to the building and appears to be in poor operating condition. The air compressor for this system is located in the boiler room, was recently installed and is in good condition with a high efficiency motor.

Air Compressor for Pneumatic HVAC Controls

Original Heating and Ventilating (HV) Unit and Exhaust Fan Controls

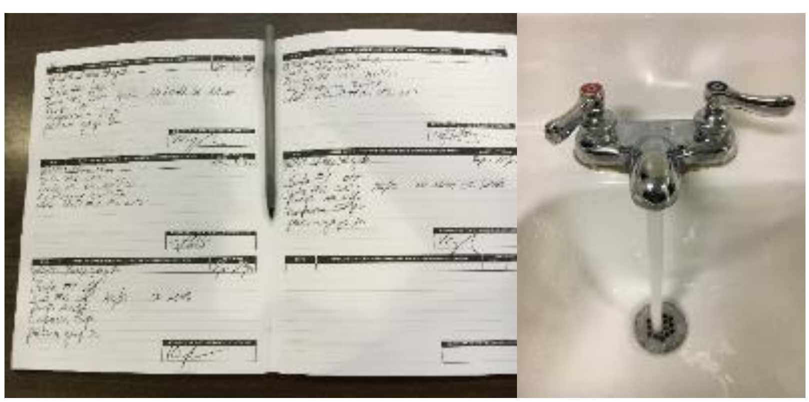
Manual Dial Thermostats

Programmable Thermostats for York RTU and Gym McQuay RTU

Domestic Hot Water Heating System

The domestic hot water heating system for the facility is fed from the aforementioned original cast iron gas fired boilers. There is a heat exchanger located in the boiler room and storage tank that is estimated to be 2500 gallons in capacity. This is a main concern for maintenance and energy use since a large inefficient boiler that is original to the building is required to operate year-round due to the indirect supply of domestic hot water. There are fractional horsepower recirculation pumps which distribute 140°F water to the entire site.

Heat Exchanger and Domestic Hot Water Storage Tank and System



Summer Boiler Status Notes and High Flow Faucet

Food Service & Laundry Equipment

The school has a kitchen that is used to prepare lunches for almost every student each school day. Most of the cooking is done using a number of gas ovens and griddles. There are a number of electric insulated holding cabinets. A majority of this equipment is in good condition and standard efficiency. There is also an electric dishwater that has an electric booster water heater that is assumed to be used each school day.

Kitchen Food Service Equipment

Kitchen Dishwasher

Refrigeration

The kitchen has a walk-in cooler, used to store food prepared for school lunches. The evaporator and doors are in good condition and high efficiency. There are also a number of stand-up refrigerators/freezers and refrigeration/freezer chests. These are in good condition and standard to high efficiency. All of this equipment was off and empty during the onsite energy audit conducted in the summer. We recommend continuing the practice of this behavior which promotes energy efficiency.

Kitchen Exhaust and Walk-in Cooler Outdoor Condensing Unit

Stand up Refrigerator Name Plates

Refrigeration Equipment

Building Plug Load

There are roughly 94 computer work stations throughout the facility. It is assumed that there is no centralized PC power management software installed. Plug loads throughout the building include general café and office equipment. There are classroom typical loads such as smart boards, projectors and fans. There are also a number of residential style refrigerators throughout the building. These vary in condition and efficiency. There were a few refrigerators noted to be almost empty. Consolidation and removal of unnecessary refrigerators should be considered. Refrigerated drink machines are located in the faculty lounge. These do not currently have controls.

Plug Loads & Vending Machines

2.7 Water-Using Systems

There are restrooms throughout this facility. A sampling of restrooms found that majority of the faucets are rated for 2.2 gallons per minute (gpm) or higher, the toilets are rated at 2.5 gallons per flush (gpf) and the urinals are rated at 2 gpf. The showerheads in the locker rooms are said to not be used anymore.

3 SITE ENERGY USE AND COSTS

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

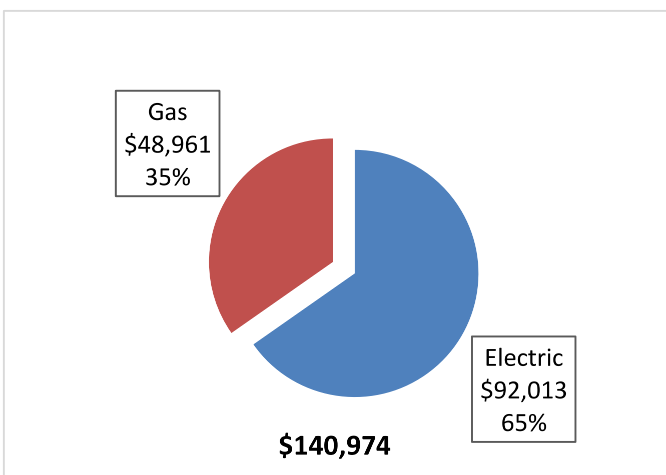
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Lawrence Intermediate School		
Fuel	**Usage**	**Cost**
Electricity	691,532 kWh	$92,013
Natural Gas	58,388 Therms	$48,961
Total		**$140,974**

The current annual energy cost for this facility is $140,974 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was $0.133/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The facility pays electric demand charges which are about 4 times higher in the summer months than during the winter. The monthly electricity consumption and peak demand are shown in Figure 9 below.

The intermediate school has bi-directional metering. The utility bills show the flow of electricity which is inclusive of what is generated on site. The meter can measure the flow of electricity in two directions. So the billed kWh is the net between the electric provided by the utility company and the solar generated electricity supplied back to the distribution grid. As the onsite generation system produces electricity, the kWh are first used to meet the customer's electric requirements such as lighting and appliances. If more electric energy is produced by the system than the customer needs, the additional kWh are measured, fed into the utility's electric system, and utilized by other customers. The monthly electricity billed and peak demand are shown in Figure 10 below.

