Local Government Energy Audit:
Energy Audit Report

BOE Warehouse

Brick Township Board of Education

34 Princeton Avenue
Brick, NJ 08723

April 17, 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 savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

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

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

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

Table of Contents

1 Executive Summary 1

1.1 Facility Summary 1
1.2 Your Cost Reduction Opportunities 1

Energy Conservation Measures 1
Energy Efficient Best Practices 3
On-Site Generation Measures 3

1.3 Implementation Planning 3

2 Facility Information and Existing Conditions 5

2.1 Project Contacts 5
2.2 General Site Information 5
2.3 Building Occupancy 5
2.4 Building Envelope 5
2.5 On-Site Generation 6
2.6 Energy-Using Systems 6

Lighting System 6
Heating Ventilation and Air Conditioning (HVAC) 7
Domestic Hot Water Heating System 8
Building Plug Load 8

2.7 Water-Using Systems 8

3 Site Energy Use and Costs 9

3.1 Total Cost of Energy 9
3.2 Electricity Usage 10
3.3 Natural Gas Usage 11
3.4 Benchmarking 12
3.5 Energy End-Use Breakdown 13

4 Energy Conservation Measures 14

4.1 Recommended ECMs 14
4.1.1 Lighting Upgrades 15

ECM 1: Install LED Fixtures 15
ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers 16

4.1.2 Lighting Control Measures 16

ECM 3: Install Occupancy Sensor Lighting Controls 16

4.2 ECMs Evaluated But Not Recommended 17

Install Tankless Water Heater 17

5 Energy Efficient Best Practices 19

Close Doors and Windows 19
Practice Proper Use of Thermostat Schedules and Temperature Resets 19
Plug Load Controls 19
Water Conservation 19

6 On-Site Generation Measures 20
6.1 Photovoltaic 20
6.2 Combined Heat and Power 22
7 Demand Response 23
8 Project Funding / Incentives 24
8.1 SmartStart 25
8.2 Direct Install 26
8.3 SREC Registration Program 27
8.4 Energy Savings Improvement Program 27
9 Energy Purchasing and Procurement Strategies 29
9.1 Retail Electric Supply Options 29
9.2 Retail Natural Gas Supply Options 29

Appendix A: Equipment Inventory & Recommendations

Appendix B: ENERGY STAR® Statement of Energy Performance

Table of Figures

Figure 1 – Previous 12 Month Utility Costs 2
Figure 2 – Potential Post-Implementation Costs 2
Figure 3 – Summary of Energy Reduction Opportunities 2
Figure 4 – Project Contacts 5
Figure 5 - Building Schedule 5
Figure 6 - Utility Summary 9
Figure 7 - Energy Cost Breakdown 9
Figure 8 - Electric Usage & Demand 10
Figure 9 - Electric Usage & Demand 10
Figure 10 - Natural Gas Usage 11
Figure 11 - Natural Gas Usage 11
Figure 12 - Energy Use Intensity Comparison – Existing Conditions 12
Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures 12
Figure 14 - Energy Balance (kBtu/ft^2 and %) 13
Figure 15 – Summary of Recommended ECMs 14
Figure 16 – Summary of Lighting Upgrade ECMs 15
Figure 17 – Summary of Lighting Control ECMs 16
Figure 18 – Summary of Measures Evaluated, But Not Recommended 17
Figure 19 – Estimated costs and benefits for a 7.8-kW solar array on this site 21
Figure 20 - ECM Incentive Program Eligibility 24

1 EXECUTIVE SUMMARY

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

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 help public facilities in New Jersey reduce their control their energy costs and help protect our environment by reducing energy demand statewide.

1.1 Facility Summary

The Brick Township Board of Education Central Receiving Warehouse (BOE Warehouse) is a 9,900 square foot storage and maintenance facility. It is occupied year round by two full time staff, plus others as needed. The building is used primarily for storage and maintenance of equipment and supplies for the school system.

The building was constructed in 1995. It consists of concrete masonry block with a sloped asphalt shingle roof. It has four doors, two garage doors, and only two windows. It contains one small receiving office, which is open weekdays from 8:00 AM to 5:00 PM. The office area contains standard office equipment, plus one Gree packaged terminal heat pump (PTHP) unit for heating and cooling. The rest of the building consists of large storage and maintenance areas with high bay ceilings, heated by two 150 MBH Modine unit heaters. Most of the storage areas are occupied only as needed.

