Local Government Energy Audit:
Energy Audit Report

Brick Township

Board of Education Office

& Central Administration Building

105 Hendrickson Avenue

Brick Township, NJ 08723

April 16, 2018

Final Report by:

TRC Energy Services

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.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Brick Township BOE Office & Central Administration Building.

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 school districts and local governments in controlling their energy costs and help protect our environment by reducing energy consumption statewide.

1.1 Facility Summary

Brick Township Board of Education Office and Central Administration Building are a single 26,875 square foot facility. The original Administration Building was built in 1978; it is about 6,875 square feet. The Board of Education Office, or the Education Enrichment Center (EEC) – is a ~20,000 square foot expansion, which was added to the building in 2002. There are separate electric and gas accounts and dedicated HVAC equipment serving each section, but for all intents and purposes it is a single building.

The Administration/EEC Building is a single story building constructed of concrete masonry block with a brick façade covering the exterior of the original section. It has a flat roof covered by a light-colored membrane.

It consists mostly of administrative offices, conference rooms for the Board of Education and staff to meet, and large multi-purpose room (in the EEC section) which is used for teacher and staff trainings. The building is typically occupied on weekdays from 8:00 AM to 5:00 PM by approximately 79 staff people.

The interior is mostly lit by 4-foot T-8 linear fluorescent fixtures, with a few older 4-foot T-12 fluorescent fixtures in the original section. The building shares a large parking lot area in front of the building with two Brick Township public schools (Veterans' Memorial Middle School & Veterans' Memorial Elementary School), which is lit by 400-Watt metal halide, mounted on 40-foot poles.

Heat is supplied to the building by Weil McLain non-condensing hot water boilers. The boiler supplying the original section of the building has an output capacity of about 643 MBH. The boiler supplying the EEC (i.e. the 2002 addition) has an output capacity of 1,084 MBH. The original section is cooled by through-the-wall AC unit units and a Trane 5-ton split system AC unit. The EEC is cooled by a 100-ton Trane air-cooled screw-type chiller

A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated 10 energy conservation measures which together represent an opportunity for Brick Township Board of Education to reduce annual energy costs for the Administration/EEC Building by $20,516 and annual greenhouse gas emissions by 181,069 lbs CO_2e. We estimate that if all measures are implemented as recommended, the project would pay for itself in 5.3 years. The breakdown of existing utility costs and the potential utility costs savings after project implementation are shown in Figure 1 and

Figure 2, respectively. Together these measures represent an opportunity to reduce building's total annual energy use by about 18.2%.

Figure 1 – Previous 12 Month Utility Costs

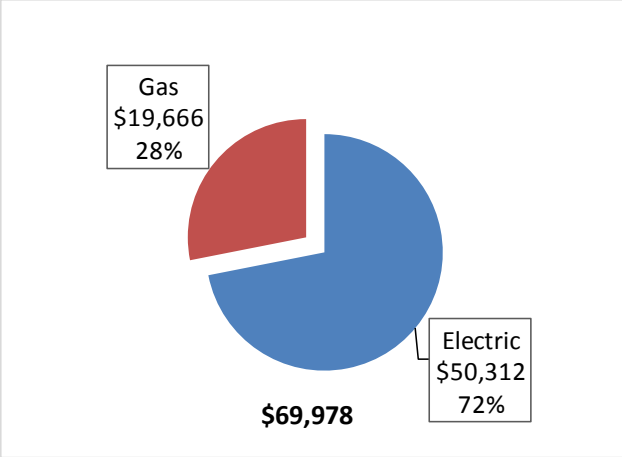
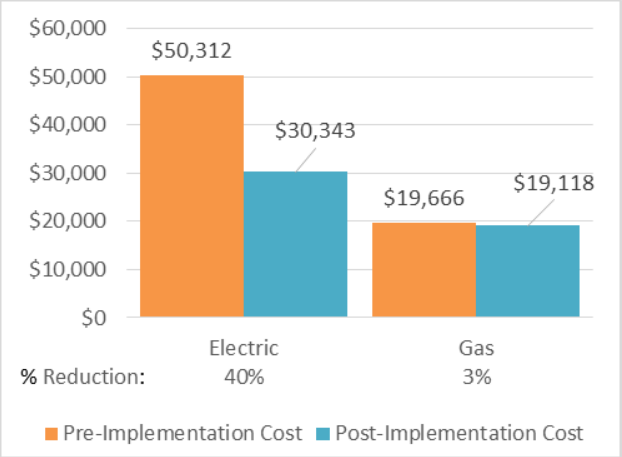


Figure 2 – Potential Post-Implementation Costs



A detailed description of the building'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 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

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		**146,462**	**30.3**	**0.0**	**$16,893.89**	**$64,444.45**	**$5,930.00**	**$58,514.45**	**3.5**	**147,486**
ECM 1	Install LED Fixtures	98,046	14.2	0.0	$11,309.32	$32,273.18	$120.00	$32,153.18	2.8	98,732
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	2,522	0.9	0.0	$290.95	$1,934.33	$190.00	$1,744.33	6.0	2,540
ECM 3	Retrofit Fixtures with LED Lamps	45,630	15.2	0.0	$5,263.31	$29,914.27	$5,620.00	$24,294.27	4.6	45,949
ECM 4	Install LED Exit Signs	263	0.0	0.0	$30.32	$322.67	$0.00	$322.67	10.6	265
Lighting Control Measures		**9,961**	**3.5**	**0.0**	**$1,149.01**	**$11,774.00**	**$1,420.00**	**$10,354.00**	**9.0**	**10,031**
ECM 5	Install Occupancy Sensor Lighting Controls	9,961	3.5	0.0	$1,149.01	$11,774.00	$1,420.00	$10,354.00	9.0	10,031
Motor Upgrades		**434**	**0.1**	**0.0**	**$50.00**	**$1,609.68**	**$0.00**	**$1,609.68**	**32.2**	**437**
ECM 6	Premium Efficiency Motors	434	0.1	0.0	$50.00	$1,609.68	$0.00	$1,609.68	32.2	437
Variable Frequency Drive (VFD) Measures		**5,972**	**0.8**	**0.0**	**$688.82**	**$6,015.30**	**$0.00**	**$6,015.30**	**8.7**	**6,013**
ECM 7	Install VFDs on Hot Water Pumps	5,972	0.8	0.0	$688.82	$6,015.30	$0.00	$6,015.30	8.7	6,013
Electric Unitary HVAC Measures		**7,253**	**5.1**	**0.0**	**$836.64**	**$15,699.58**	**$460.00**	**$15,239.58**	**18.2**	**7,304**
ECM 8	Install High Efficiency Electric AC	7,253	5.1	0.0	$836.64	$15,699.58	$460.00	$15,239.58	18.2	7,304
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**67.9**	**$646.45**	**$15,842.26**	**$1,452.00**	**$14,390.26**	**22.3**	**7,954**
ECM 9	Install High Efficiency Hot Water Boilers	0	0.0	67.9	$646.45	$15,842.26	$1,452.00	$14,390.26	22.3	7,954
Domestic Water Heating Upgrade		**3,036**	**1.4**	**-10.4**	**$251.65**	**$2,091.20**	**$300.00**	**$1,791.20**	**7.1**	**1,845**
ECM 10	Install Tankless Water Heater	3,036	1.4	-10.4	$251.65	$2,091.20	$300.00	$1,791.20	7.1	1,845
TOTALS		**173,118**	**41.1**	**57.6**	**$20,516.46**	**$117,476.46**	**$9,562.00**	**$107,914.46**	**5.3**	**181,069**

* - 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.