Figure 9 - Electric Usage & Demand

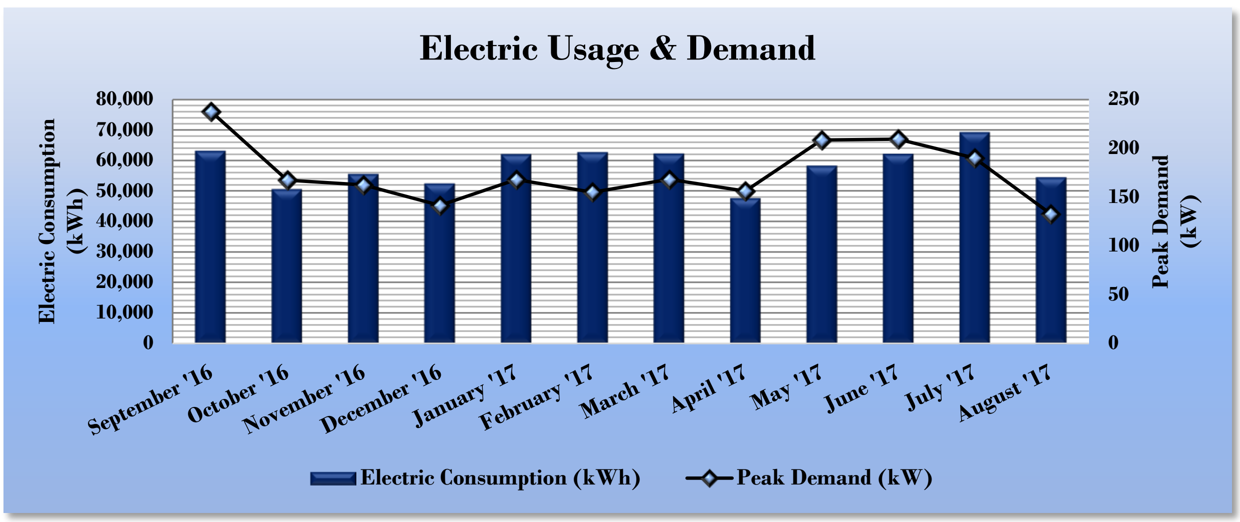


Figure 10 - Electric Usage & Generation

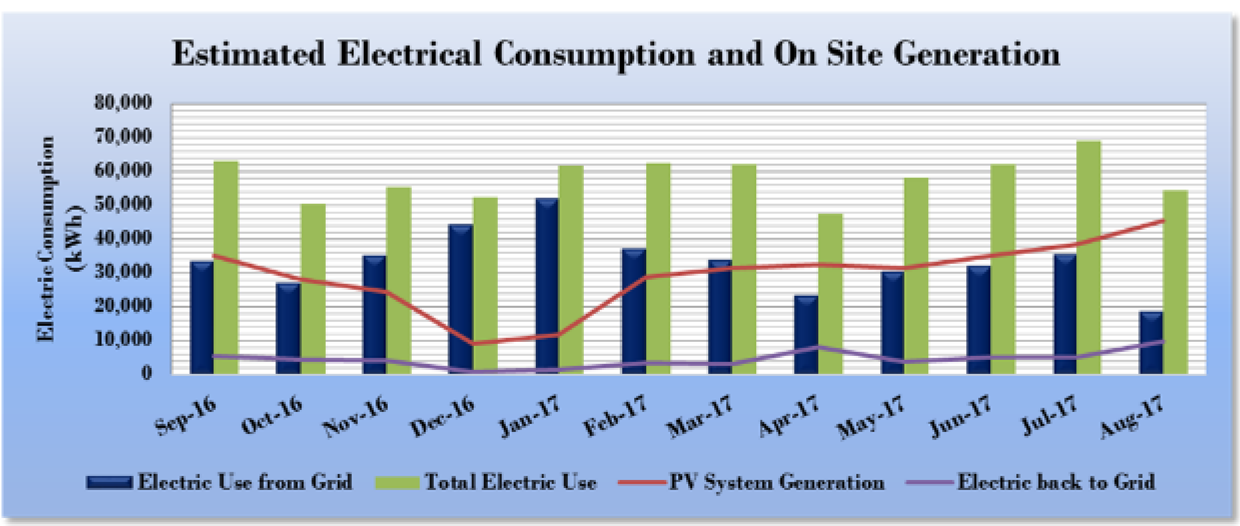


Figure 11 - Electric Usage & Demand

Electric Billing Data for Lawrence Intermediate School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
9/27/16	32	63,020	238	$2,704	$8,385
10/26/16	29	50,525	167	$630	$6,723
11/28/16	33	55,486	162	$612	$7,383
12/28/16	30	52,316	141	$532	$6,961
1/27/17	30	61,907	168	$632	$8,237
2/28/17	32	62,569	155	$583	$8,325
3/29/17	29	62,140	168	$634	$8,268
4/28/17	30	47,551	156	$588	$6,327
5/30/17	32	58,120	208	$785	$7,733
6/28/17	29	62,040	209	$2,380	$8,255
7/29/17	31	69,103	190	$2,162	$9,195
8/30/17	32	54,334	133	$1,510	$7,230
Totals	**369**	**699,111**	**214**	**$13,753**	**$93,022**
Annual	**365**	**691,532**	**214**	**$13,604**	**$92,013**

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.839/therm, which is the blended rate used throughout the analyses in this report. Note that gas usage illustrates a substantial baseline of use, primarily to provide domestic hot water through the space heating boiler as discussed. The monthly gas consumption is shown in the chart below.

Figure 12 - Natural Gas Usage

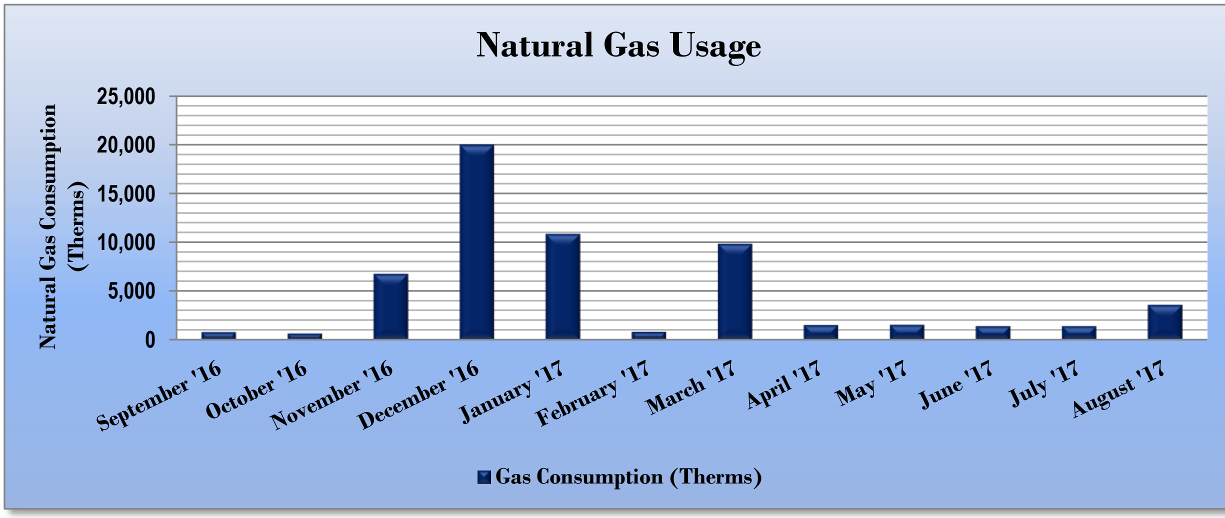


Figure 13 - Natural Gas Usage

Gas Billing Data for Lawrence Intermediate School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
9/27/16	32	784	$534
10/26/16	29	645	$632
11/28/16	33	6,736	$5,389
12/28/16	30	19,944	$15,506
1/27/17	30	10,821	$10,017
2/28/17	32	814	$2,076
3/29/17	29	9,839	$7,614
4/28/17	30	1,517	$4,151
5/30/17	32	1,535	$986
6/28/17	29	1,391	$918
7/29/17	31	1,410	$906
8/30/17	32	3,591	$769
Totals	369	59,028	$49,497
Annual	365	58,388	$48,961

3.4 Benchmarking

This facility was benchmarked using Portfolio Manager®, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager® analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

The EUI is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. 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.

Figure 14 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Lawrence Intermediate School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	134.1	141.4
Site Energy Use Intensity (kBtu/ft^2)	81.2	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the table below:

Figure 15 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Lawrence Intermediate School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	121.8	141.4
Site Energy Use Intensity (kBtu/ft^2)	75.2	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 51**.**

A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance.

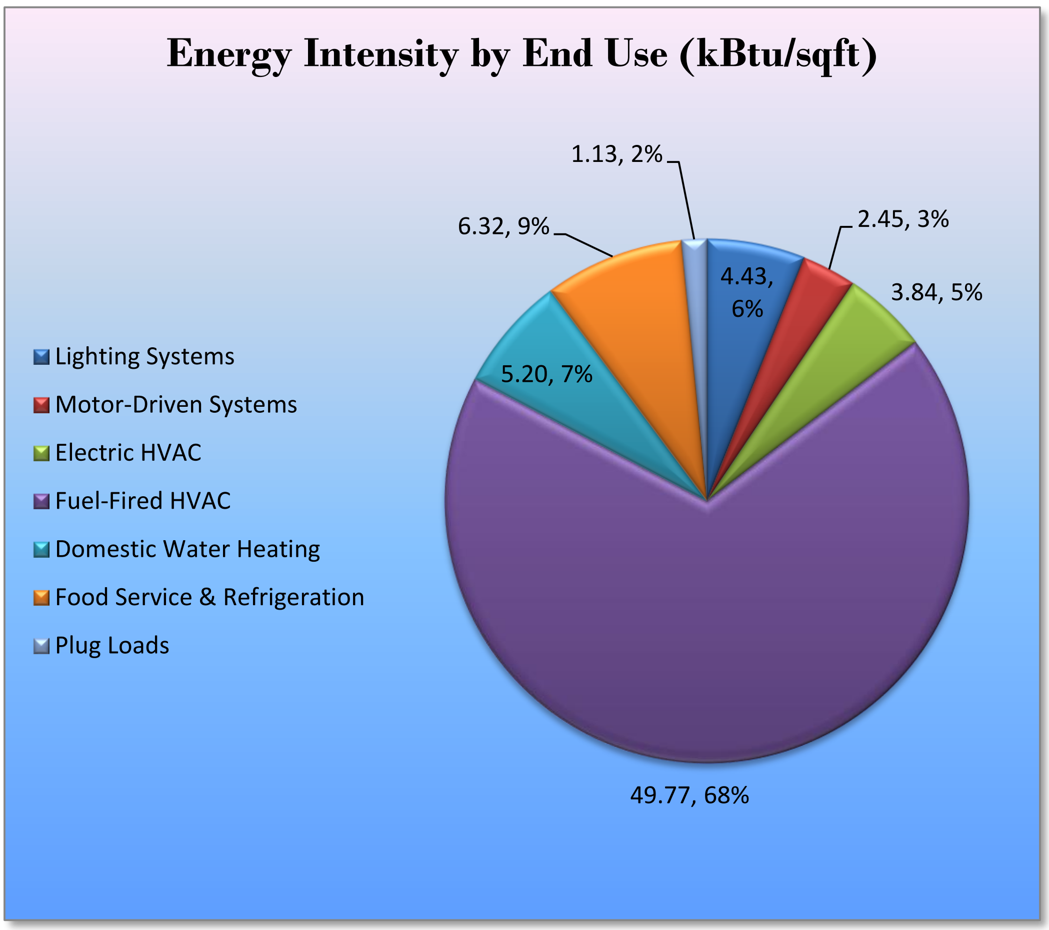
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager® account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager® regularly, so that you can keep track of your building's performance. 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.

