



Local Government Energy Audit: Energy Audit Report



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Transportation Garage

I Lotta Burke Way

Marlboro, New Jersey 07746

Marlboro Township Board of
Education

October 23, 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.

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I EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPUB) has sponsored this Local Government Energy Audit (LGEA) Report for the Transportation Garage.

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 local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

I.1 Facility Summary

The Transportation Garage is a 9,060 square foot facility comprised of office space in the front and a large transportation garage in the back. The office space and the garage are single story, but the garage is an open space with high ceilings. The office area has a break room, kitchen, restrooms, and office space. The garage has storage, a tire room, and restrooms. The building was originally built in 1980, and operates Monday through Friday, year-round.

The building is 100% heated and 30% cooled with a combination heating and cooling system. The majority of the lighting is provided by linear fluorescent fixtures. A thorough description of the facility and our observations are located in Section 2.

I.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated and recommends five measures which together represent an opportunity for the Transportation Garage to reduce annual energy costs by roughly \$2,488 and annual greenhouse gas emissions by 19,998 lbs CO₂e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 3.2 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce the Transportation Garage's annual energy use by 7%.

Figure 1 – Previous 12 Month Utility Costs

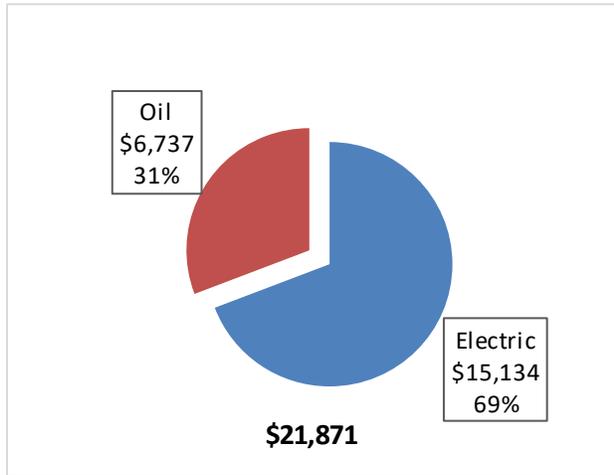
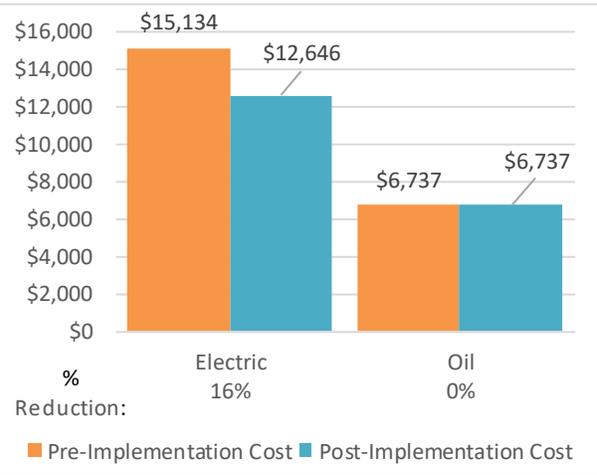


Figure 2 – Potential Post-Implementation Costs



A detailed description of the Transportation Garage’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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades			15,885	2.5	0.0	\$1,989.81	\$7,117.40	\$1,045.00	\$6,072.40	3.1	15,997
ECM 1	Install LED Fixtures	Yes	4,568	0.6	0.0	\$572.19	\$2,583.23	\$325.00	\$2,258.23	3.9	4,600
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	916	0.2	0.0	\$114.77	\$588.00	\$30.00	\$558.00	4.9	923
ECM 3	Retrofit Fixtures with LED Lamps	Yes	10,401	1.7	0.0	\$1,302.85	\$3,946.17	\$690.00	\$3,256.17	2.5	10,474
Lighting Control Measures			2,362	0.4	0.0	\$295.84	\$1,892.00	\$245.00	\$1,647.00	5.6	2,378
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	2,362	0.4	0.0	\$295.84	\$1,892.00	\$245.00	\$1,647.00	5.6	2,378
Plug Load Equipment Control - Vending Machine			1,612	0.0	0.0	\$201.90	\$230.00	\$0.00	\$230.00	1.1	1,623
ECM 5	Vending Machine Control	Yes	1,612	0.0	0.0	\$201.90	\$230.00	\$0.00	\$230.00	1.1	1,623
TOTALS			19,859	2.9	0.0	\$2,487.55	\$9,239.40	\$1,290.00	\$7,949.40	3.2	19,998

* - 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 measures 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.