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.

Energy Efficient Best Practices

TRC also identified seven low cost (or no cost) energy efficient best 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 best practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. It is our understanding Brick Township Board of Education is already implementing many of the best practices described in the audit reports, however they are listed for representative purposes only.

- Close Doors and Windows
- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean and/or Replace HVAC Filters
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls

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

On-Site Generation Measures

On October 30, 2015, Brick Township Board of Education entered into a long-term solar power purchase agreement (PPA) with GeoPeak Energy, LLC. According to the terms of the PPA, GeoPeak will install rooftop solar arrays on seven Brick Township schools, including a 68 kW PV solar array on the roof of the Brick Township BOE Administration/ EEC Building in 2017. Brick BOE has agreed to purchase the electric output of the solar arrays at a specified rate (as detailed in the PPA) over the next 20 years.

Installation of the solar array on the building's rooftop had not yet begun at the time of TRC's inspection of there. Because an agreement for solar development of the site was already in place, no additional analysis was deemed to be necessary for on-site generation potential at the facility.

For further details the building's on-site generation potential, please see 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

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 3 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.

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 8.3 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 or: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Will Kolibas	Exec Director of Facilities	wkolibas@brickschools.org	732-785-3000
James W. Edwards	Business Administrator	jedwards@brickschools.org	732 785-3000
TRC Energy Services			
Tom Page	Auditor	tpage@TRCsolutions.com	(732) 855-0033

2.2 General Site Information

On February 23, 2017, TRC performed an energy audit at Brick Township Board of Education Office and Central Administration Building in Brick Township, New Jersey. TRC's team met with Will Kolibas to review the facility operations and help focus our investigation on specific energy-using systems. Brick Township Board of Education Office and Central Administration Building is a single 26,875 square foot facility. The original Administration Building was built in 1978; it is about 6,875 square feet. The Board of Education Office - a.k.a. the Education Enrichment Center (EEC) – is a ~20,000 square foot expansion, which was added to the building in 2002. There are separate electric and gas accounts and dedicated HVAC equipment serving each section, but for all intents and purposes it is a single building.

The Administration/EEC Building consists mostly of administrative offices, conference rooms for the Board of Education and staff to meet, and large multi-purpose room (in the EEC section) which is used for teacher and staff trainings.

2.3 Building Occupancy

The building is typically occupied on weekdays from 8:00 AM to 5:00 PM by approximately 79 staff people.

The interior is mostly lit by 4-foot T8 linear fluorescent fixtures, with a few older 4-foot T12 fluorescent fixtures in the original section. The building shares a large parking lot area in front of the building with two Brick Township schools (Veteran's Memorial Middle School & Elementary School), which is lit by 400-Watt metal halide, mounted on 40-foot poles.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Board of Education Business Office	Weekday	8:00 AM - 5:00 PM
Board of Education Business Office	Weekend	CLOSED
Central Admin Bldg / Educational Enrichment Center	Weekday	8:00 AM - 5:00 PM
Central Admin Bldg / Educational Enrichment Center	Weekend	CLOSED

2.4 Building Envelope

The Administration/EEC building is a single story building constructed of concrete masonry block with a brick façade covering the exterior of the original section. It has a flat roof covered by a light-colored membrane.

The building's windows and doors appeared to be well sealed. No excessive air infiltration was found.

Image 1: Building Main Entrances

2.5 On-Site Generation

The Brick Township Board of Education Administration/EEC Building is one of the buildings that was included in a solar PPA that the Brick Township BOE signed with GeoPeak Energy, LLC in October 2015. According to the terms of the PPA, a 68 kW solar array is planned to be installed on the building's rooftop in 2017 (along with other Brick Township schools). At the time of our inspection, installation had not yet begun at that site.

2.6 Energy-Using Systems

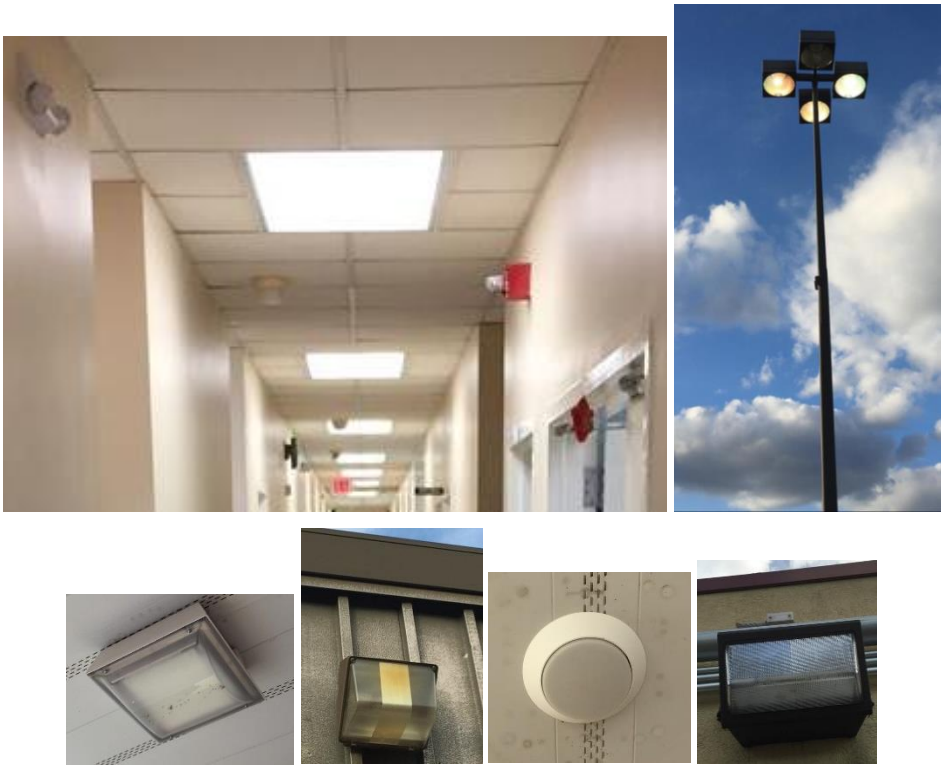
Please see Appendix A: Equipment Inventory & Recommendations for an inventory of facility's equipment.

Lighting System

The interior is mostly lit by 4-foot T8 linear fluorescent fixtures, with a few older 4-foot T12 fluorescent fixtures in the original section. The EEC section of the building also has 32-Watt U-bend T8 fluorescent fixtures in some offices. Lighting is controlled by occupancy sensors in a few rooms (in the 1978 section), but most areas are controlled by manual switches only.

The building perimeter is lit 250-Watt HID fixtures and incandescents. The building shares a large parking lot area in front of the building with two Brick Township public schools Veterans' Memorial Middle School & Veterans' Memorial Elementary School), which is lit by 400-Watt HID fixtures, mounted on 40-foot poles. Exterior lights are controlled by timers.