Interior lighting is provided mostly by 4-foot linear T8 fluorescent fixtures. Exterior lighting around the building consists of compact fluorescent recessed cans, plus some newly installed LED spotlights. 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 the costs and savings for four energy efficiency measures. Three measures are recommended for implementation. Together the three recommended measures represent an opportunity for BOE Warehouse to reduce its annual energy costs for the Warehouse by about $1,051 and annual greenhouse gas emissions by 8,246 lbs CO_2e. We estimate that if all measures are implemented as recommended, the project would likely pay for itself in energy savings alone in about 9.5 years. The breakdown of existing utility costs is shown in Figure 1 below. Figure 2 shows the estimated reduction in annual utility that would result from the upgrades. Together these measures represent an opportunity to reduce energy usage at the Brick Township BOE Warehouse by 8%.

Figure 1 – Previous 12 Month Utility Costs

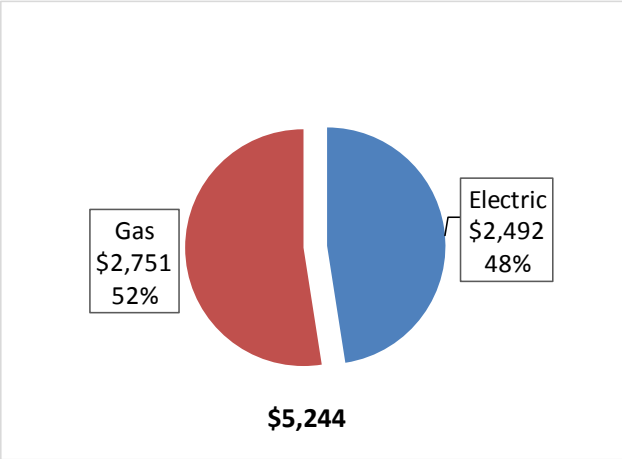
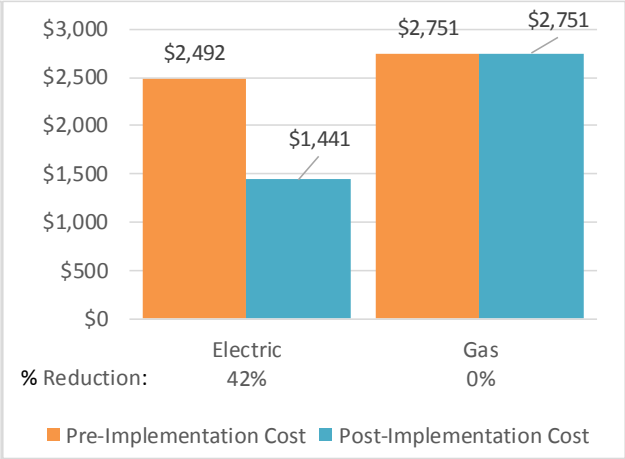


Figure 2 – Potential Post-Implementation Costs



A detailed description of BOE Warehouse'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		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**6,489**	**2.2**	**0.0**	**$833.07**	**$9,239.97**	**$990.00**	**$8,249.97**	**9.9**	**6,534**
ECM 1	Install LED Fixtures	Yes	975	0.1	0.0	$125.15	$976.64	$0.00	$976.64	7.8	982
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	5,514	2.1	0.0	$707.92	$8,263.33	$990.00	$7,273.33	10.3	5,553
Lighting Control Measures			**1,697**	**0.6**	**0.0**	**$217.85**	**$1,968.00**	**$270.00**	**$1,698.00**	**7.8**	**1,709**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	1,697	0.6	0.0	$217.85	$1,968.00	$270.00	$1,698.00	7.8	1,709
***	*Install Tankless Water Heater*	*No*	*2,031*	*0.5*	*-6.9*	*$195.62*	*$973.72*	*$300.00*	*$673.72*	*3.4*	*1,234*
TOTALS			**8,186**	**2.8**	**0.0**	**$1,050.91**	**$11,207.97**	**$1,260.00**	**$9,947.97**	**9.5**	**8,243**

* - 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).

*** Measures highlighted in *red* were evaluated, but are not recommended for implementation. Values estimated for these measures are not included in ECM totals.

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.