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

Energy Efficient Practices

TRC also identified 10 low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at the Transportation Garage include:

- Close Doors and Windows
- Ensure Lighting Controls Are Operating Properly
- Turn Off Unneeded Motors
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Furnace Maintenance
- Perform Proper Water Heater Maintenance
- Perform Maintenance on Compressed Air Systems
- Install Plug Load Controls
- Water Conservation

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

On-Site Generation Measures

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

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

1.3 Implementation Planning

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

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

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

- SmartStart
- Direct Install
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 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 than 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			
Cindy Barr-Rague	Business Administrator/Board Secretary	cbarr-rague@mtps.org	732-972-2000 Ext 2010
Michael Crivelli	Supervisor of Building and Grounds	mcrivelli@mtps.org	732-972-2122
Adam Brown	Night Supervisor- Buildings and Grounds		
TRC Energy Services			
Smruti Srinivasan	Auditor	Ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 28, 2018, TRC performed an energy audit at the Transportation Garage located in Marlboro, New Jersey. TRC's team met with Adam Brown to review the facility operations and help focus our investigation on specific energy-using systems.

The Transportation Garage is a 9,060 square foot facility comprised of office space in the front and a large garage in the back. The office space and the garage are single story, but the garage is an open space with high ceilings. The office area has a break room, kitchen, restrooms, and office space. The garage has the garage bays, storage rooms, and restrooms.

The building was constructed in 1980. Over the last five years the facility has replaced all of the existing 2' fluorescent lamps in the Mechanics Shop with LED Lamps. The site also recently replaced the electric domestic hot water heater.

2.3 Building Occupancy

The transportation garage is open Monday through Friday and is closed on weekends. The facility operates year-round. The typical schedule is presented in the table below. During a typical day, the facility is occupied by approximately 10 full time staff members.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Transportation Garage	Weekday	6:00:00 AM - 5:00 PM
Transportation Garage	Weekend	Not Occupied

2.4 Building Envelope

The transportation garage is constructed of metal stud walls, with a corrugated metal façade on the garage, and vinyl siding on the office space. The buildings have slightly slanted metal roofs that appear to be in good condition. The buildings have single paned windows which are in fair condition. The single paned windows should be considered for replacement to reduce energy use and improve comfort. Replacing windows with high efficiency windows is not typically cost effective based only on energy savings. The exterior doors are constructed of aluminum and in good condition.



Image 1: Building Envelope

2.5 On-Site Generation

The Transportation Garage does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

Lighting System

Lighting is provided predominately by 32-Watt linear fluorescent T8 lamps with electronic ballasts. Most of the building spaces use 2-lamp or 4-lamp, 2-foot wide by 4-foot long fixtures. Lighting control in most interior spaces is provided by wall switches. The building has minimal exterior lighting, which consists of high pressure sodium fixtures, compact fluorescent, and incandescent fixtures that are controlled with timers.

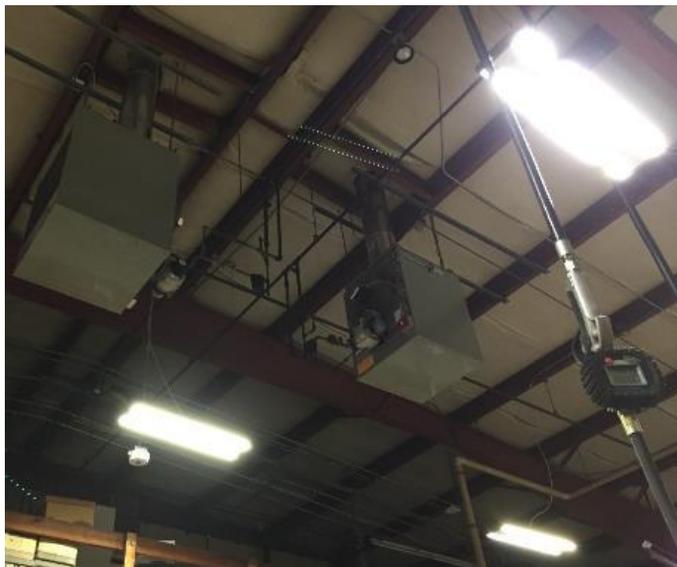


Image 2: Lighting System

Heating and Air Conditioning

The Transportation Garage has a combination heat and air conditioning system serving the office area. The heating portion consists of two 120 MBH Thermo Products Furnaces, located in the garage. Air conditioning is provided by a direct expansion system that consists of two Johnson Controls split system AC units. The compressors and condensers are located next to each other on the exterior of the garage, and each evaporator is located above the furnaces in the garage. The heating and air conditioning utilize a common distribution system

The garage bays are heated by electric warm air heaters. There are also ceiling mount electric heaters serving the storage room, and electric baseboard heat in the break room.