Image 2: Lighting Fixtures at Central Admin / EEC Building



Hot Water Heating System

Heat is supplied to the building by two Weil McLain non-condensing hot water boilers. The boiler that supplies the original section of the building has an output capacity of about 643 MBH. It is 41 years old and in fair condition. The boiler that supplies the EEC section (the 2002 addition) has an output capacity of 1,084 MBH. It is 15 years old and in good condition.

Hot water is distributed to unit ventilators throughout the building by four hot water pumps (two for each boiler). The heating hot water pumps serving the Administration section are ¾ HP each. The pumps serving the EEC section are 3 HP each. All are run at constant speed.

Image 3: Hot water boilers and unit ventilators

Direct Expansion (DX) Air Conditioning

The original 1978 section of the building is cooled by a Trane 5-ton split system air conditioning unit. The unit is located behind the building. The unit installed in 1978 and is in fair condition.

There are also three small through-the-wall air conditioning units that provide cooling to the Administration section.

There are also two Carrier ductless mini-split system units which serve of the EEC section of the building. Nameplate data for these units was not available. They are estimated to provide about 3 tons of cooling each and believed to be about 15 years old. They appear to be in good condition.

Image 4: Ductless Mini-Split and Through-the-wall AC units

Chiller Systems

The EEC section is cooled by a 100-ton Trane air-cooled screw-type chiller. The condensing unit is located behind the building. It is 15 years old and in good condition.

Chilled water is distributed throughout the building by two 10-HP chilled water pumps which are in very good condition and controlled by VFDs.

Chilled water coils in three Aaon air handling units (AHUs) distribute conditioned air to ceiling ventilators in the EEC section.

Image 5: Trane Chilled Water System and Related Equipment

Domestic Hot Water Heating System

The original 1978 Administration Building section receives domestic hot water from one Rheem electric hot water heater with a 65-gallon storage tank.

Image 6: One Electric DHW Heater and Two Gas-Fired DHW Heaters

The 2002 EEC section received domestic hot water from two 150-gallon gas-fired A.O. Smith domestic hot water heaters.

The hot water heaters are all about 15 years old and appear to be in good condition.

Refrigeration

The building has three GE medium-sized refrigerators (~20 ft^3 ea.) and two Sanyo mini-refrigerators used by facility staff.

Building Plug Load

The building has typical office equipment for an administrative office building of its size. We counted approximately 33 computer work stations (with one or two LCD monitors each). There are also about 10 printers and six large copy machines on site. The building also contains four large server racks, five microwave ovens, a washer and dryer, and a dishwasher.

Image 7: Building Plug Load Equipment

2.7 Water-Using Systems

The building has ten restrooms. A sampling of restroom fixtures showed them to be low-flow devices that meet federal guidelines for water conservation. The faucets were found to be less than or equal to 2.2 gallons per minute (gpm), the toilets were found to be less than or equal to 1.6 gallons per flush (gpf), and the urinals were found to be less than or equal to 1.0 gpf.

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

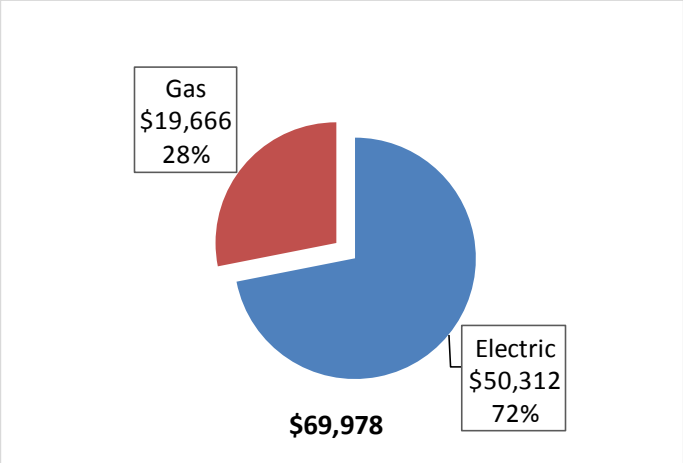
The following energy consumption and cost data is based on a recent 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Brick Twp BOE Office & Central Admin Bldg		
Fuel	**Usage**	**Cost**
Electricity	436,180 kWh	$50,312
Natural Gas	20,666 Therms	$19,666
Total		**$69,978**

The current annual energy cost for this facility is $69,978 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric rate over a recent 12-month period was found to be **$0.115/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 monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

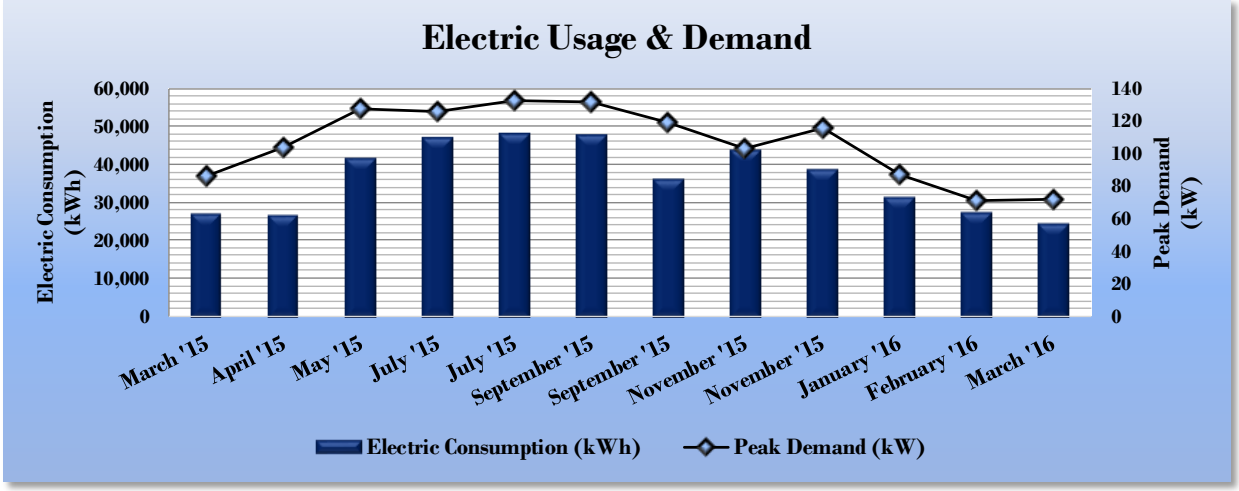


Figure 9 - Electric Usage & Demand

Electric Billing Data for Brick Twp BOE Office & Central Admin Bldg					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Total Electric Cost	TRC Estimated Usage?
4/15/15	33	27,360	86	$3,225	No
5/14/15	29	26,800	104	$3,402	No
6/15/15	32	41,520	128	$4,820	No
7/16/15	31	47,120	126	$5,355	No
8/14/15	29	48,320	133	$5,515	No
9/16/15	33	47,760	132	$5,452	No
10/15/15	29	36,240	120	$4,212	No
11/16/15	32	43,680	103	$4,893	No
12/15/15	29	38,640	116	$4,474	No
1/18/16	34	31,520	87	$3,608	No
2/16/16	29	27,520	71	$3,122	No
3/16/16	29	24,480	72	$2,786	No
Totals	**369**	**440,960**	**132.8**	**$50,863**	0
Annual	**365**	**436,180**	**132.8**	**$50,312**	