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 four 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
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Install Plug Load Controls
- Water Conservation

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

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for the Brick Township BOE Warehouse. Based on the configuration of the site and its loads there appears to be sufficient rooftop potential to install solar PV system that could displace nearly all of the building's current electric service.

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

1.3 Implementation Planning

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

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

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

- SmartStart
- Direct Install

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 8.4 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8 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 March 2, 2017, TRC performed an energy audit at the BOE Warehouse located in Brick, New Jersey. TRC's team met with Will Kolibas to review the facility operations and help focus our investigation on specific energy-using systems.

The BOE Warehouse is a 9,900 square foot storage and maintenance facility that was constructed in 1995. It contains one small receiving office with standard office equipment. The office occupies about 10% of the building floor space. It is the only area of the building with air conditioning. Most of the storage areas are occupied only as needed.

2.3 Building Occupancy

The building is occupied year round by two full time staff, plus others as needed. The building is used primarily for storage and maintenance of equipment and supplies for the school system. The building is open weekdays from 8:00 AM to 5:00 PM.

Figure 5 - Building Schedule

Building Occupancy Schedule		
Building Name	**Weekday/Weekend**	**Operating Schedule**
Brick Township Board of Education Warehouse	Weekday	8:00 AM - 5:00 PM
Brick Township Board of Education Warehouse	Weekend	NONE

2.4 Building Envelope

The building is constructed of concrete masonry block with a sloped asphalt single roof. It has four doors, two 12 foot by 12 foot insulated garage doors, and two windows. Windows are double-paned glass. All door and window seals appeared to be in good condition.

Image 1: Warehouse Main Entrance

2.5 On-Site Generation

Brick Township BOE Warehouse does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

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

Lighting System

Interior lighting is provided mostly by 4-foot linear T8 fluorescent fixtures. Exterior perimeter lighting around the building consists of compact fluorescent recessed cans, plus some newly installed LED spotlights. Lighting control is provided by manual switches. There is a parking area, but it is not illuminated.

Image 2: Interior and Exterior Lighting Fixtures

Heating Ventilation and Air Conditioning (HVAC)

The receiving office is heated and cooled by one Gree packaged terminal heat pump (PTHP) unit. It is five years old and has a heating and cooling capacity of 12,000 Btu/hr. It has a seasonal energy efficiency rating (SEER) of 10.7 SEER for cooling and a coefficient of performance (COP) of 3.1 for heating, which is reasonably efficient for a PTHP unit.

The rest of the building consists of large storage and maintenance areas with high bay ceilings, heated by two ceiling-mounted, gas-fired 150 MBH Modine warm air unit heaters, which are both about 15 years old and in fairly good condition. There is no cooling in storage areas, although there are two small exhaust fans.

Heating and cooling units are controlled manually. Because of the building's low occupancy, heating and cooling units are turned on when the space is occupied, used as needed, and turned down or turned off when occupants leave the space.

Image 3: Heating, Ventilation, and Air Conditioning Systems

Domestic Hot Water Heating System

Domestic hot water is provided by a 15-gallon A.O. Smith hot water heater. It is 22 years old, but in good condition. The hot water heater supplies one small rest room and clothes washer.

Please see Section 4.2 for more details on the proposed domestic hot water upgrade and why it was not included among the recommended measures in Figure 3.

Image 4: Domestic Hot Water Heating

Building Plug Load

The building has a low occupancy and typically no heavy equipment used onsite, therefore the building plug load is minimal. The receiving office has typical office equipment, including two computers and two printers. The facility has one refrigerator and one washing machine. All plug load equipment are relatively new and efficient models.

Image 5: Refrigeration and Plug Load Equipment

2.7 Water-Using Systems

The building has one small restroom. All water-using fixtures were found to be low-flow devices that meet current commercial building standards for water conservation.