The units are manually controlled by a thermostat located in the zone. The unit operates on demand to maintain a space temperature setpoint around 72°F (adjustable by staff).



Image 3: Common HVAC System

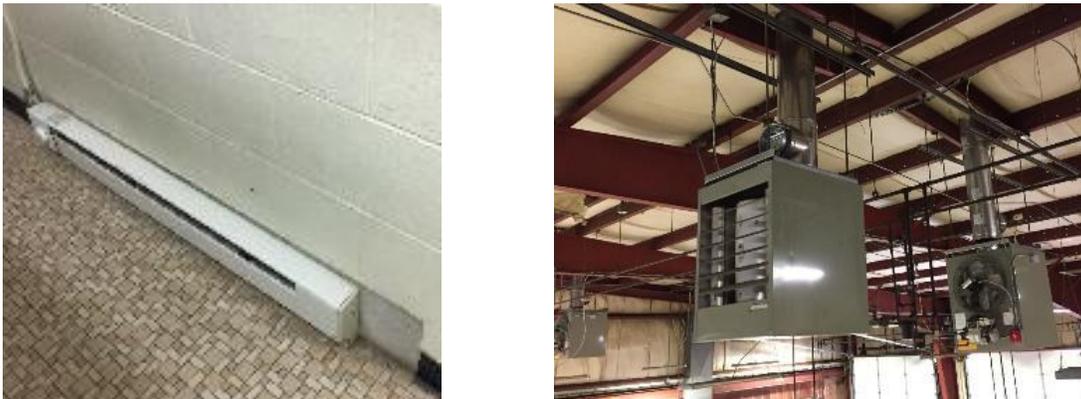


Image 4: Electric Heating System

Domestic Water Heating System

The domestic hot water system for the facility consists of one Bradford White electric hot water heater with an input rating of 4.5 kW each. The water heater has a 30-gallon storage tank. The system operates on the water supply pressure, so no pumps are required.



Image 5: Domestic Hot Water System

Building Plug Load and Vending Machines

There are roughly seven computer work stations throughout the facility and four printers. There is no centralized PC power management software installed.

The facility has a single refrigerated beverage vending machine.



Image 6: Refrigerated Vending Machine

2.7 Water-Using Systems

There are three restrooms at this facility. A sampling of restrooms found that all of the faucets are rated for around 2 gallons per minute (gpm) and the toilets are rated at 1.6 gallons per flush (gpf).

3 SITE ENERGY USE AND COSTS

Utility data for electricity and no. 2 fuel oil was analyzed to identify opportunities for savings. In addition, data for electricity and no. 2 fuel oil 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

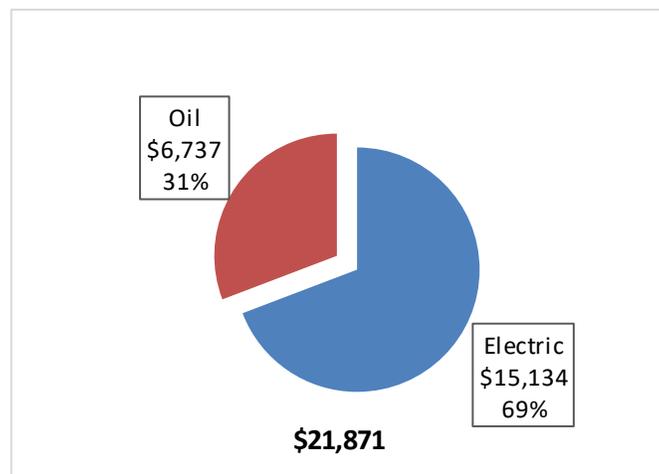
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Transportation Garage		
Fuel	Usage	Cost
Electricity	120,819 kWh	\$15,134
No. 2 Fuel Oil	3,847 Gallons	\$6,737
Total		\$21,871