3.3 Natural Gas Usage

Natural Gas is provided by NJ Natural Gas. The average natural gas rate over a recent 12-month period was found to be **$0.952/therm**, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Natural Gas Usage

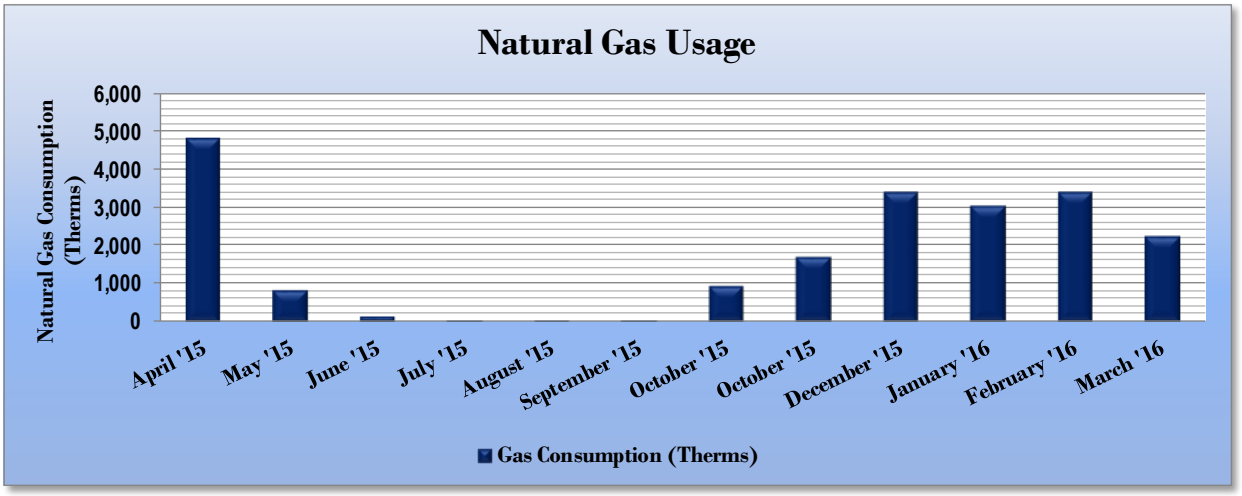


Figure 11 - Natural Gas Usage

Gas Billing Data for Brick Twp BOE Office & Central Admin Bldg			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
4/17/15	28	4,802	$4,236
5/18/15	31	835	$939
6/18/15	31	146	$358
7/21/15	33	19	$255
8/17/15	27	16	$252
9/16/15	30	19	$255
10/19/15	33	940	$988
11/13/15	25	1,721	$1,557
12/18/15	35	3,399	$3,020
1/19/16	32	3,042	$2,692
2/17/16	29	3,411	$2,993
3/18/16	30	2,260	$2,067
Totals	**364**	**20,610**	**$19,612**
Annual	**365**	**20,666**	**$19,666**

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 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Brick Twp BOE Office & Central Admin Bldg	National Median Building Type: Office
Source Energy Use Intensity (kBtu/ft^2)	254.6	148.1
Site Energy Use Intensity (kBtu/ft^2)	132.3	67.3

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

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Brick Twp BOE Office & Central Admin Bldg	National Median Building Type: Office
Source Energy Use Intensity (kBtu/ft^2)	168.6	148.1
Site Energy Use Intensity (kBtu/ft^2)	103.4	67.3

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. Based on the results of our benchmarking analysis the building appears to be using significantly more energy than the average building of its size, age, and building. The facility has a current score of 17 (out of 100). Following installation of the energy efficiency measures described in this report, the building will likely perform much closer to the national median in terms of energy usage per square foot.

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

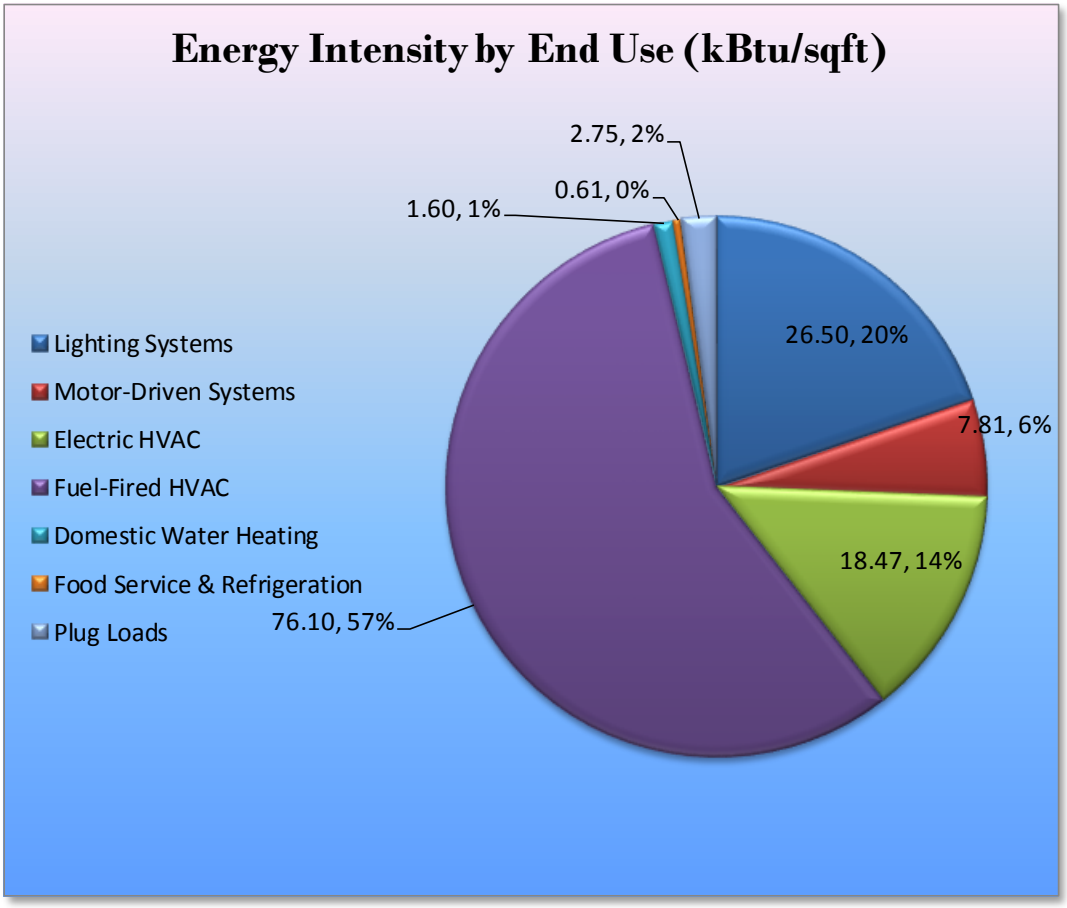
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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.