3.5 Energy End-Use Breakdown

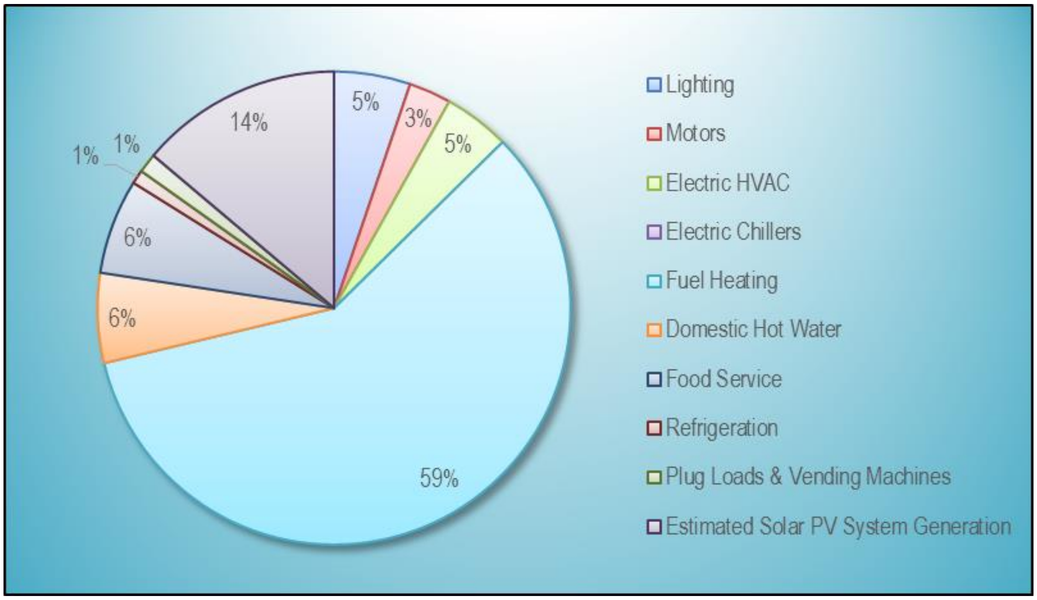
In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures. The total kBtu reflected in the energy balance chart is the difference between the existing baseline year and what is actually purchased for use on site.

Figure 16 - Energy Balance (% and kBtu/SF)



The total kBtu associated with the chart above is the total energy purchased for use at the building. This does not include the electric generation by the existing PV System. For a snapshot of energy use at the Lawrence Intermediate School which is inclusive of the on-site generation by PV System, see below.

Figure 17 - Energy Balance (% mmBtu by End Use)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Lawrence Intermediate School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based on the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs as High Priority

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 18 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**67,472**	**27.5**	**0.0**	**$8,977.69**	**$70,184.67**	**$14,060.00**	**$56,124.67**	**6.3**	**67,944**
ECM 1	Install LED Fixtures	9,264	1.1	0.0	$1,232.70	$19,319.31	$2,000.00	$17,319.31	14.0	9,329
ECM 2	Retrofit Fixtures with LED Lamps	58,208	26.4	0.0	$7,744.99	$50,865.36	$12,060.00	$38,805.36	5.0	58,615
Lighting Control Measures		**1,105**	**0.2**	**0.0**	**$147.00**	**$1,470.00**	**$0.00**	**$1,470.00**	**10.0**	**1,113**
ECM 3	Install Daylight Dimming Controls	394	0.0	0.0	$52.45	$270.00	$0.00	$270.00	5.1	397
ECM 4	Install High/Low Lighitng Controls	711	0.2	0.0	$94.55	$1,200.00	$0.00	$1,200.00	12.7	716
HVAC System Improvements		**13,716**	**0.0**	**0.0**	**$1,825.01**	**$2,718.84**	**$0.00**	**$2,718.84**	**1.5**	**13,812**
ECM 5	Implement Demand Control Ventilation	13,716	0.0	0.0	$1,825.01	$2,718.84	$0.00	$2,718.84	1.5	13,812
Domestic Water Heating Upgrade		**0**	**0.0**	**68.4**	**$573.71**	**$279.63**	**$0.00**	**$279.63**	**0.5**	**8,011**
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	68.4	$573.71	$279.63	$0.00	$279.63	0.5	8,011
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$214.47**	**$230.00**	**$50.00**	**$180.00**	**0.8**	**1,623**
ECM 7	Vending Machine Control	1,612	0.0	0.0	$214.47	$230.00	$50.00	$180.00	0.8	1,623
Custom Measures		**57**	**0.0**	**251.3**	**$2,114.98**	**$8,200.00**	**$0.00**	**$8,200.00**	**3.9**	**29,484**
ECM 8	Building Envelope Weatherization	57	0.0	251.3	$2,114.98	$8,200.00	$0.00	$8,200.00	3.9	29,484
TOTALS		**83,962**	**27.7**	**319.7**	**$13,852.87**	**$83,083.14**	**$14,110.00**	**$68,973.14**	**5.0**	**121,986**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

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

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 19 below.

Figure 19 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**67,472**	**27.5**	**0.0**	**$8,977.69**	**$70,184.67**	**$14,060.00**	**$56,124.67**	**6.3**	**67,944**
ECM 1	Install LED Fixtures	9,264	1.1	0.0	$1,232.70	$19,319.31	$2,000.00	$17,319.31	14.0	9,329
ECM 2	Retrofit Fixtures with LED Lamps	58,208	26.4	0.0	$7,744.99	$50,865.36	$12,060.00	$38,805.36	5.0	58,615

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	9,264	1.1	0.0	$1,232.70	$19,319.31	$2,000.00	$17,319.31	14.0	9,329

Measure Description

We recommend replacing building mounted exterior fixtures containing metal halide lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are much longer than traditional HID technology. Furthermore, the upgrade to long life LED equipment reduced the frequency of lifts needed for maintaining light fixtures which are mounted high on the exterior of the building.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	54,404	26.0	0.0	$7,238.84	$50,451.96	$12,000.00	$38,451.96	5.3	54,784
Exterior	3,804	0.4	0.0	$506.15	$413.40	$60.00	$353.40	0.7	3,831

Measure Description

We recommend retrofitting existing incandescent, compact fluorescent and linear fluorescent lamp fixtures with LED lamps. This measure also includes retrofitting the existing T5HO high bay fixtures in the gym and multipurpose room with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs 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.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent tubes and more than ten times longer than many incandescent lamps. Furthermore, the upgrade to long life LED equipment would reduce the frequency of lifts needed for maintaining light fixtures which are mounted in high ceilings.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 20 below.

Figure 20 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**1,105**	**0.2**	**0.0**	**$147.00**	**$1,470.00**	**$0.00**	**$1,470.00**	**10.0**	**1,113**
ECM 3	Install Daylight Dimming Controls	394	0.0	0.0	$52.45	$270.00	$0.00	$270.00	5.1	397
ECM 4	Install High/Low Lighitng Controls	711	0.2	0.0	$94.55	$1,200.00	$0.00	$1,200.00	12.7	716

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 3: Install Photocell Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
394	0.0	0.0	$52.45	$270.00	$0.00	$270.00	5.1	397

Measure Description

We recommend installing photocell controls on the three building mounted HID fixtures which were seen on during a sunny day. These are likely operating 24 hours a day, seven days a week and may be properly controlled through the use of photosensors to reduce electric lighting in the daytime. Photosensor controls will limit the operation of these fixtures to hours between dusk and dawn.

ECM 4: Install High/Low Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
711	0.2	0.0	$94.55	$1,200.00	$0.00	$1,200.00	12.7	716

Measure Description

We recommend installing 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. Typical areas for such lighting control are stairwells and interior corridors.

Lighting fixtures with these controls operate at default low levels when the area is not occupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. The lighting systems are switched to full lighting levels whenever an occupant is detected. Fixtures are automatically switched back to low level after an area has been vacant for a preset period of time. Energy savings results from only providing full lighting levels when it is required.

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage needs to be provided to ensure that lights turn on in each area as an occupant approaches. Additional savings from reduced lighting maintenance may also result from this measure, due to reduced lamp operation.

4.1.3 HVAC System Upgrades

Our recommendation for HVAC system improvement are summarized in Figure 21 below.

Figure 21 - Summary of HVAC System Improvement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**13,716**	**0.0**	**0.0**	**$1,825.01**	**$2,718.84**	**$0.00**	**$2,718.84**	**1.5**	**13,812**
ECM 5	Implement Demand Control Ventilation	13,716	0.0	0.0	$1,825.01	$2,718.84	$0.00	$2,718.84	1.5	13,812

ECM 5: Implement Demand Control Ventilation (DCV)

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
13,716	0.0	0.0	$1,825.01	$2,718.84	$0.00	$2,718.84	1.5	13,812

Measure Description

This measure is recommended for the gym and multipurpose room HVAC systems. Demand control ventilation (DCV) monitors indoor air CO_2 content to measure room occupancy. This data is used to regulate the amount of outdoor provided to the space for ventilation. In order to ensure adequate air quality, standard ventilation systems often provide outside air based on a space's estimated maximum occupancy. However, during low occupancy periods, the space may be over ventilated. This wastes energy through excessive fan usage and additional cost to heat and cool the excessive air flow. DCV reduces unnecessary outdoor air intake by regulating ventilation based on actual occupancy levels, saving significant amounts of energy. DCV is most suited for facilities or areas where occupancy levels vary significantly hour to hour and day to day.