The current annual energy cost for this facility is \$21,871 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 \$0.125/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. There are no demand charges associated with this location. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

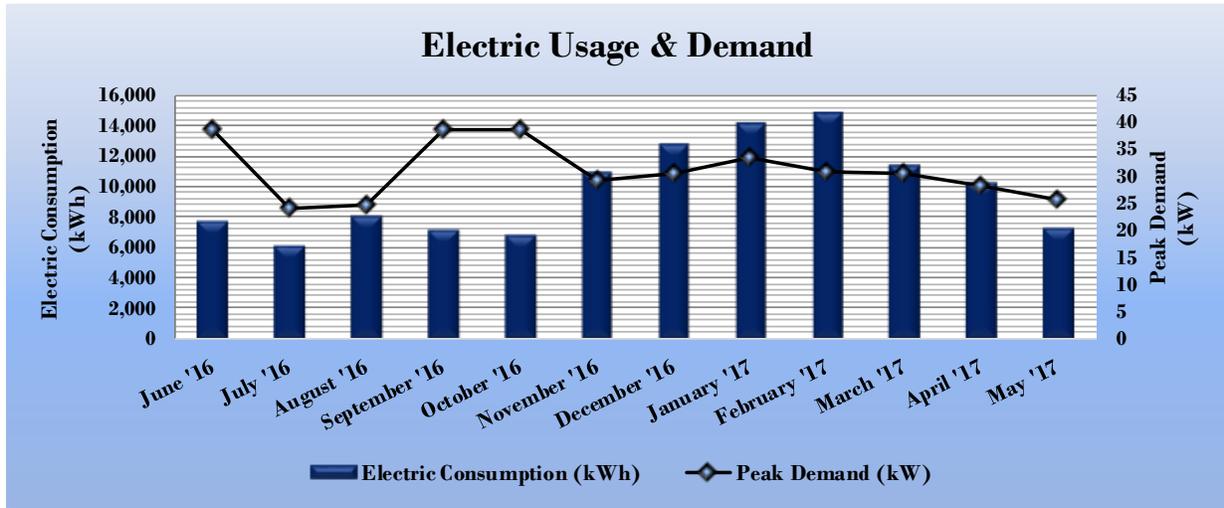


Figure 9 - Electric Usage & Demand

Electric Billing Data for Transportation Garage					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
6/21/16	32	7,760	39		\$957
7/29/16	37	6,160	24		\$810
8/31/16	32	8,120	25		\$1,017
9/30/16	29	7,200	39		\$924
10/31/16	30	6,840	39		\$885
11/30/16	29	10,920	29		\$1,343
12/31/16	30	12,840	31		\$1,548
1/31/17	30	14,160	33		\$1,728
2/28/17	27	14,920	31		\$1,820
3/22/17	21	11,440	30		\$1,447
4/20/17	28	10,240	28		\$1,306
5/22/17	31	7,240	26		\$975
Totals	356	117,840	38.6	\$0	\$14,761
Annual	365	120,819	38.6	\$0	\$15,134

3.3 No. 2 Fuel Oil Usage

No. 2 fuel oil is provided by Allied Oil LLC. The average oil cost for the past 12 months is \$1.751/Gallon, which is the blended rate used throughout the analyses in this report. The oil consumption is shown in the table below.