Figure 14 - Energy Balance (kBtu/ft² and %)



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 Brick Township BOE Administration/EEC Building 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 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

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

Figure 15 – 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		**146,462**	**30.3**	**0.0**	**$16,893.89**	**$64,444.45**	**$5,930.00**	**$58,514.45**	**3.5**	**147,486**
ECM 1	Install LED Fixtures	98,046	14.2	0.0	$11,309.32	$32,273.18	$120.00	$32,153.18	2.8	98,732
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	2,522	0.9	0.0	$290.95	$1,934.33	$190.00	$1,744.33	6.0	2,540
ECM 3	Retrofit Fixtures with LED Lamps	45,630	15.2	0.0	$5,263.31	$29,914.27	$5,620.00	$24,294.27	4.6	45,949
ECM 4	Install LED Exit Signs	263	0.0	0.0	$30.32	$322.67	$0.00	$322.67	10.6	265
Lighting Control Measures		**9,961**	**3.5**	**0.0**	**$1,149.01**	**$11,774.00**	**$1,420.00**	**$10,354.00**	**9.0**	**10,031**
ECM 5	Install Occupancy Sensor Lighting Controls	9,961	3.5	0.0	$1,149.01	$11,774.00	$1,420.00	$10,354.00	9.0	10,031
Motor Upgrades		**434**	**0.1**	**0.0**	**$50.00**	**$1,609.68**	**$0.00**	**$1,609.68**	**32.2**	**437**
ECM 6	Premium Efficiency Motors	434	0.1	0.0	$50.00	$1,609.68	$0.00	$1,609.68	32.2	437
Variable Frequency Drive (VFD) Measures		**5,972**	**0.8**	**0.0**	**$688.82**	**$6,015.30**	**$0.00**	**$6,015.30**	**8.7**	**6,013**
ECM 7	Install VFDs on Hot Water Pumps	5,972	0.8	0.0	$688.82	$6,015.30	$0.00	$6,015.30	8.7	6,013
Electric Unitary HVAC Measures		**7,253**	**5.1**	**0.0**	**$836.64**	**$15,699.58**	**$460.00**	**$15,239.58**	**18.2**	**7,304**
ECM 8	Install High Efficiency Electric AC	7,253	5.1	0.0	$836.64	$15,699.58	$460.00	$15,239.58	18.2	7,304
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**67.9**	**$646.45**	**$15,842.26**	**$1,452.00**	**$14,390.26**	**22.3**	**7,954**
ECM 9	Install High Efficiency Hot Water Boilers	0	0.0	67.9	$646.45	$15,842.26	$1,452.00	$14,390.26	22.3	7,954
Domestic Water Heating Upgrade		**3,036**	**1.4**	**-10.4**	**$251.65**	**$2,091.20**	**$300.00**	**$1,791.20**	**7.1**	**1,845**
ECM 10	Install Tankless Water Heater	3,036	1.4	-10.4	$251.65	$2,091.20	$300.00	$1,791.20	7.1	1,845
TOTALS		**173,118**	**41.1**	**57.6**	**$20,516.46**	**$117,476.46**	**$9,562.00**	**$107,914.46**	**5.3**	**181,069**

* - 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

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – 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		**146,462**	**30.3**	**0.0**	**$16,893.89**	**$64,444.45**	**$5,930.00**	**$58,514.45**	**3.5**	**147,486**
ECM 1	Install LED Fixtures	98,046	14.2	0.0	$11,309.32	$32,273.18	$120.00	$32,153.18	2.8	98,732
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	2,522	0.9	0.0	$290.95	$1,934.33	$190.00	$1,744.33	6.0	2,540
ECM 3	Retrofit Fixtures with LED Lamps	45,630	15.2	0.0	$5,263.31	$29,914.27	$5,620.00	$24,294.27	4.6	45,949
ECM 4	Install LED Exit Signs	263	0.0	0.0	$30.32	$322.67	$0.00	$322.67	10.6	265

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	132,542	19.3	0.0	$15,288.36	$8,830.04	$120.00	$8,710.04	0.6	133,469

Measure Description

We recommend replacing existing exterior fixtures containing HID lamps be replaced 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 more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 2: Retrofit Fixtures with LED Lamps and Drivers

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	$844.96	$0.00	$844.96	0.0	0
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing T12 fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers, which are designed to be used in fluorescent fixtures. With older fixtures such as T12 fluorescents, we recommend replacing both the lamp and the ballast. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. 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 a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 3: 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	46,545	14.1	0.0	$5,368.81	$28,544.17	$5,545.00	$22,999.17	4.3	46,870
Exterior	4,189	0.6	0.0	$483.17	$232.50	$75.00	$157.50	0.3	4,218

Measure Description

We recommend retrofitting existing T8 fluorescent, incandescent, halogen, and/or HID fixtures 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 a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 4: Install LED Exit Signs

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	420	0.0	0.0	$48.47	$322.67	$0.00	$322.67	6.7	423
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend replacing all incandescent or compact fluorescent Exit signs with LED Exit signs. Most of the building's Exit signs already use LEDs, but a few of the older type remain with compact fluorescent or incandescent lamps. These could be retrofitted, though new replacement LED Exit signs are inexpensive. LED Exit signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output.

4.1.2 Lighting Control Measures

Figure 17 – 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		**9,961**	**3.5**	**0.0**	**$1,149.01**	**$11,774.00**	**$1,420.00**	**$10,354.00**	**9.0**	**10,031**
ECM 5	Install Occupancy Sensor Lighting Controls	9,961	3.5	0.0	$1,149.01	$11,774.00	$1,420.00	$10,354.00	9.0	10,031

ECM 5: 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)
9,961	3.5	0.0	$1,149.01	$11,774.00	$1,420.00	$10,354.00	9.0	10,031

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in most restrooms, storage rooms, classrooms, and offices areas. Most areas are currently controlled manually. Occupancy 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.

4.1.3 Motor Upgrades

Our recommendations for motor upgrades are summarized in Figure 18 below.

Figure 18 – Summary of Motor 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)
Motor Upgrades		**434**	**0.1**	**0.0**	**$50.00**	**$1,609.68**	**$0.00**	**$1,609.68**	**32.2**	**437**
ECM 6	Premium Efficiency Motors	434	0.1	0.0	$50.00	$1,609.68	$0.00	$1,609.68	32.2	437

ECM 6: 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)
434	0.1	0.0	$50.00	$1,609.68	$0.00	$1,609.68	32.2	437

Measure Description

We recommend replacing standard efficiency motors with *NEMA Premium™* high efficiency motors, which meet current standards for high efficiency under the U.S. Energy Independence and Security Act of 2007 (EISA 2007). 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 were 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.

When adding variable frequency drives (VFD) motor controls, we recommend replacing motors with high efficiency models at the same time, if possible to maximize efficiency and motor life.

4.1.4 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 19 below.

Figure 19 – Summary of Variable Frequency Drive 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)
Variable Frequency Drive (VFD) Measures		**5,972**	**0.8**	**0.0**	**$688.82**	**$6,015.30**	**$0.00**	**$6,015.30**	**8.7**	**6,013**
ECM 7	Install VFDs on Hot Water Pumps	5,972	0.8	0.0	$688.82	$6,015.30	$0.00	$6,015.30	8.7	6,013

ECM 7: 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)
5,972	0.8	0.0	$688.82	$6,015.30	$0.00	$6,015.30	8.7	6,013

Measure Description

We recommend installing a variable frequency drives (VFD) to control a 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.