3 SITE ENERGY USE AND COSTS

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

3.1 Total Cost of Energy

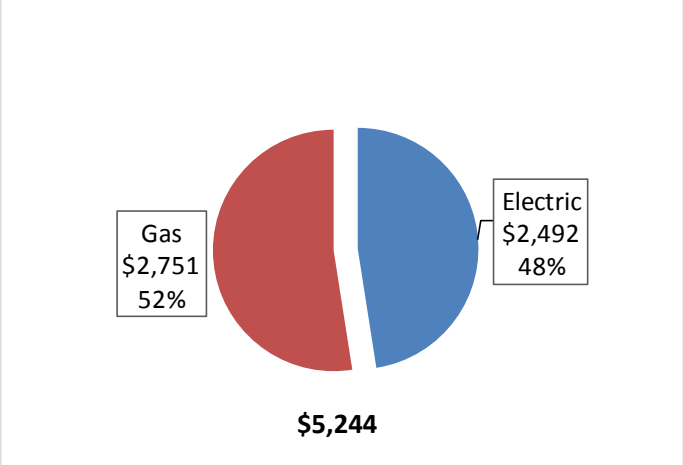
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Brick Township Board of Education		
Fuel	**Usage**	**Cost**
Electricity	19,414 kWh	$2,492
Natural Gas	2,927 Therms	$2,751
Total		**$5,244**

The current annual energy cost for this facility is $5,244 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.128/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

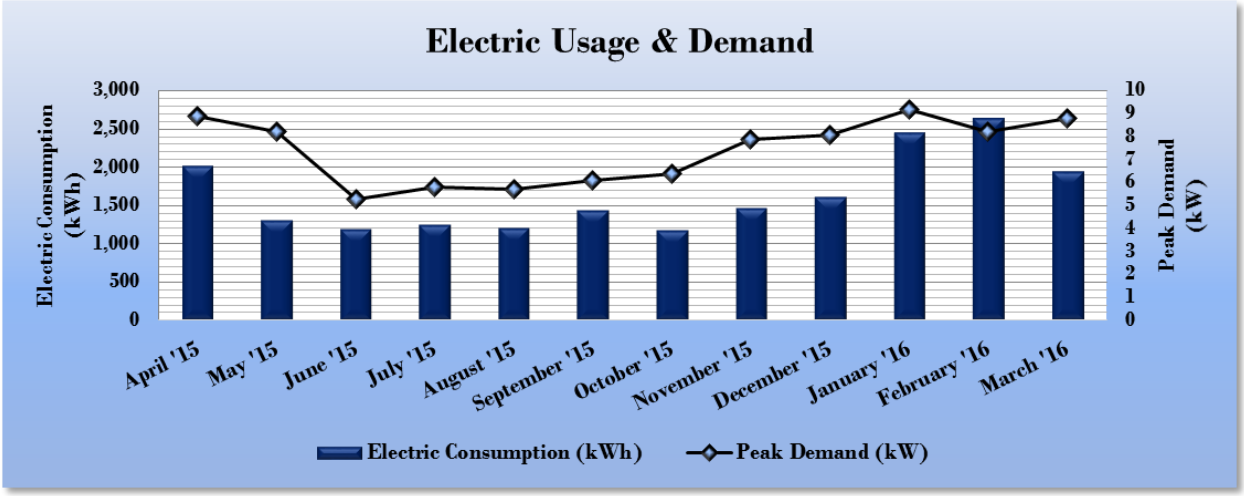


Figure 9 - Electric Usage & Demand

Electric Billing Data for Brick Township Board of Education				
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Total Electric Cost
4/15/15	33	2,016	8.9	$248
5/14/15	29	1,296	8.2	$175
6/15/15	32	1,188	5.3	$168
7/16/15	31	1,248	5.8	$174
8/14/15	29	1,198	5.7	$169
9/16/15	33	1,428	6.1	$192
10/15/15	29	1,173	6.4	$163
11/16/15	32	1,457	7.9	$191
12/14/15	28	1,601	8.1	$205
1/18/16	35	2,446	9.2	$288
2/16/16	29	2,636	8.2	$307
3/16/16	29	1,940	8.8	$238
Totals	**369**	**19,627**	**9.2**	**$2,520**
Annual	**365**	**19,414**	**9.2**	**$2,492**

3.3 Natural Gas Usage

Natural gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $0.940/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. This profile is typical for a site that only uses natural gas for space heating.