Energy savings associated with DCV are based on hours of operation, space occupancy, system air flow, outside air reduction, and other factors. Energy savings results from eliminating unnecessary ventilation and space conditioning.

4.1.4 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 22 below.

Figure 22 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**68.4**	**$573.71**	**$279.63**	**$0.00**	**$279.63**	**0.5**	**8,011**
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	68.4	$573.71	$279.63	$0.00	$279.63	0.5	8,011

ECM 6: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	68.4	$573.71	$279.63	$0.00	$279.63	0.5	8,011

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators can reduce hot water usage, relative to standard and high flow aerators, which saves energy. Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings. The estimated savings for this measure is based on the existing (indirect) means of producing domestic hot water.

It should be noted that if the showers in the locker rooms are going to be used in the future, the replacement of high flow showerheads with low flow vandal proof showerheads should be considered for implementation at that time.

4.1.5 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment control measures are summarized in Figure 23 below.

Figure 23 - Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$214**	**$230**	**$50**	**$180**	**0.8**	**1,623**
ECM 7	Vending Machine Control	1,612	0.0	0.0	$214	$230	$50	$180	0.8	1,623

ECM 7: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,612	0.0	0.0	$214.47	$230.00	$50.00	$180.00	0.8	1,623

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use of the refrigerated vending machines. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

4.1.6 Custom Measures

Additional custom measure energy saving opportunities are addressed in this section. Recommended custom measures are summarized in Figure 24 below.

Figure 24 - Summary of Custom ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Custom Measures		**57**	**0.0**	**251.3**	**$2,114.98**	**$8,200.00**	**$0.00**	**$8,200.00**	**3.9**	**29,484**
ECM 8	Building Envelope Weatherization	57	0.0	251.3	$2,114.98	$8,200.00	$0.00	$8,200.00	3.9	29,484

ECM 8: Building Envelope Weatherization

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
57	0.0	251.3	$2,114.98	$8,200.00	$0.00	$8,200.00	3.9	29,484

Measure Description

We recommend weather-stripping the exterior doors, caulking the perimeter of window frames and sealing wall cracks throughout the building. Exterior doors should be properly weather-stripped which may include the installation of a bottom sweep, center sweep and weather-stripping around the perimeter of the door.

Building envelopes that limit air infiltration and have adequate insulation play a key role in optimizing heating and cooling efficiency by controlling moisture, preventing heat loss, and by providing occupant comfort. Cracks and gaps throughout the building – around windows and doors, through utility openings, at the foundation and roof – may not seem significant, but their effects add up. Reducing uncontrolled air infiltration through air sealing is a cost effective way to improve the performance and energy efficiency of your facility. The proper sealing of sources for air infiltration and exfiltration will reduce heat transfer between the building and the environment, reducing the load on the facility's heating and cooling equipment.

4.2 ECMs Evaluated But Not Recommended as High Priority

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 25 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures	**769**	**0.3**	**0.0**	**$102.30**	**$2,430.00**	**$315.00**	**$2,115.00**	**20.7**	**774**
Install Occupancy Sensor Lighting Controls	769	0.3	0.0	$102.30	$2,430.00	$315.00	$2,115.00	20.7	774
Motor Upgrades	**1,023**	**0.8**	**0.0**	**$136.12**	**$17,214.42**	**$0.00**	**$17,214.42**	**126.5**	**1,030**
Premium Efficiency Motors	1,023	0.8	0.0	$136.12	$17,214.42	$0.00	$17,214.42	126.5	1,030
Variable Frequency Drive (VFD) Measures	**18,272**	**20.3**	**0.0**	**$2,431.17**	**$52,539.10**	**$4,800.00**	**$47,739.10**	**19.6**	**18,399**
Install VFDs on Constant Volume (CV) HVAC	12,227	16.8	0.0	$1,626.83	$39,310.20	$4,800.00	$34,510.20	21.2	12,312
Install VFDs on Hot Water Pumps	4,535	1.9	0.0	$603.37	$7,213.60	$0.00	$7,213.60	12.0	4,566
Install Boiler Draft Fan VFDs	1,510	1.7	0.0	$200.97	$6,015.30	$0.00	$6,015.30	29.9	1,521
Electric Unitary HVAC Measures	**24,000**	**17.5**	**0.0**	**$3,193.35**	**$89,677.09**	**$3,836.00**	**$85,841.09**	**26.9**	**24,168**
Install High Efficiency Electric AC	24,000	17.5	0.0	$3,193.35	$89,677.09	$3,836.00	$85,841.09	26.9	24,168
Gas Heating (HVAC/Process) Replacement	**0**	**0.0**	**884.7**	**$7,418.74**	**$105,576.45**	**$7,891.00**	**$97,685.45**	**13.2**	**103,589**
Install High Efficiency Hot Water Boilers	0	0.0	884.7	$7,418.74	$105,576.45	$7,891.00	$97,685.45	13.2	103,589
HVAC System Improvements	**11,601**	**2.6**	**0.0**	**$1,543.65**	**$4,000.00**	**$1,750.00**	**$2,250.00**	**1.5**	**11,683**
Install Dual Enthalpy Outside Economizer Control	11,601	2.6	0.0	$1,543.65	$4,000.00	$1,750.00	$2,250.00	1.5	11,683
Domestic Water Heating Upgrade	**0**	**0.0**	**162.5**	**$1,362.56**	**$75,165.00**	**$1,400.00**	**$73,765.00**	**54.1**	**19,026**
Install High Efficiency Gas Water Heater	0	0.0	162.5	$1,362.56	$75,165.00	$1,400.00	$73,765.00	54.1	19,026
Custom Measures	**3,652**	**0.0**	**0.0**	**$485.88**	**$3,910.00**	**$0.00**	**$3,910.00**	**8.0**	**3,677**
Computer Power Management Software	3,652	0.0	0.0	$485.88	$3,910.00	$0.00	$3,910.00	8.0	3,677
TOTALS	**59,316**	**41.6**	**1,047.2**	**$16,673.78**	**$350,512.06**	**$19,992.00**	**$330,520.06**	**19.8**	**182,346**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

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

Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
769	0.3	0.0	$102.30	$2,430.00	$315.00	$2,115.00	20.7	774

Measure Description

We evaluated installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in offices, classroom and restrooms. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period.

Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings exceeds the expected useful life of the proposed equipment. The controls upgrade is not justified by energy savings alone, likely because the more cost effective applications have already been implemented.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure.

Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,023	0.8	0.0	$136.12	$17,214.42	$0.00	$17,214.42	126.5	1,030

Measure Description

We evaluated replacing standard efficiency motors with NEMA Premium® efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

Reasons for not Recommending as a High Priority Measure

This measure is coupled with the three variable speed motor control measures that follow. Since we are not recommending the installation of Variable Frequency Drives (VFDs), this measure is therefore not recommended as a standalone upgrade. The projected payback period for this measure based on the energy savings is greater than the cost effective criteria. In order to be deemed cost effective, the simple payback must be below ten years.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure. If the district ever moves forward with the Variable Frequency Drives (VFDs), we recommend implementing this measure as well. When a VFD is installed, the motor it is intended to drive should also be upgraded to a Premium Efficiency motor.

Install VFDs on Constant Volume (CV) HVAC

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
12,227	16.8	0.0	$1,626.83	$39,310.20	$4,800.00	$34,510.20	21.2	12,312

Measure Description

We evaluated installing variable frequency drives (VFDs) to control supply fan motor speeds to convert the constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one. Zone thermostats will cause the VFD to modulate fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature. Energy savings results from reducing fan speed (and power) when there is a reduced load required for the zone. The magnitude of energy savings is based on the estimated amount of time that fan motors operate at partial load.

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings is greater than the cost effective criteria. In order to be deemed cost effective, the simple payback must be below ten years.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure. If the district moves forward to a design phase, we suggest considering the following. For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing will have to be determined during the final project design. The control system should be programmed to maintain the minimum air flow whenever the compressor is operating.

Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
4,535	1.9	0.0	$603.37	$7,213.60	$0.00	$7,213.60	12.0	4,566

Measure Description

We evaluated installing variable frequency drives (VFD) to control hot water pumps. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results 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.

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings is greater than the cost effective criteria. In order to be deemed cost effective, the simple payback must be below ten years.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure. It should be noted that this measure is on the cusp of being deemed cost effective and the payback is lower than the expected useful life of proposed equipment.