4.1.5 Electric Unitary HVAC Measures

Our recommendations for unitary HVAC measures are summarized in Figure 20 below.

Figure 20 - Summary of Unitary HVAC 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)
Electric Unitary HVAC Measures		**7,253**	**5.1**	**0.0**	**$836.64**	**$15,699.58**	**$460.00**	**$15,239.58**	**18.2**	**7,304**
ECM 8	Install High Efficiency Electric AC	7,253	5.1	0.0	$836.64	$15,699.58	$460.00	$15,239.58	18.2	7,304

ECM 8: 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)
7,253	5.1	0.0	$836.64	$15,699.58	$460.00	$15,239.58	18.2	7,304

Measure Description

We recommend replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. The building has a 5-ton air conditioning unit and two 3-ton dusctless mini-split AC units which are past their rater useful lifetimes and should be replaced.

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.

4.1.6 Gas-Fired Heating System Replacements

Our recommendations for gas-fired heating system replacements are summarized in Figure 21 below.

Figure 21 - Summary of Gas-Fired Heating Replacement 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)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**67.9**	**$646.45**	**$15,842.26**	**$1,452.00**	**$14,390.26**	**22.3**	**7,954**
ECM 9	Install High Efficiency Hot Water Boilers	0	0.0	67.9	$646.45	$15,842.26	$1,452.00	$14,390.26	22.3	7,954

ECM 9: 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	67.9	$646.45	$15,842.26	$1,452.00	$14,390.26	22.3	7,954

Measure Description

We recommend replacing one of the building's two boilers (the smaller older hot water boiler which supplies the original Administration Building area) with a new 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.

The most notable efficiency improvement is condensing hydronic boilers that can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130°F. Therefore, condensing hydronic boilers were only evaluated when the return water temperature is less than 130°F during most of the operating hours. As a result condensing hydronic boilers are recommended for this site.

4.1.7 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		**3,036**	**1.4**	**-10.4**	**$251.65**	**$2,091.20**	**$300.00**	**$1,791.20**	**7.1**	**1,845**
ECM 10	Install Tankless Water Heater	3,036	1.4	-10.4	$251.65	$2,091.20	$300.00	$1,791.20	7.1	1,845

ECM 10: Install Tankless Hot 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)
3,036	1.4	-10.4	$251.65	$2,091.20	$300.00	$1,791.20	7.1	1,845

Measure Description

We recommend replacing the existing 65-gallon electric storage hot water heater with a new gas-fired tankless hot water heating system. It is cheaper to heat hot water with an gas-fired hot water heater, rather than an electric one and a tankless gas-fired system would most likely be the cost effective option, since it uses less energy than a storage hot water heater.

Tankless water heaters (a.k.a. “on-demand water heaters”) only heat water when hot water is needed. Water is heated as it flows through the pipe to the hot water tap. Energy savings from a tankless water heater is based from eliminating heat losses associated with maintaining unnecessary standby hot water capacity.

5 ENERGY EFFICIENT BEST 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. The recommendations below are for informational purposes only and do not reflect actual efforts actively being performed by Brick Township Board of Education.

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.

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.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

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.

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 "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

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.

On October 30, 2015, Brick Township Board of Education entered into a long-term solar power purchase agreement (PPA) with GeoPeak Energy, LLC. According to the terms of the PPA, GeoPeak will install rooftop solar arrays on seven Brick Township schools, including a 68 kW PV solar array of the roof of the BOE Administration/ EEC Building. Brick BOE has agreed to purchase the electric output of the solar arrays at a specified rate (as detailed in the PPA) over the next 20 years.

Installation of the solar array had not yet begun at the time of TRC's inspection of the facility, though installation and purchases of the array's electric output is expected to begin this year.

Image 8: School's rooftop before and after solar PV installation

The first image above shows an aerial view of the school (from Google Maps) prior to installation of the solar array. The second image (from the PPA with GeoPeak, LLC) shows the proposed layout for the rooftop solar array. The image shows that most of the unshaded flat roof space has already been developed for solar electric generation. There appears to be some space available (on the roof of the original section of the building for possible expansion of the rooftop solar array is the Board of Education chooses to do so in the future. However, because an agreement for solar development of the building's rooftop is already in place, no additional analysis was deemed to be necessary for on-site generation potential at the facility.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

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

7 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 (http://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.

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 23 for a list of the eligible programs identified for each recommended ECM.

Figure 23 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings
ECM 1	Install LED Fixtures	X		X	
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	X		X	
ECM 3	Retrofit Fixtures with LED Lamps	X		X	
ECM 4	Install LED Exit Signs			X	
ECM 5	Install Occupancy Sensor Lighting Controls	X		X	
ECM 6	Premium Efficiency Motors		X	X	
ECM 7	Install VFDs on Hot Water Pumps		X	X	
ECM 8	Install High Efficiency Electric AC	X		X	
ECM 9	Install High Efficiency Hot Water Boilers	X		X	
ECM 10	Install Tankless Water Heater	X		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.

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.

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 a peak electric demand that does not exceed 200 kW for a recent 12-month period. 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 who 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 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 Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Rm 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	1,260	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	None	29	1,260	0.03	49	$5.61	$58.50	$10.00	8.64
Boiler Rm 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	1,260	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	None	29	1,260	0.05	97	$11.22	$117.00	$20.00	8.64
Copy Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,680	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.07	164	$18.91	$233.00	$40.00	10.21
Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,340	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.21	723	$83.37	$468.00	$80.00	4.65
Hallway	3	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,340	Relamp & Reballast	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.14	485	$55.90	$351.00	$30.00	5.74
Hallway	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	$0.00	$0.00	$0.00	0.00
Hallway	1	Exit Signs: Incandescent	None	25	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	195	$22.46	$107.56	$0.00	4.79
Purchasing Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,176	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.11	182	$20.95	$234.00	$40.00	9.26
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,176	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.05	91	$10.47	$117.00	$20.00	9.26
Accounts Payable	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,176	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.08	136	$15.71	$175.50	$30.00	9.26
Accounts Receivable	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,340	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,638	0.07	228	$26.34	$233.00	$40.00	7.33
New Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,340	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,638	0.18	603	$69.54	$285.40	$60.00	3.24
New Office	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,340	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,638	0.22	741	$85.52	$439.67	$60.00	4.44
New Office	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,340	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,638	0.03	107	$12.28	$63.20	$0.00	5.14
Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,176	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.08	136	$15.71	$175.50	$30.00	9.26
Main Office	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,340	Relamp	Yes	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,638	0.41	1,407	$162.26	$935.93	$175.00	4.69
HR Room	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,680	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.46	1,148	$132.36	$1,089.00	$175.00	6.91
HR Room	8	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,680	Relamp & Reballast	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.43	1,065	$122.79	$936.00	$80.00	6.97
Conf Rm	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,680	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.13	328	$37.82	$350.00	$60.00	7.67
Conf Rm	1	Exit Signs: Incandescent	None	25	1,680	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	1,680	0.02	37	$4.31	$107.56	$0.00	24.97
Men's Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	840	0.03	59	$6.75	$174.50	$10.00	24.36
Women's Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	840	0.07	117	$13.51	$387.00	$20.00	27.17
Women's Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,200	Relamp	Yes	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	840	0.02	31	$3.54	$35.90	$5.00	8.73
Payroll	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,340	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,638	0.13	457	$52.67	$350.00	$60.00	5.51