Figure 10 - Natural Gas Usage

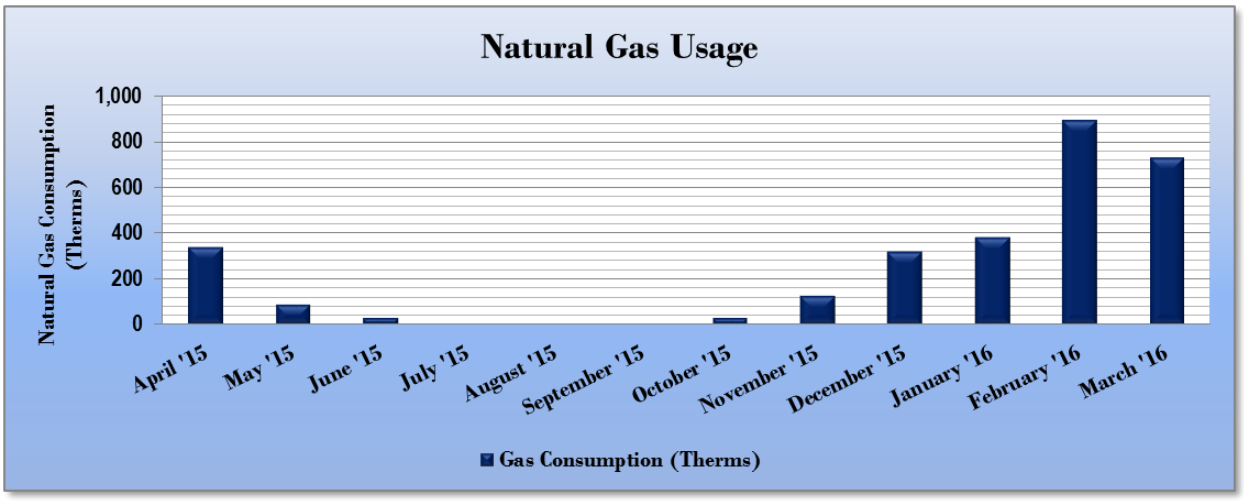


Figure 11 - Natural Gas Usage

Gas Billing Data for Brick Township Board of Education			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
4/16/15	30	337.9	$320
5/18/15	32	85.0	$99
6/17/15	30	29.0	$50
7/21/15	34	0.0	$25
8/14/15	24	0.0	$20
9/16/15	33	0.0	$25
10/14/15	28	29.1	$49
11/13/15	30	125.2	$129
12/17/15	34	320.1	$279
1/19/16	33	379.7	$345
2/13/16	25	892.6	$771
3/16/16	32	729.0	$639
Totals	**365**	**2,927**	**$2,751**
Annual	**365**	**2,927**	**$2,751**

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 Township Board of Education	National Median Building Type: Garage
Source Energy Use Intensity (kBtu/ft^2)	52.1	123.1
Site Energy Use Intensity (kBtu/ft^2)	36.3	78.8

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 Township Board of Education	National Median Building Type: Garage
Source Energy Use Intensity (kBtu/ft^2)	41.7	123.1
Site Energy Use Intensity (kBtu/ft^2)	33.4	78.8

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. The score for this building is 48.