Install VFDs on Boiler Draft Fan Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,510	1.7	0.0	$200.97	$6,015.30	$0.00	$6,015.30	29.9	1,521

Measure Description

We evaluated replacing existing volume control devices on boiler draft fans, such as inlet vanes or dampers, with variable frequency drives (VFD). Inlet vanes or dampers are an inefficient means of controlling the air volume compared to VFDs. The existing volume control device would be removed, or permanently disabled, and the control signal would be redirected to the VFD to determine proper fan motor speed. Energy savings results from more efficient control of motor energy usage when fan motors are operated at partial load. The magnitude of energy savings is based on the estimated amount of time that fan motors would be operated at partial load.

Additional maintenance savings may result from this measure as well, since VFDs are solid state electronic device, which generally requires less maintenance than mechanical air volume control devices.

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings exceeds the expected useful life of the replacement equipment as well as exceeding the life of the host equipment. The upgrade to high efficiency is not justified by energy savings alone.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend that replacement of the boilers be considered. VFD fan controls would typically be incorporated into a boiler upgrade.

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
24,000	17.5	0.0	$3,193.35	$89,677.09	$3,836.00	$85,841.09	26.9	24,168

Measure Description

We evaluated replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings exceeds the expected useful life of the replacement equipment. The upgrade to high efficiency is not justified by energy savings alone.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure.

Install High Efficiency Hot Water Boilers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	884.7	$7,418.74	$105,576.45	$7,891.00	$97,685.45	13.2	103,589

Measure Description

We evaluated replacing older inefficient hot water boilers with high efficiency hot water boilers. Significant improvements have been made in combustion technology resulting in increased overall boiler efficiency. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

Reasons for not Recommending as a High Priority Measure

Based on the protocol for this program, we are only to evaluate non-condensing high efficiency boilers when we cannot verify return water temperatures lower than 130°F. This measure assumes a one for one replacement based on program restrictions. In order to be deemed cost effective, the simple payback period must be 13 years. Therefore, based on the energy and economic results this measure was evaluated but is not recommended as a high priority measure.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure.

It should be noted that much higher efficiencies may be achieved if condensing high efficiency boilers are installed. We therefore recommend the following considerations if and when you chose to move forward with a heating system design:

- Install multiple smaller capacity modular boilers to:
    - Increase part load efficiency
    - Increase redundancy/reliability
    - Save on mechanical room space
- Install high efficiency condensing boilers, as long as they may be configured and controlled to operate with return water temperatures lower than 130°F
- Well maintained boilers will typically last more than 25 years

If the boilers are replaced, a standalone hot water heater will be required to provide domestic how water for the facility. This measure is addressed in a following section.

Install Dual-Enthalpy Economizers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
11,601	2.6	0.0	$1,543.65	$4,000.00	$1,750.00	$2,250.00	1.5	11,683

Measure Description

Dual-enthalpy economizers are used to control a ventilation system's outside air intake in order to reduce a facility's total cooling load. A dual-enthalpy economizer monitors the air temperature and humidity of both the outside and return air. The control supplies the lowest energy (temperature and humidity) air to the air handling system. When outside air conditions allow, outside air can be used for cooling instead of running the air handling system's compressor. This reduces the demand on the cooling system, lowering its usage hours and saving energy. Savings result from using outside air instead of mechanical cooling when outside air conditions permit.

Reasons for not Recommending as a High Priority Measure

This measure is coupled with another measure as described above. Since we are not recommending to install high efficiency air conditioning units, this measure is therefore also not recommended.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure. If the district ever moves forward with the installation of high efficiency air conditioning units, we recommend implementing this measure as an add on.

Install High Efficiency Gas Water Heater

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	162.5	$1,362.56	$75,165.00	$1,400.00	$73,765.00	54.1	19,026

Measure Description

We recommend replacing the existing indirect water heating system with a high efficiency tank water heater. Improvements in combustion efficiency and reductions in heat losses have improved the overall efficiency of storage water heaters. Energy savings results from using less gas to heat water, due to higher unit efficiency, and fewer run hours to maintain the tank water temperature. Significantly, the heating hot water boiler could be taken off line seasonally when space heat is not required.

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings exceeds the expected useful life of the replacement equipment. The upgrade to high efficiency is not justified by energy savings alone.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure. This measure would need be taken in conjunction with removal of the indirect heating system, piping reconfiguration, and could potentially involve replacement of the hot water heating boiler system.

Computer Power Management Software

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
3,652	0.0	0.0	$485.88	$3,910.00	$0.00	$3,910.00	8.0	3,677

Measure Description

We evaluated the implementation of computer power management software. The computing environment in most school and office facilities includes desktops, which are typically left on over nights, weekends and holidays. Screen savers are commonly confused as a power management strategy. This contributes to excessive electrical energy consumption, which may be avoided by proper management. There are innovative software packages available in the market today that are designed to deliver significant energy saving and provide ongoing tracking measurements. Operational and maintenance benefits are captured through the use of a central power management platform where issues may be diagnosed and problematic devices may be isolated. Energy savings policies may be enforced as well as identifying and eliminating underutilized devices. This measure investigates the potential benefits to implementing computer power management software to better match the energy use to user needs.

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings is greater than the cost effective criteria. In order to be deemed cost effective, the simple payback for plug load controls must be below three years.

5 Energy Efficient Practices

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of 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.

Use Fans to Reduce Cooling Load

Utilizing ceiling fans to supplement cooling is a low cost strategy to reduce cooling load considerably. Thermostat settings can be increased by 4°F with no change in overall occupant comfort when the wind chill effect of moving air is employed for cooling.

Ensure Economizers are Functioning Properly

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Check for and Seal Duct Leakage

Duct leakage in commercial buildings typically accounts for 5% to 25% of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building, significantly increasing cooling and heating costs. By sealing sources of leakage, cooling, heating, and ventilation energy use can be reduced significantly, depending on the severity of air leakage.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, 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. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any 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 any 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 over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Plug Load Best Practices Guide http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. 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. The EPA WaterSense™ ratings for urinals is 0.5 gpf and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.4 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at 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.

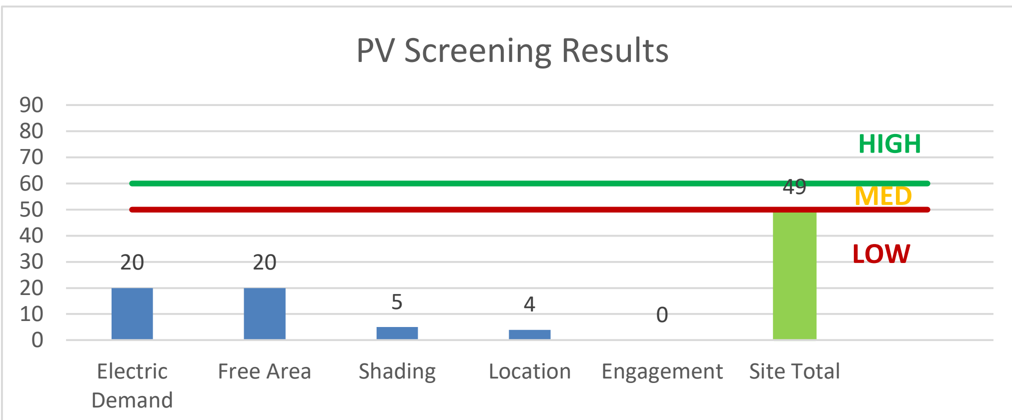
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a low potential for installing another PV array. This high level evaluation was provided for the free area over the parking lot.

In order to be cost-effective, a solar PV array needs certain minimum criteria, such as flat or south-facing rooftop or other unshaded space on which to place the PV panels. In our opinion, the facility does not appear to meet these minimum criteria for cost-effective PV installation.

Figure 26 - Photovoltaic Screening



6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

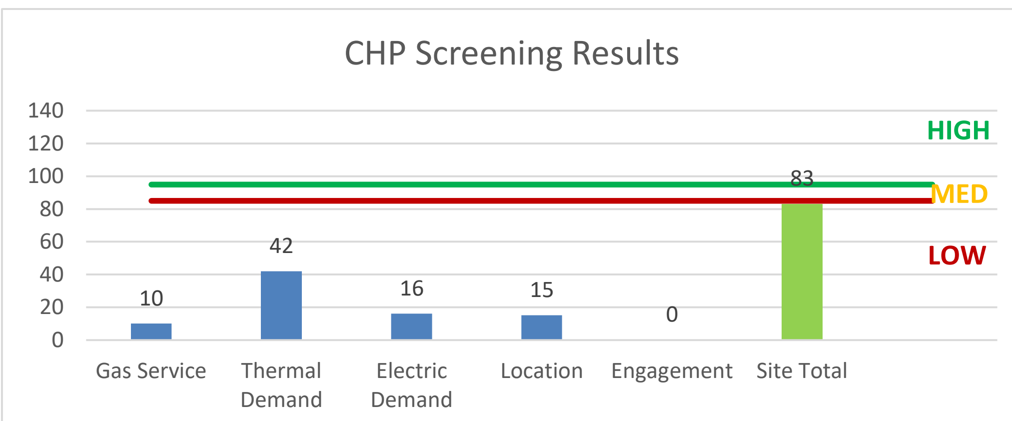
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use 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 a low potential for installing a cost-effective CHP system.