	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 Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Common Area	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,638	Relamp	No	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,638	0.22	537	$61.90	$475.67	$100.00	6.07
Common Area	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	$0.00	$0.00	$0.00	0.00
Break Rm	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,680	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.13	328	$37.82	$350.00	$60.00	7.67
HR 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,680	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,176	0.23	577	$66.57	$380.53	$80.00	4.51
HR 2	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,680	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.17	410	$47.27	$562.50	$85.00	10.10
Restroom	4	Incandescent: 60W Incadescent	Wall Switch	60	1,176	Relamp	Yes	4	LED Screw-In Lamps: 9W LED Bulb	Occupancy Sensor	9	823	0.17	296	$34.09	$332.00	$55.00	8.13
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	840	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	840	0.05	65	$7.48	$117.00	$20.00	12.96
Rm 25A	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,680	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,176	0.20	492	$56.73	$416.80	$80.00	5.94
Middle Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,340	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.21	723	$83.37	$468.00	$80.00	4.65
Middle Hallway	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	$0.00	$0.00	$0.00	0.00
Rm 25A	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,680	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,176	0.20	492	$56.73	$300.80	$60.00	4.24
Rm 27	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,680	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,176	0.15	369	$42.55	$341.60	$65.00	6.50
Rm 27	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,680	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,176	0.06	144	$16.64	$95.13	$20.00	4.51
Rm 28 (Main Server Rm)	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,680	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.07	164	$18.91	$233.00	$40.00	10.21
Rm 28 (Conf Rm)	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,680	Relamp	Yes	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,176	0.41	1,010	$116.49	$935.93	$175.00	6.53
Rm 28 (Conf Rm)	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,680	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,176	0.22	532	$61.40	$323.67	$40.00	4.62
Women's Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	840	0.07	117	$13.51	$387.00	$55.00	24.58
Rm 29	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,680	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,176	0.20	492	$56.73	$416.80	$80.00	5.94
Rm 30	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,680	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,176	0.20	492	$56.73	$416.80	$80.00	5.94
Sm Conf Rm	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,680	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,176	0.20	492	$56.73	$416.80	$80.00	5.94
Closet	2	Incandescent: 60W Incadescent	Wall Switch	60	600	Relamp	Yes	2	LED Screw-In Lamps: 9W LED Bulb	Occupancy Sensor	9	420	0.09	75	$8.70	$147.00	$30.00	13.45
Rm 32	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,340	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,638	0.20	685	$79.01	$416.80	$80.00	4.26
Rm 33	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,340	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,638	0.20	685	$79.01	$416.80	$80.00	4.26
Tech Common Area	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,340	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,638	0.27	913	$105.35	$738.00	$115.00	5.91
Tech Common Area	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,340	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,638	0.10	342	$39.51	$150.40	$30.00	3.05

	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 Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	840	0.07	117	$13.51	$387.00	$55.00	24.58
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.03	19	$2.23	$58.50	$10.00	21.78
Rm 24	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,340	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,638	0.53	1,809	$208.62	$1,126.20	$215.00	4.37
Lobby Area	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,340	Relamp	Yes	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,638	0.25	852	$98.28	$775.60	$35.00	7.54
Lobby Area	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	$0.00	$0.00	$0.00	0.00
Best Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,680	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,176	0.20	492	$56.73	$416.80	$80.00	5.94
Meeting Rm	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,680	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,176	0.30	738	$85.09	$567.20	$110.00	5.37
Best Program	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,176	Relamp	No	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,176	0.22	385	$44.44	$475.67	$100.00	8.45
Restroom	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	$0.00	$0.00	$0.00	0.00
Reception Rm	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,340	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,638	0.40	1,370	$158.02	$871.60	$155.00	4.53
Central Registration	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,340	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,638	0.30	1,027	$118.52	$721.20	$125.00	5.03
Central Registration	10	Incandescent: 60W Incadescent	Wall Switch	60	2,340	Relamp	Yes	10	LED Screw-In Lamps: 9W LED Bulb	Occupancy Sensor	9	1,638	0.43	1,470	$169.58	$425.00	$85.00	2.00
Registration Hallway	7	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,340	Relamp	No	7	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,340	0.16	556	$64.11	$442.40	$0.00	6.90
Registration Hallway	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	$0.00	$0.00	$0.00	0.00
Conference Rm	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,680	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,176	0.53	1,298	$149.78	$1,126.20	$215.00	6.08
Conference Rm	1	Exit Signs: LED - 2 W Lamp	None	6	1,680	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	1,680	0.00	0	$0.00	$0.00	$0.00	0.00
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	840	0.03	55	$6.30	$179.20	$0.00	28.45
Secretaria	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,340	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,638	0.35	1,206	$139.08	$840.80	$155.00	4.93
Boiler Rm 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,200	0.11	185	$21.38	$234.00	$40.00	9.08
Boiler Rm 2	1	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.00	31	$3.55	$107.56	$0.00	30.33
Main Hallway	31	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,340	Relamp	No	31	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.81	2,801	$323.06	$1,813.50	$310.00	4.65