Figure 10-No. 2 Fuel Oil Usage

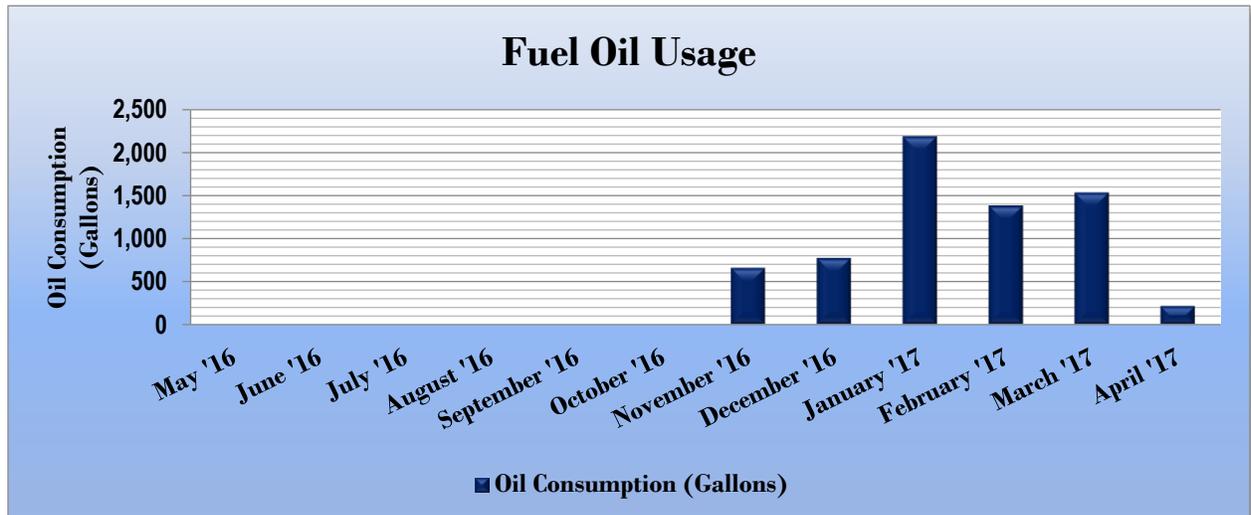


Figure 11 –No. 2 Fuel Oil Usage

No. 2 Fuel Oil Billing Data for Transportation Garage			
Period Ending	Days in Period	Oil Usage (Gallons)	Fuel Cost
5/1/16	31	0	\$0
6/1/16	30	0	\$0
7/1/16	31	0	\$0
8/1/16	31	0	\$0
9/1/16	30	0	\$0
10/1/16	31	0	\$0
11/1/16	30	423	\$656
12/1/16	31	463	\$771
1/1/17	31	1,279	\$2,185
2/1/17	28	733	\$1,381
3/1/17	31	835	\$1,532
4/1/17	30	113	\$213
Totals	365	3,847	\$6,737
Annual	365	3,847	\$6,737

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		
	Transportation Garage	National Median Building Type: Municipal
Source Energy Use Intensity (kBtu/ft ²)	202.3	148.1
Site Energy Use Intensity (kBtu/ft ²)	104.3	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		
	Transportation Garage	National Median Building Type: Municipal
Source Energy Use Intensity (kBtu/ft ²)	178.8	148.1
Site Energy Use Intensity (kBtu/ft ²)	96.9	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. Your building is not one of the building categories that are eligible to receive a score.

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

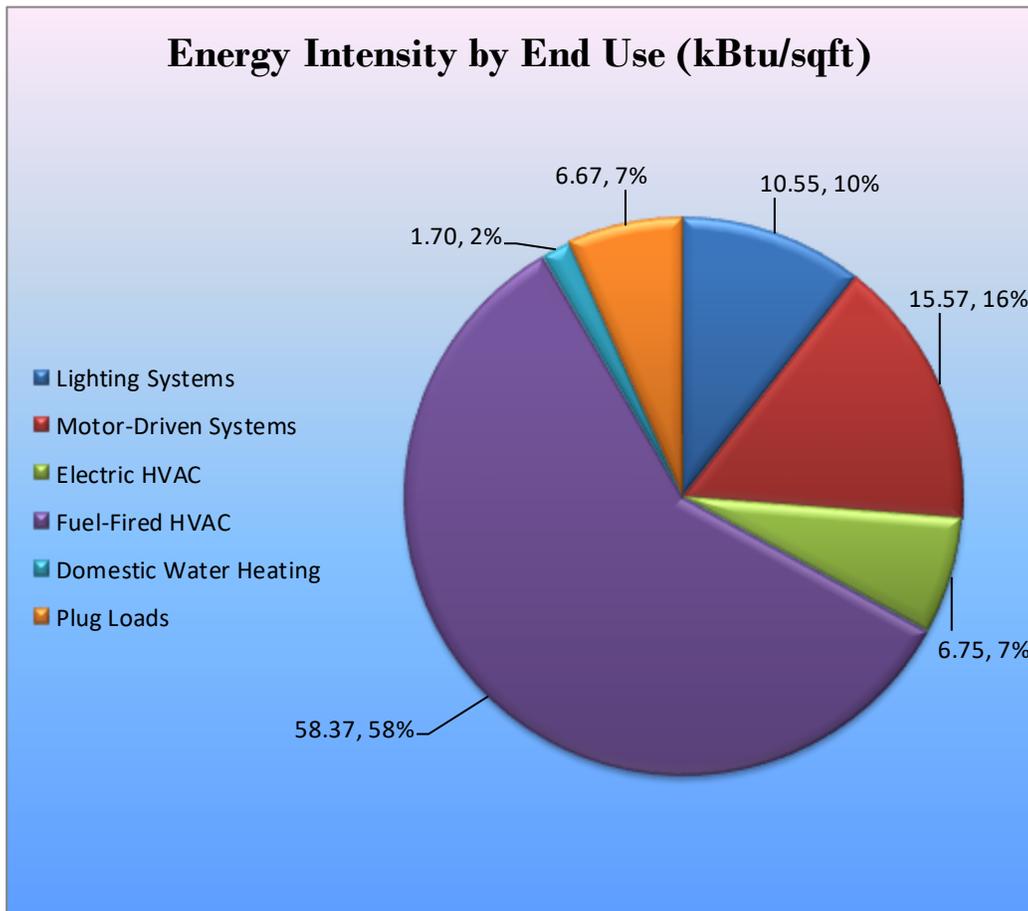
For more information on ENERGY STAR® certification go to: <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1>.