Low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the low potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.

Figure 27 - Combined Heat and Power Screening



Please reach out for additional information about the Combined Heat & Power Program if and when interested in a CHP system.

7 Demand Response

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage 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 DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

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

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

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

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR program information.

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

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 28 for a list of the eligible programs identified for each recommended ECM.

Figure 28 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	x		x	x		
ECM 2	Retrofit Fixtures with LED Lamps	x		x	x		
ECM 3	Install Daylight Dimming Controls			x	x		
ECM 4	Install High/Low Lighitng Controls			x	x		
ECM 5	Implement Demand Control Ventilation			x	x		
ECM 6	Install Low-Flow Domestic Hot Water Devices			x	x		
ECM 7	Vending Machine Control	x		x	x		
ECM 8	Building Envelope Weatherization				x		

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: [www.njcleanenergy.com/ci.](http://www.njcleanenergy.com/ci)

8.1 SmartStart

Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the retrofit incentives have been applied in this report. Custom measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

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

8.2 Direct Install

Overview

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

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the Direct Install program you will need to contact the participating contractor assigned to the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct Install website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since Direct Install offers a free assessment of eligible measures, Direct Install is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI.

8.3 Pay for Performance - Existing Buildings

Overview

The Pay for Performance – Existing Buildings (P4P EB) program is designed for larger customers with a peak demand over 200 kW in any of the preceding 12 months. Under this program the minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings. P4P is generally a good option for medium to large sized facilities looking to implement as many measures as possible under a single project in order to achieve deep energy savings. This program has an added benefit of evaluating a broad spectrum of measures that may not otherwise qualify under other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also utilize the P4P program.

Please note that the scope of work presented in this audit report does not quite meet the requirements of the P4P program as outlined above. There is a potential for the intermediate school to qualify for the P4P program. However, this requires total source savings for measures to be greater than 15% and limits the contribution lighting savings to 50% of the total source savings. The energy and economic results provided demonstrate that the recommended project including only high priority measures would not meet these requirements, however the total project including all evaluated measures would. Additional opportunities may also be identified by an ESCO moving forward.

Incentives

Incentives are calculated based on estimated and achieved energy savings ranging from $0.18-$0.22/kWh and $1.80-$2.50/therm, capped at the lesser of 50% total project cost, or $1 million per electric account and $1 million per natural gas account, per fiscal year, not to exceed $2 million per project. An incentive of $0.15/square foot is also available to offset the cost of developing the Energy Reduction Plan (see below) contingent on the project moving forward with measure installation.

How to Participate

To participate in the P4B EB program you will need to contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, the Partner will help further evaluate the measures identified in this report through development of the Energy Reduction Plan (ERP), assist you in implementing selected measures, and verify actual savings one year after the installation. At each of these three milestones your Partner will also facilitate securing program incentives.

Approval of the final scope of work is required by the program prior to installation completion. Although installation can be accomplished by a contractor of your choice (some P4P Partners are also contractors) or by internal personnel, the Partner must remain involved to ensure compliance with the program guidelines and requirements.

Detailed program descriptions, instructions for applying, applications and list of Partners can be found at: www.njcleanenergy.com/P4P.

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. 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 can be leveraged to help further reduce the total project cost of eligible measures.

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 utilized 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. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP.

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 Energy Purchasing and Procurement Strategies

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third-party (i.e. non-utility) energy supplier.

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 is purchasing electricity from a third-party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third-party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. 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 is typically dependent upon whether a customer seeks 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 is not purchasing natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility is purchasing natural gas from a third-party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third-party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: 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	Watts per Fixture	Annual Operating Hours	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	15	LED Screw-In Lamps: Screw in Lamps	Wall Switch	11	1,339	None	No	15	LED Screw-In Lamps: Screw in Lamps	Wall Switch	11	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Custodian Office	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.14	321	0.0	$42.72	$452.58	$85.00	8.60
Restroom	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	14	1,339	None	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	14	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,875	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,875	0.22	711	0.0	$94.66	$365.15	$100.00	2.80
Classroom 53	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.44	724	0.0	$96.38	$876.36	$240.00	6.60
Classroom 54	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.44	724	0.0	$96.38	$876.36	$240.00	6.60
Classroom 55	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.44	724	0.0	$96.38	$876.36	$240.00	6.60
Classroom 56	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.44	724	0.0	$96.38	$876.36	$240.00	6.60
Classroom 57	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.44	724	0.0	$96.38	$876.36	$240.00	6.60
Classroom 58	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.44	724	0.0	$96.38	$876.36	$240.00	6.60
Classroom 59	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.44	724	0.0	$96.38	$876.36	$240.00	6.60
Classroom 60	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.44	724	0.0	$96.38	$876.36	$240.00	6.60
Walkway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	937	0.08	193	0.0	$25.63	$309.55	$30.00	10.91
Walkway	3	Compact Fluorescent: Screw in Lamps	Wall Switch	23	1,339	Relamp	No	3	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	1,339	0.01	32	0.0	$4.24	$51.68	$0.00	12.18
Storage Room 50D	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,339	0.06	152	0.0	$20.28	$109.55	$30.00	3.92
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,678	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,875	0.11	514	0.0	$68.35	$346.06	$40.00	4.48
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,339	0.04	102	0.0	$13.52	$73.03	$20.00	3.92
Classroom 50	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.32	534	0.0	$70.99	$547.73	$150.00	5.60
Classroom 46	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.32	534	0.0	$70.99	$547.73	$150.00	5.60
Classroom 44	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.32	534	0.0	$70.99	$547.73	$150.00	5.60
Classroom 43	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.32	534	0.0	$70.99	$547.73	$150.00	5.60
Classroom 51	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.32	534	0.0	$70.99	$547.73	$150.00	5.60
Classroom 48	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.32	534	0.0	$70.99	$547.73	$150.00	5.60
Classroom 42	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.32	534	0.0	$70.99	$547.73	$150.00	5.60
Classroom 41	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.32	534	0.0	$70.99	$547.73	$150.00	5.60

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,678	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,875	0.16	771	0.0	$102.53	$419.09	$60.00	3.50
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,339	0.06	152	0.0	$20.28	$109.55	$30.00	3.92
Custodial Clsoet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	670	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	670	0.02	25	0.0	$3.38	$36.52	$10.00	7.84
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,678	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,875	0.11	514	0.0	$68.35	$346.06	$40.00	4.48
Classroom 49	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.32	534	0.0	$70.99	$547.73	$150.00	5.60
Room 49F	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.06	107	0.0	$14.20	$109.55	$30.00	5.60
Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,678	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,678	0.13	610	0.0	$81.14	$219.09	$60.00	1.96
Copy Room 46A	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.11	181	0.0	$24.09	$219.09	$60.00	6.60
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,678	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,875	0.08	385	0.0	$51.26	$309.55	$30.00	5.45
Closet 44B	1	Compact Fluorescent: Screw in Lamps	Wall Switch	23	670	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	670	0.00	5	0.0	$0.71	$17.23	$0.00	24.37
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.08	193	0.0	$25.63	$379.55	$65.00	12.27
Work Room / Office 42D	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,339	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.14	339	0.0	$45.12	$489.09	$95.00	8.73
Classroom 40	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.24	391	0.0	$52.06	$401.67	$110.00	5.60
Hallway	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,875	Relamp	No	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,875	0.24	783	0.0	$104.12	$401.67	$110.00	2.80
Office Room 67	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.13	213	0.0	$28.40	$219.09	$60.00	5.60
Library Room 63	30	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	30	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	1.10	1,811	0.0	$240.95	$2,190.90	$600.00	6.60
Server Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	None	No	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Work Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	None	No	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.09	142	0.0	$18.93	$146.06	$40.00	5.60
Staff Room 61	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.19	320	0.0	$42.60	$328.64	$90.00	5.60
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.06	107	0.0	$14.20	$109.55	$30.00	5.60
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.06	107	0.0	$14.20	$109.55	$30.00	5.60
Electric Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	670	None	No	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	670	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electric Room	1	Compact Fluorescent: Screw in Lamps	Wall Switch	23	670	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	670	0.00	5	0.0	$0.71	$17.23	$0.00	24.37
Hallway	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,678	None	No	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,678	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 2	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	937	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 2A	10	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	937	0.19	313	0.0	$41.59	$724.60	$0.00	17.42
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	None	No	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 1	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 3	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 4	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 6	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 7	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 8	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 9	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 10	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 11	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 12	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 5	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.19	320	0.0	$42.60	$328.64	$90.00	5.60
Office 8A	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	None	No	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	None	No	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 13	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.26	427	0.0	$56.79	$438.18	$120.00	5.60
Classroom 14	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.26	427	0.0	$56.79	$438.18	$120.00	5.60
Classroom 15	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.26	427	0.0	$56.79	$438.18	$120.00	5.60
Office 16	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.04	71	0.0	$9.47	$73.03	$20.00	5.60
Elevator Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	670	None	No	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	670	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	None	No	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
2nd Floor Hallway	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,875	Relamp	No	17	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,875	0.37	1,209	0.0	$160.92	$620.76	$170.00	2.80
Classroom 27	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 28	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 29	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 30	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.26	427	0.0	$56.79	$438.18	$120.00	5.60
Classroom 31	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 32	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 33	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.26	427	0.0	$56.79	$438.18	$120.00	5.60
Classroom 34	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.26	427	0.0	$56.79	$438.18	$120.00	5.60
Classroom 35	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.26	427	0.0	$56.79	$438.18	$120.00	5.60
Room 36	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,339	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.19	452	0.0	$60.16	$562.12	$115.00	7.43
Room 28A	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,339	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.19	452	0.0	$60.16	$562.12	$115.00	7.43
Work Room 25	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	None	No	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 23	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 24	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 26	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.39	640	0.0	$85.19	$657.27	$180.00	5.60
Classroom 22	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.45	747	0.0	$99.39	$766.82	$210.00	5.60
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	None	No	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	None	No	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Custodial Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	670	None	No	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	670	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Access Room	2	Incandescent: Screw in Lamps	Wall Switch	200	670	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	30	670	0.22	262	0.0	$34.83	$34.45	$10.00	0.70
Stiarwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	None	No	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main Entrance	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,678	None	No	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,678	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Guidance Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	937	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	937	0.19	320	0.0	$42.60	$328.64	$90.00	5.60
Conference Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	937	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	937	0.06	107	0.0	$14.20	$109.55	$30.00	5.60
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	625	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	625	0.04	47	0.0	$6.31	$73.03	$20.00	8.40
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	625	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	625	0.04	47	0.0	$6.31	$73.03	$20.00	8.40
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	625	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	625	0.04	47	0.0	$6.31	$73.03	$20.00	8.40