	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 Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main Hallway	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	$0.00	$0.00	$0.00	0.00
Break Rm	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,680	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,176	0.53	1,298	$149.78	$1,126.20	$215.00	6.08
Break Rm	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	$0.00	$0.00	$0.00	0.00
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	840	0.03	55	$6.30	$179.20	$0.00	28.45
Director of Curriculum Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,680	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,176	0.35	866	$99.85	$686.80	$140.00	5.48
Superintendent's Office	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,680	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,176	0.60	1,475	$170.18	$1,172.40	$215.00	5.63
Superintendent's Office	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	$0.00	$0.00	$0.00	0.00
Director of Planning Office	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,680	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,176	0.60	1,475	$170.18	$1,172.40	$215.00	5.63
Director of Planning Office	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	$0.00	$0.00	$0.00	0.00
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	840	0.03	55	$6.30	$179.20	$0.00	28.45
Superintendent Secretary Office	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,680	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,176	0.70	1,731	$199.70	$1,411.60	$275.00	5.69
Superintendent Secretary Office	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	$0.00	$0.00	$0.00	0.00
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	840	0.03	55	$6.30	$179.20	$0.00	28.45
Special Service Office	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,340	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,638	0.53	1,809	$208.62	$1,126.20	$215.00	4.37
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	840	0.03	55	$6.30	$179.20	$0.00	28.45
Special Service Office 2	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,340	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,638	0.45	1,541	$177.78	$946.80	$170.00	4.37
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	840	0.03	55	$6.30	$179.20	$0.00	28.45
Director of Special Service Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,340	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,638	0.35	1,206	$139.08	$840.80	$155.00	4.93
Men's Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	840	0.03	59	$6.75	$174.50	$10.00	24.36
Women's Rm	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	840	0.03	55	$6.30	$179.20	$20.00	25.27
Copy Rm	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,680	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,176	0.45	1,107	$127.64	$946.80	$170.00	6.09
Copy Rm	1	Exit Signs: LED - 2 W Lamp	None	6	1,680	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	1,680	0.00	0	$0.00	$0.00	$0.00	0.00
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	840	0.03	55	$6.30	$179.20	$0.00	28.45
End Door Entranceway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,340	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,638	0.07	228	$26.34	$233.00	$40.00	7.33
End Door Entranceway	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	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 Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Multi-Purpose Rm	23	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,340	Relamp	Yes	23	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,638	1.34	4,622	$533.13	$2,728.07	$530.00	4.12
Multi-Purpose Rm	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	$0.00	$0.00	$0.00	0.00
Door 9 Entranceway	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,340	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,638	0.29	1,005	$115.90	$745.67	$135.00	5.27
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	840	0.03	55	$6.30	$179.20	$0.00	28.45
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,340	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,638	0.03	114	$13.17	$174.50	$10.00	12.49
Teaching Kitchen	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,340	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,638	0.23	804	$92.72	$496.53	$100.00	4.28
Women's Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,680	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.07	164	$18.91	$387.00	$55.00	17.56
Men's Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,680	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,176	0.07	164	$18.91	$387.00	$55.00	17.56
Mop Closet	1	Incandescent: 60W Incadescent	Wall Switch	60	600	Relamp	No	1	LED Screw-In Lamps: 9W LED Bulb	Wall Switch	9	600	0.04	36	$4.13	$15.50	$5.00	2.54
Custodial Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,680	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,176	0.23	577	$66.57	$496.53	$100.00	5.96
Custodial Office	1	Exit Signs: LED - 2 W Lamp	None	6	1,680	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	1,680	0.00	0	$0.00	$0.00	$0.00	0.00
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	700	0.03	46	$5.25	$179.20	$0.00	34.13
Parking Lot	49	Metal Halide: (1) 400W Lamp	None	458	4,680	Fixture Replacement	No	49	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	None	150	4,680	12.01	82,638	$9,532.01	$27,350.33	$0.00	2.87
Building Perimeter	11	Metal Halide: (1) 250W Lamp	None	295	4,680	Fixture Replacement	No	11	LED - Fixtures: Wrapped Lens	None	46	4,680	2.18	14,998	$1,729.94	$4,581.94	$110.00	2.59
Building Perimeter	15	Incandescent: 60W Incadescent	None	60	4,680	Relamp	No	15	LED Screw-In Lamps: 9W LED Bulb	None	9	4,680	0.61	4,189	$483.17	$232.50	$75.00	0.33
Building Perimeter	1	Metal Halide: (1) 70W Lamp	None	95	4,680	Fixture Replacement	No	1	LED - Fixtures: Wrapped Lens	None	20	4,680	0.06	411	$47.37	$340.91	$10.00	6.99

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
Admin Boiler Rm	Admin Building	2	Heating Hot Water Pump	0.8	81.1%	No	2,745	No	81.1%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Admin Boiler Rm	Admin Building Boiler	1	Process Blower	0.3	69.5%	No	2,745	No	69.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BOE/EEC Boiler Rm	BOE/EEC Building	2	Heating Hot Water Pump	3.0	85.5%	No	2,745	Yes	89.5%	Yes	2	0.87	6,405	0.0	$738.82	$7,624.98	$0.00	10.32
BOE/EEC Boiler Rm	BOE/EEC Building	2	Chilled Water Pump	10.0	89.5%	Yes	3,391	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BOE/EEC Boiler Rm	BOE/EEC Boiler	1	Process Blower	0.3	73.4%	No	2,745	No	73.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	AHU-1 / Multi-Purpose Rm	2	Process Fan	5.0	87.5%	No	2,745	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	AHU-2 / EEC Bldg	2	Process Fan	1.0	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	AHU-3 / EEC Bldg	2	Process Fan	1.0	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
Behind Building	Admin Bldg	1	Split-System AC	5.00		Yes	1	Split-System AC	5.00		20.00		No	2.01	2,844	0.0	$328.05	$7,481.10	$460.00	21.40
Admin Bldg	Accounts Payable	1	Through-The-Wall AC	0.71		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Admin Bldg	Copy Rm	1	Through-The-Wall AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Admin Bldg	Admin Bldg	1	Through-The-Wall AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Behind Building	BOE Office (aka EEC)	2	Ductless Mini-Split AC	3.00		Yes	1	Ductless Mini-Split AC	3.00		19.00		No	3.12	4,409	0.0	$508.59	$8,218.48	$0.00	16.16

Electric Chiller Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	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
Behind Building	BOE Office (aka EEC)	1	Air-Cooled Screw Chiller	100.00	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
Admin Boiler Rm	Admin Bldg	1	Non-Condensing Hot Water Boiler	643.00	Yes	1	Condensing Hot Water Boiler	660.00	94.30%	Et	0.00	0	67.9	$646.45	$15,842.26	$1,452.00	22.26
EEC Boiler Rm	BOE Office (aka EEC)	1	Non-Condensing Hot Water Boiler	1,084.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
Copy Rm	Admin Bldg	1	Storage Tank Water Heater (> 50 Gal)	Yes	1	Tankless Water Heater	Natural Gas	95.00%	EF	1.35	3,036	-10.4	$251.65	$2,091.20	$300.00	7.12
EEC Boiler Rm	BOE Office (aka EEC)	2	Storage Tank Water Heater (> 50 Gal)	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
Whole Building	3	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Whole Building	2	Stand-Up Refrigerator, Solid Door (≤15 cu. ft.)	No	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?
Whole Building	33	Desktop Computers	109.0	Yes
Whole Building	39	Computer Monitors	28.0	Yes
Whole Building	6	Large Copy Machines	600.0	Yes
Whole Building	4	Medium Printers	60.0	No
Whole Building	6	Small Printers	20.0	No
Whole Building	5	Microwaves	1,000.0	Yes
Whole Building	6	Portable Dehumidifiers	625.0	Yes
Whole Building	4	Coffee Machines	900.0	No
Whole Building	2	Toaster Ovens	850.0	No
Whole Building	1	Washing Machine	567.0	Yes
Whole Building	1	Dryer	4,000.0	Yes
Whole Building	1	Dishwasher	200.0	Yes
Whole Building	4	Servers	450.0	No

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Brick BOE Central Administration / Business Office

Primary Property Type: Office
Gross Floor Area (ft²): 26,875
Built: 1978

For Year Ending: February 29, 2016
Date Generated: July 14, 2017

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
Brick BOE Central Administration / Business Office 101 Hendrickson Avenue Brick, New Jersey 08723	Brick Township Board of Education 101 Hendrickson Avenue Brick, NJ 08724 (732) 785-3000	James Edwards 101 Hendrickson Avenue Brick, NJ 08724 (732) 785-3000 jedwards@brickschools.org

Property ID: 5964749

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
134.1 kBtu/ft²

Source EUI
257.3 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	1,497,379 (42%)
Natural Gas (kBtu)	2,107,744 (58%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	95.5
National Median Source EUI (kBtu/ft²)	183.1
% Diff from National Median Source EUI	40%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	284

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)