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

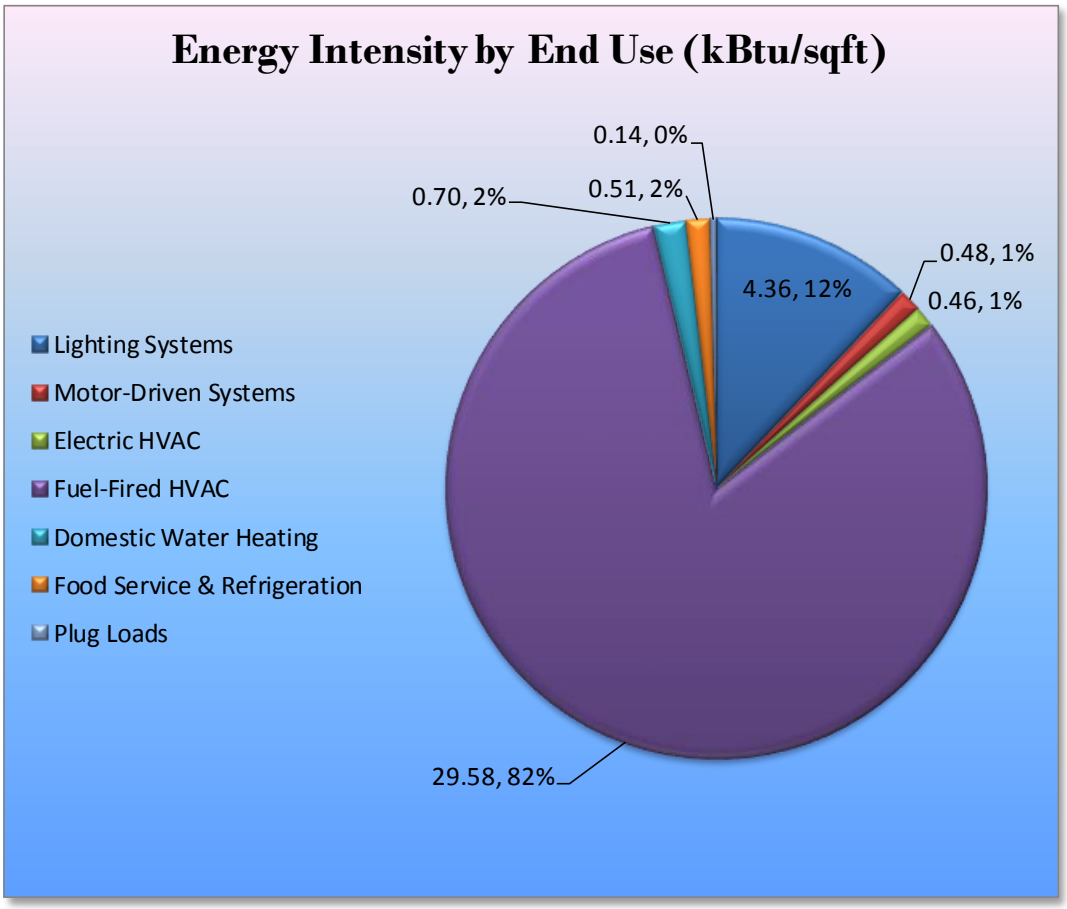
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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 BOE Warehouse 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		**6,489**	**2.2**	**0.0**	**$833.07**	**$9,239.97**	**$990.00**	**$8,249.97**	**9.9**	**6,534**
ECM 1	Install LED Fixtures	975	0.1	0.0	$125.15	$976.64	$0.00	$976.64	7.8	982
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	5,514	2.1	0.0	$707.92	$8,263.33	$990.00	$7,273.33	10.3	5,553
Lighting Control Measures		**1,697**	**0.6**	**0.0**	**$217.85**	**$1,968.00**	**$270.00**	**$1,698.00**	**7.8**	**1,709**
ECM 3	Install Occupancy Sensor Lighting Controls	1,697	0.6	0.0	$217.85	$1,968.00	$270.00	$1,698.00	7.8	1,709
TOTALS		**8,186**	**2.8**	**0.0**	**$1,050.91**	**$11,207.97**	**$1,260.00**	**$9,947.97**	**9.5**	**8,243**

* - 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		**6,489**	**2.2**	**0.0**	**$833.07**	**$9,239.97**	**$990.00**	**$8,249.97**	**9.9**	**6,534**
ECM 1	Install LED Fixtures	975	0.1	0.0	$125.15	$976.64	$0.00	$976.64	7.8	982
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	5,514	2.1	0.0	$707.92	$8,263.33	$990.00	$7,273.33	10.3	5,553

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

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)
975	0.1	0.0	$125.15	$976.64	$0.00	$976.64	7.8	982

Measure Description

We recommend installing LED retrofit kits to replace compact fluorescent (CFL) recessed can lighting on the exterior of building and upgrading all exterior light fixtures to 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 Fluorescent Fixtures with LED Lamps and Drivers

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)
5,514	2.1	0.0	$707.92	$8,263.33	$990.00	$7,273.33	10.3	5,553

Measure Description

We recommend retrofitting existing interior fluorescent T8 fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary) that are designed to be used retrofitted fluorescent T8 fixtures. The proposed upgrade would use the existing fixture housing but replace fixture components with more efficient LED 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.

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		**1,697**	**0.6**	**0.0**	**$217.85**	**$1,968.00**	**$270.00**	**$1,698.00**	**7.8**	**1,709**
ECM 3	Install Occupancy Sensor Lighting Controls	1,697	0.6	0.0	$217.85	$1,968.00	$270.00	$1,698.00	7.8	1,709

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

ECM 3: Install 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)
1,697	0.6	0.0	$217.85	$1,968.00	$270.00	$1,698.00	7.8	1,709

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, storage rooms, and offices areas. Lighting sensors detect occupancy

using ultrasonic and/or infrared sensors. This measure would save additional energy by ensuring that lights are on only when spaces are occupied.

For most space types, 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.