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 (% and kBtu/SF)



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 Transportation Garage 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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades		15,885	2.5	0.0	\$1,989.81	\$7,117.40	\$1,045.00	\$6,072.40	3.1	15,997
ECM 1	Install LED Fixtures	4,568	0.6	0.0	\$572.19	\$2,583.23	\$325.00	\$2,258.23	3.9	4,600
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	916	0.2	0.0	\$114.77	\$588.00	\$30.00	\$558.00	4.9	923
ECM 3	Retrofit Fixtures with LED Lamps	10,401	1.7	0.0	\$1,302.85	\$3,946.17	\$690.00	\$3,256.17	2.5	10,474
Lighting Control Measures		2,362	0.4	0.0	\$295.84	\$1,892.00	\$245.00	\$1,647.00	5.6	2,378
ECM 4	Install Occupancy Sensor Lighting Controls	2,362	0.4	0.0	\$295.84	\$1,892.00	\$245.00	\$1,647.00	5.6	2,378
Plug Load Equipment Control - Vending Machine		1,612	0.0	0.0	\$201.90	\$230.00	\$0.00	\$230.00	1.1	1,623
ECM 5	Vending Machine Control	1,612	0.0	0.0	\$201.90	\$230.00	\$0.00	\$230.00	1.1	1,623
TOTALS		19,859	2.9	0.0	\$2,487.55	\$9,239.40	\$1,290.00	\$7,949.40	3.2	19,998

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

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

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades		15,885	2.5	0.0	\$1,989.81	\$7,117.40	\$1,045.00	\$6,072.40	3.1	15,997
ECM 1	Install LED Fixtures	4,568	0.6	0.0	\$572.19	\$2,583.23	\$325.00	\$2,258.23	3.9	4,600
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	916	0.2	0.0	\$114.77	\$588.00	\$30.00	\$558.00	4.9	923
ECM 3	Retrofit Fixtures with LED Lamps	10,401	1.7	0.0	\$1,302.85	\$3,946.17	\$690.00	\$3,256.17	2.5	10,474

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 ₂ e Emissions Reduction (lbs)
Interior	0	0.0	0.0	\$0.00	\$0.00	\$0.00	\$0.00	0.0	0
Exterior	4,568	0.6	0.0	\$572.19	\$2,583.23	\$325.00	\$2,258.23	3.9	4,600

Measure Description

We recommend replacing of the exterior high pressure fixtures 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 high pressure sodium lamp.

ECM 2: Retrofit Fluorescent 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 ₂ e Emissions Reduction (lbs)
Interior	916	0.2	0.0	\$114.77	\$588.00	\$30.00	\$558.00	4.9	923
Exterior	0	0.0	0.0	\$0.00	\$0.00	\$0.00	\$0.00	0.0	0

Measure Description

We recommend retrofitting existing fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure addresses the facilities' T12 fixtures. 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 tube.

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 ₂ e Emissions Reduction (lbs)
Interior	10,083	1.7	0.0	\$1,263.02	\$3,646.17	\$690.00	\$2,956.17	2.3	10,154
Exterior	318	0.0	0.0	\$39.83	\$300.00	\$0.00	\$300.00	7.5	320

Measure Description

We recommend retrofitting existing fluorescent and incandescent lighting technologies 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 tube and more than 10 times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 17 below.