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	625	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	625	0.04	47	0.0	$6.31	$73.03	$20.00	8.40
Copy Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	625	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	625	0.04	47	0.0	$6.31	$73.03	$20.00	8.40
Main Office	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.26	423	0.0	$56.22	$511.21	$140.00	6.60
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.07	121	0.0	$16.06	$146.06	$40.00	6.60
Hallway	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	33	1,875	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,875	0.04	138	0.0	$18.36	$130.06	$40.00	4.91
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.09	142	0.0	$18.93	$146.06	$40.00	5.60
Copy Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	937	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.04	71	0.0	$9.47	$73.03	$20.00	5.60
Nurse Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	937	Relamp	No	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	937	0.22	362	0.0	$48.19	$438.18	$120.00	6.60
Exam Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,339	0.02	51	0.0	$6.76	$36.52	$10.00	3.92
Restroom	1	Compact Fluorescent: Screw in Lamps	Wall Switch	23	1,339	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	1,339	0.00	11	0.0	$1.41	$17.23	$0.00	12.18
Restroom	1	Compact Fluorescent: Screw in Lamps	Wall Switch	23	1,339	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	1,339	0.00	11	0.0	$1.41	$17.23	$0.00	12.18
Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,875	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,875	0.17	569	0.0	$75.73	$292.12	$80.00	2.80
Classroom 77	6	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	33	937	Relamp	No	6	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	937	0.06	103	0.0	$13.77	$195.09	$60.00	9.81
Music Room 79A	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	No	26	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,339	0.56	1,321	0.0	$175.79	$949.39	$260.00	3.92
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,339	0.02	51	0.0	$6.76	$36.52	$10.00	3.92
Storage Room 76B	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	670	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	670	0.04	51	0.0	$6.76	$73.03	$20.00	7.84
Faculty Lounge 74	7	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	33	937	Relamp	No	7	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	937	0.07	121	0.0	$16.06	$227.61	$70.00	9.81
Multipurpose Room	15	Linear Fluorescent - T5HO: 4' T5HO (54W) - 4L	Occupancy Sensor	234	1,875	Relamp	No	15	LED - Linear Tubes: (4) 4' T5HO (25W) Lamps	Occupancy Sensor	102	1,875	1.30	4,268	0.0	$567.95	$1,583.78	$0.00	2.79
Stage	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	670	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	670	0.30	356	0.0	$47.33	$511.21	$140.00	7.84
Storage	1	Compact Fluorescent: Screw in Lamps	Wall Switch	26	670	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	18	670	0.01	6	0.0	$0.80	$17.23	$0.00	21.56
Kitchen	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,339	Relamp	No	13	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,339	0.48	1,121	0.0	$149.16	$949.39	$260.00	4.62
Restroom	1	Compact Fluorescent: Screw in Lamps	Wall Switch	23	670	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	670	0.00	5	0.0	$0.71	$17.23	$0.00	24.37
Storage	1	Compact Fluorescent: Screw in Lamps	Wall Switch	23	670	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	670	0.00	5	0.0	$0.71	$17.23	$0.00	24.37
Hallway	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,678	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,875	0.33	1,541	0.0	$205.05	$638.18	$120.00	2.53
Classroom 80	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.33	771	0.0	$102.53	$708.18	$155.00	5.40

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 82	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.49	1,156	0.0	$153.79	$927.27	$215.00	4.63
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.08	193	0.0	$25.63	$379.55	$65.00	12.27
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	937	0.08	193	0.0	$25.63	$379.55	$65.00	12.27
Gym	40	Linear Fluorescent - T5HO: 4' T5HO (54W) - 4L	Occupancy Sensor	234	1,875	Relamp	No	40	LED - Linear Tubes: (4) 4' T5HO (25W) Lamps	Occupancy Sensor	102	1,875	3.46	11,383	0.0	$1,514.53	$4,223.40	$0.00	2.79
Locker Room #1	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	1,339	None	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,339	0.02	51	0.0	$6.76	$36.52	$10.00	3.92
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,339	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,339	0.01	27	0.0	$3.59	$18.26	$5.00	3.70
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,875	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,875	0.04	142	0.0	$18.93	$73.03	$20.00	2.80
Locker Room #2	6	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	1,339	None	No	6	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	1,339	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,339	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,339	0.02	51	0.0	$6.76	$36.52	$10.00	3.92
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,339	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,339	0.01	27	0.0	$3.59	$18.26	$5.00	3.70
Under Canopy	9	LED Screw-In Lamps: Screw in Lamps	None	18	5,475	None	No	9	LED Screw-In Lamps: Screw in Lamps	None	18	5,475	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Under Canopy	1	LED Screw-In Lamps: Screw in Lamps	None	18	5,475	None	No	1	LED Screw-In Lamps: Screw in Lamps	None	18	5,475	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Under Canopy	6	Incandescent: Screw in Lamps	None	120	5,475	Relamp	No	6	LED Screw-In Lamps: Screw in Lamps	None	18	5,475	0.40	3,853	0.0	$512.71	$206.70	$60.00	0.29
Under Canopy	6	Compact Fluorescent: Screw in Lamps	None	46	5,475	Relamp	No	6	LED Screw-In Lamps: Screw in Lamps	None	32	5,475	0.05	521	0.0	$69.37	$206.70	$0.00	2.98
Building Mounted	17	Metal Halide: (1) 100W Lamp	None	128	4,015	Fixture Replacement	No	17	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	30	4,015	1.09	7,692	0.0	$1,023.52	$16,421.41	$1,700.00	14.38
Building Mounted	3	Metal Halide: (1) 100W Lamp	None	128	8,760	Fixture Replacement	Yes	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	30	4,380	0.22	3,415	0.0	$454.40	$3,167.90	$300.00	6.31
Building Mounted	1	LED Screw-In Lamps: Screw in Lamps	None	18	4,015	None	No	1	LED Screw-In Lamps: Screw in Lamps	None	18	4,015	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pole Mounted	3	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	75	4,015	None	No	3	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	75	4,015	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pole Mounted	8	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	75	4,015	None	No	8	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	75	4,015	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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?	Annual Operating Hours	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Boiler Exhuast	2	Exhaust Fan	3.0	87.5%	No	848	Yes	89.5%	Yes	2	1.73	1,576	0.0	$209.67	$7,624.98	$0.00	36.37
Boiler Room	Boiler Burner	2	Other	3.0	84.0%	No	848	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Hot Water Supply	2	Heating Hot Water Pump	7.5	88.5%	No	848	Yes	91.0%	Yes	2	2.01	4,733	0.0	$629.82	$9,476.48	$0.00	15.05
Boiler Room	Assumed Boiler Feed Pump Motors	2	Boiler Feed Water Pump	0.8	86.0%	No	848	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Domestic Hot Water Pumps	1	Water Supply Pump	0.8	74.0%	No	1,373	Yes	81.1%	No		0.03	68	0.0	$9.07	$536.42	$0.00	59.17
Boiler Room	Domestic Water Circulation Pump	1	Water Supply Pump	2.0	89.5%	No	1,373	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Air Compressor for Pneumatic Controls	2	Air Compressor	3.0	86.5%	No	1,239	Yes	89.5%	No		0.09	161	0.0	$21.45	$1,752.72	$0.00	81.71
Roof	Building Exhaust	20	Exhaust Fan	0.1	74.0%	No	1,373	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gym & Café	Hot Water Pump for Coil at HV	8	Heating Hot Water Pump	0.8	74.0%	No	686	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gym & Café	Supply Fan for HV	8	Supply Fan	5.0	87.5%	No	686	Yes	89.5%	Yes	8	11.55	8,504	0.0	$1,131.52	$33,575.28	$3,200.00	26.84
Roof	Kitchen Exhaust	2	Exhaust Fan	1.5	86.5%	No	686	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms & Offices	Unitary HVAC	100	Supply Fan	0.3	74.0%	No	686	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms & Offices	Unitary HVAC	20	Supply Fan	0.3	74.0%	No	686	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Library & Music	Supply Fan for HV	4	Supply Fan	5.0	87.5%	No	686	Yes	89.5%	Yes	4	5.77	4,252	0.0	$565.76	$16,787.64	$1,600.00	26.84