4.2 ECMs Evaluated But Not Recommended

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

Figure 18 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade	**2,031**	**1.4**	**-6.9**	**$195.62**	**$973.72**	**$300.00**	**$673.72**	**3.4**	**1,234**
Install Tankless Water Heater	2,031	1.4	-6.9	$195.62	$973.72	$300.00	$673.72	3.4	1,234
TOTALS	**2,031**	**1.4**	**-6.9**	**$195.62**	**$973.72**	**$300.00**	**$673.72**	**3.4**	**1,234**

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

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

Install Tankless 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)
2,031	0.5	-6.9	$195.62	$973.72	$300.00	$673.72	3.4	1,234

Measure Description

We evaluated replacement of the existing electric storage tank water heater with a gas-fired tankless water heating system. 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.

Reasons for not Recommending

Our analysis showed that switching from an electric hot water heater to an on-demand, gas-fired hot water heater would be a cost-effective measure for the facility. This upgrade would increase gas usage on the site, but normally we would recommend this upgrade, because gas is cheaper than electricity on a BTU basis.

However, in this case, continuing to heat hot water at the site with electricity might be the better option. That is because the site has the potential to lower its average cost of electric power, through installation of a rooftop solar array and that could potentially replace nearly all of its current electric service (See Section 6 for more details). If the site is developed for solar power generation as we recommend, then it would not make sense to switch to gas-fired water heating at the same time.

On the other hand, if Brick Township BOE decides against pursuing solar development of the Warehouse site, then we would recommend upgrading the current water heater with a new gas-fired, tankless model.

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.

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.

Plug Load Controls

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

Water Conservation

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

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

6 On-Site Generation Measures

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

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

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

6.1 Photovoltaic

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

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

Brick Township Board of Education has on-going installations of solar energy projects at several schools. The rooftop area of the Warehouse is much smaller, but because the energy demands are relatively low at the site, a solar array at the Warehouse site could provide nearly all of the building's electric power needs.

The front of the building faces south-southwest. According to *PV-Watts*[1] (an online solar calculator of the US Dept. of Energy) the building has sufficient unshaded rooftop space available to accommodate a solar array of up to about 25 kW_{DC} of solar generating capacity. However, the building's average power demand is only about 9 kW of electric power. TRC estimates that the building's total annual electric consumption could be served by a PV array less than one-third the size of the available roof space.

We estimate that a 7.8-kW PV array, installed on the building's front rooftop, would generate about **10,626 kWh** per year. Such an array would offset about 95% the building's annual electric needs - i.e. after implementation of the lighting upgrades recommended in this report. The array would occupy only

[1] http://pvwatts.nrel.gov/pvwatts.php

about 560 ft^2 of available roof space. An image of the available roof space is shown below. The estimated costs and savings for such an installations are shown in the Figure 19 below.

Image 6: Warehouse rooftop (approximate size of proposed solar PV array)

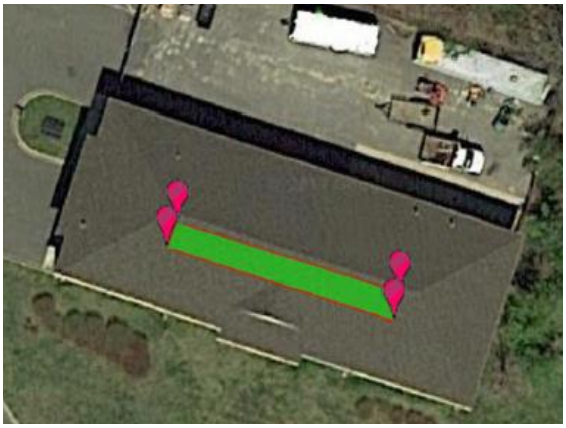


Figure 19 – Estimated costs and benefits for a 7.8-kW solar array on this site

Total Installed Cost	$27,300	$
Value of Electric Generation per Year	$1,360.13	$
Annual Income from SRECS	$2,350.00	$
Total Economic Value per Year	$3,710.13	$
Simple Payback Period	7.36	years

We estimate that the proposed array would pay for itself in about **7.4 years**.

For this analysis we assumed an installed cost of about $3.50 per watt and a Solar Renewable Energy Certificate (SREC) value of $235/MWh. These values are based on recent experience for similar commercial solar projects installed in New Jersey.

Solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.3 for additional information.