Electric 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 (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	DX Cooling for Gym	1	Packaged AC	20.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	DX Cooling for Café	1	Packaged AC	20.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	DX Cooling for Guidance Offices	1	Packaged AC	3.00		Yes	1	Packaged AC	3.00		14.00		Yes	1.51	2,756	0.0	$366.67	$7,306.88	$526.00	18.49
Roof	DX Cooling for Library	1	Packaged AC	8.00		Yes	1	Packaged AC	8.00		13.00		Yes	3.55	6,290	0.0	$836.95	$15,006.85	$834.00	16.93
Roof	DX Cooling for Classrooms	1	Packaged AC	8.00		Yes	1	Packaged AC	8.00		13.00		Yes	3.55	6,290	0.0	$836.95	$15,006.85	$834.00	16.93
Roof	DX Cooling for Classroom Wing	2	Packaged AC	5.00		Yes	2	Packaged AC	5.00		14.00		Yes	5.04	9,186	0.0	$1,222.24	$23,689.60	$1,420.00	18.22
Roof	DX Cooling for Classrooms	1	Packaged AC	5.00		Yes	1	Packaged AC	5.00		14.00		Yes	2.52	4,593	0.0	$611.12	$11,844.80	$710.00	18.22
Roof	DX Cooling for Classrooms	1	Packaged AC	5.00		Yes	1	Packaged AC	5.00		14.00		Yes	2.52	4,593	0.0	$611.12	$11,844.80	$710.00	18.22
Outdoor Condensing Unit	Classrooms	2	Split-System AC	3.00		Yes	2	Split-System AC	3.00		14.00		No	1.38	1,894	0.0	$251.95	$8,977.32	$552.00	33.44
Offices & Classrooms	New Window AC Unit	6	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Offices & Classrooms	Old Window AC Unit	7	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Offices & Classrooms	Portable AC Unit	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating 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)	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Hydronic Heating System	1	Non-Condensing Hot Water Boiler	3,035.00	Yes	1	Non-Condensing Hot Water Boiler	3,035.00	85.00%	Ec	0.00	0	663.5	$5,564.05	$52,788.23	$3,945.50	8.78
Boiler Room	Hydronic Heating System	1	Non-Condensing Hot Water Boiler	3,035.00	Yes	1	Non-Condensing Hot Water Boiler	3,035.00	85.00%	Ec	0.00	0	221.2	$1,854.68	$52,788.23	$3,945.50	26.33

Demand Control Ventilation Recommendations

		Recommendation Inputs				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	Number of Zones	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Café	Café	1	20.00			0.00	6,858	0.0	$912.51	$1,359.42	$0.00	1.49
Gym	Gym	1	20.00			0.00	6,858	0.0	$912.51	$1,359.42	$0.00	1.49

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Domestic Hot Water System	1	Indirect System	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	96.00%	Et	0.00	0	162.5	$1,362.56	$75,165.00	$1,400.00	54.14

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	37	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	64.9	$544.29	$265.29	$0.00	0.49
Locker Room Restrooms	2	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	3.5	$29.42	$14.34	$0.00	0.49

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions			Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Cooler (35F to 55F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Freezer Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Refrigerator Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Gas Griddle (3 Feet Width)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Convection Oven (Half Size)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Rack Oven (Double)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Insulated Food Holding Cabinet (1/2 Size)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Single Tank Conveyor (High Temp)	Natural Gas	Electric	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	**Quantity**	**Equipment Description**	**Energy Rate (W)**	**ENERGY STAR Qualified?**
Intermediate School	94	Desktop Computer	120.0	
Intermediate School	3	Coffee Maker	200.0	
Intermediate School	2	Toaster	850.0	
Intermediate School	4	Refrigerator	690.0	
Intermediate School	5	Microwavee	1,100.0	
Intermediate School	48	Fan	100.0	
Intermediate School	55	TV	150.0	
Intermediate School	42	Projector	200.0	
Intermediate School	2	Laptop Cart	1,200.0	
Intermediate School	22	Smart Board	316.0	
Intermediate School	3	Mini Fridge	260.0	
Intermediate School	2	Speaker	100.0	
Intermediate School	16	Printer	40.0	
Intermediate School	3	Large Xerox- Type Printers	515.0	
Intermediate School	7	Large Floor Fans	550.0	
Intermediate School	1	Misc Equipment Loads	1,400.0	

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	**Quantity**	**Vending Machine Type**	**Install Controls?**	**Total Peak kW Savings**	**Total Annual kWh Savings**	**Total Annual MMBtu Savings**	**Total Annual Energy Cost Savings**	**Total Installation Cost**	**Total Incentives**	**Simple Payback w/ Incentives in Years**
Facility Lounge	1	Refrigerated	Yes	0.00	1,612	0.0	$214.47	$230.00	$50.00	0.84
Facility Lounge	1	Non-Refrigerated	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Custom Recommendations

Building Envelope Weatherization

Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis					
Annual Electric HVAC Energy Use (kWh)	*Annual Heating Gas Use (mmBtu)*	*Annual Heating Oil Use (mmBtu)*	Assumed % Electric HVAC Savings	Assumed % Fuel HVAC Savings	Total Annual kWh Savings	Total Annual Gas mmBtu Savings	Total Annual Fuel mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
113,538	5,026	0	0.1%	5.0%	57	251	0	$2,115	$8,200	3.88

	qty	$/unit	est. costs
Weather-strip Exterior Double Doors	10	100	$ 1,000
Weather-strip Exterior Single Doors		60	$ -
Caulk the Perimeter of Windows and Wall Cracks	1800	4	$ 7,200
		Total Estimated Costs	**$ 8,200**

Computer Power Management Software

# of Desktops	Normal Running Mode					Idle Running Mode					Suspended/Off Mode				
94	*Mon - Fri 8AM-5PM*	*Mon - Fri 5PM-8AM*	*Weekends & Holidays*	Energy Rate (W)*	Weekly Run Hours	Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	*Weekends & Holidays*	*Energy Rate (W)**	*Weekly Run Hours*	Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	Weekends & Holidays	Energy Rate (W)*	*Weekly Run Hours*
Existing Conditions	10%	5%	0%	120	**8**	5%	5%	5%	80	**8**	85%	90%	95%	5	**152**
Proposed Conditions	10%	0%	0%	120	**4**	0%	0%	0%	80	**0**	90%	100%	100%	5	**164**

Usage per Device			Energy Impact & Financial Analysis					
Weeks of Use	Annual kWh Usage	*Diversity Factor***	Total Annual kWh Savings	Total Annual Energy Cost Savings	*Cost per Desktop*	*Add'l Hardware Cost*	Total Installation Cost	Simple Payback Period (Years)
44	105	90%	3,652	$486	$15.00	$2,500.0	$3,910	8.05
44	62							

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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51

ENERGY STAR® Score[1]

Lawrence Intermediate School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 101,000
Built: 1970

For Year Ending: July 31, 2017
Date Generated: September 24, 2018

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
Lawrence Intermediate School 66 Eggerts Crossing Road Lawrenceville, New Jersey 08648	Lawrence Township BOE 2565 Princeton Pike Lawrenceville, NJ 08648 (609) 671-5418	Thomas Eldridge 2565 Princeton Pike Lawrenceville, NJ 08648 (609) 671-5418 teldridge@LTPS.org

Property ID: 6441260

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
80.9 kBtu/ft²

Source EUI
111 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	1,529,172 (19%)
Electric - Solar (kBtu)	987,463 (12%)
Natural Gas (kBtu)	5,654,463 (69%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	81.7
National Median Source EUI (kBtu/ft²)	112.1
% Diff from National Median Source EUI	-1%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	455

Signature & Stamp of Verifying Professional

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

Signature: ____________________ Date: __________

Licensed Professional

____ ________

(____)____-______

____

Professional Engineer Stamp
(if applicable)