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

6.2 Combined Heat and Power

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

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

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

There is no thermal load that could reasonably be met by a CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

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.

In our opinion this site is not a good candidate for DR due to the minimal loads available to shed.

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

Figure 20 - 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	Install Occupancy Sensor Lighting Controls	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. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

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

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

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 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec.

8.4 Energy Savings Improvement Program

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

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

(1) Use an Energy Services Company or "ESCO."
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

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

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

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

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

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

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

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

9.2 Retail Natural Gas Supply Options

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

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

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Grounds Shop	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,500	Relamp & Reballast	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,050	0.18	398	0.0	$51.07	$972.00	$95.00	17.17
Grounds Shop	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	0.0	$0.00	$0.00	$0.00	0.00
Back Exterior	4	LED Screw-In Lamps: 18W LED Spotlight	None	18	4,880	None	No	4	LED Screw-In Lamps: 18W LED Spotlight	None	18	4,880	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main Storage Area	36	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp & Reballast	Yes	36	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	1.93	5,602	0.0	$719.19	$6,906.00	$860.00	8.41
Side Storage Area	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	700	0.03	44	0.0	$5.67	$117.00	$10.00	18.86
Side Storage Area	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,000	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	700	0.21	311	0.0	$39.95	$917.33	$115.00	20.08
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,000	Relamp & Reballast	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	700	0.05	78	0.0	$9.99	$277.83	$40.00	23.81
Receiving 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	0.0	$0.00	$0.00	$0.00	0.00
Receiving Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.21	622	0.0	$79.91	$763.33	$100.00	8.30
Back Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp & Reballast	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.05	156	0.0	$19.98	$277.83	$40.00	11.91
Exterior - Lot Side	1	LED Screw-In Lamps: 18W LED Spotlight	None	18	4,880	None	No	1	LED Screw-In Lamps: 18W LED Spotlight	None	18	4,880	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior - Lot Side	4	Compact Fluorescent: 23W Screw-In CFL	None	23	4,880	Fixture Replacement	No	4	LED - Fixtures: Downlight Recessed	None	10	4,880	0.04	279	0.0	$35.86	$279.04	$0.00	7.78
Exterior - Front	7	Compact Fluorescent: 23W Screw-In CFL	None	23	4,860	Fixture Replacement	No	7	LED - Fixtures: Downlight Recessed	None	10	4,860	0.07	487	0.0	$62.50	$488.32	$0.00	7.81
Exterior - Far Side	3	Compact Fluorescent: 23W Screw-In CFL	None	23	4,860	Fixture Replacement	No	3	LED - Fixtures: Downlight Recessed	None	10	4,860	0.03	209	0.0	$26.79	$209.28	$0.00	7.81

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
Restroom	Restroom	1	Exhaust Fan	0.3	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main Storage Area	Garage Door	1	Other	0.5	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
Receiving Office	Receiving Office	1	Packaged Terminal HP	1.00	12.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Warehouse	Main Storage Area	2	Warm Air Unit Heater	120.00	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
Office Storage Room	Restroom	1	Storage Tank Water Heater (≤ 50 Gal)	Yes	1	Tankless Water Heater	Natural Gas	82.00%	EF	0.45	2,031	-6.9	$195.62	$973.72	$300.00	3.44

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
Back Room	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Receiving Office	1	Computer	109.0	Yes
Receiving Office	1	Monitor	80.0	Yes
Receiving Office	2	Sm. Printer	14.0	Yes
Receiving Office	1	Coffee Maker	900.0	No
Receiving Office	1	Clothes Washer	900.0	Yes

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

48

ENERGY STAR® Score[1]

Brick Township BOE Warehouse

Primary Property Type: Non-Refrigerated Warehouse
Gross Floor Area (ft²): 9,900
Built: 1995

For Year Ending: February 29, 2016
Date Generated: July 10, 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 Township BOE Warehouse 34 Princeton 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: 5951216

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
38.2 kBtu/ft²

Source EUI
54.4 kBtu/ft²

Annual Energy by Fuel		
Electric - Grid (kBtu)	67,732 (18%)	
Natural Gas (kBtu)	310,592 (82%)	

National Median Comparison	
National Median Site EUI (kBtu/ft²)	37.5
National Median Source EUI (kBtu/ft²)	53.4
% Diff from National Median Source EUI	2%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	24

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)