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 ₂ e Emissions Reduction (lbs)
Lighting Control Measures	2,362	0.4	0.0	\$295.84	\$1,892.00	\$245.00	\$1,647.00	5.6	2,378
ECM 4 Install Occupancy Sensor Lighting Controls	2,362	0.4	0.0	\$295.84	\$1,892.00	\$245.00	\$1,647.00	5.6	2,378

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 4: 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 ₂ e Emissions Reduction (lbs)
2,362	0.4	0.0	\$295.84	\$1,892.00	\$245.00	\$1,647.00	5.6	2,378

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in offices, kitchen, cafeteria, the garage, closets, hallways, and storage rooms. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required. Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment controls are summarized in Figure 18 below.

Figure 18-Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine	1,612	0.0	0.0	\$201.90	\$230.00	\$0.00	\$230.00	1.1	1,623
ECM 5 Vending Machine Control	1,612	0.0	0.0	\$201.90	\$230.00	\$0.00	\$230.00	1.1	1,623

ECM 5: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
1,612	0.0	0.0	\$201.90	\$230.00	\$0.00	\$230.00	1.1	1,623

Measure Description

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

5 ENERGY EFFICIENT PRACTICES

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

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.

Turn Off Unneeded Motors

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Reducing run hours for these motors can result in significant energy savings. Whenever possible, use automatic devices such as twist timers or occupancy sensors to ensure that motors are turned off when not needed.

Clean and/or Replace HVAC Filters

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

Check for and Seal Duct Leakage

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

Perform Proper Furnace Maintenance

Preventative furnace maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should include tasks such as checking for gas / carbon monoxide leaks; changing the air and fuel filters; checking components for cracks, corrosion, dirt, or debris build-up; ensuring the ignition system is working properly; testing and adjusting operation and safety controls; inspecting the electrical connections; and ensuring proper lubrication for motors and bearings.

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.

Perform Maintenance on Compressed Air Systems

Like all electro-mechanical equipment, compressed air systems require periodic maintenance to operate at peak efficiency. A maintenance plan should be developed for process related compressed air systems to include inspection, cleaning, and replacement of inlet filter cartridges, cleaning of drain traps, daily inspection of lubricant levels to reduce unwanted friction, inspection of belt condition and tension, checking for system leaks and adjustment of loose connections, and overall system cleaning. Contact a qualified technician for help with setting up periodic maintenance schedule.

Plug Load Controls

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

Water Conservation

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

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

6 ON-SITE GENERATION MEASURES

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

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

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

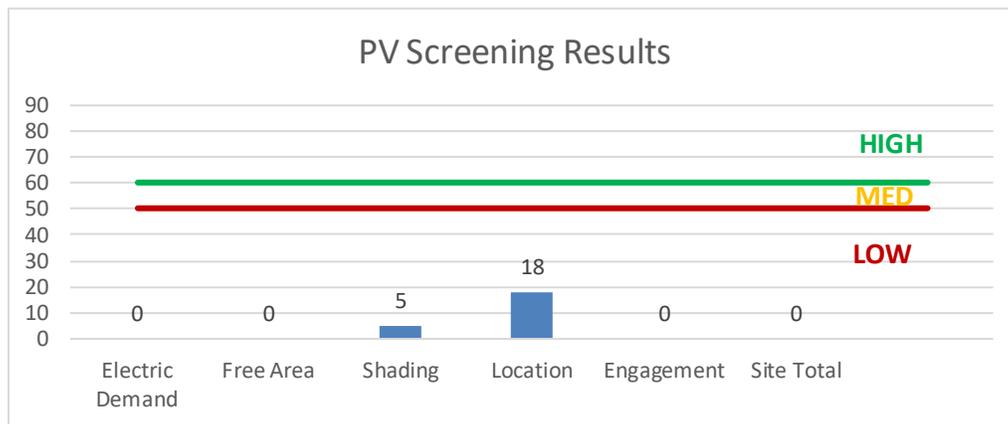
6.1 Photovoltaic

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

A preliminary screening based on the facility’s electric demand, size and location of free area, and shading elements shows that the facility has a **Low** potential for installing a PV array.

In order to be cost-effective, a solar PV array needs certain minimum criteria, such as a high electric demand and open area for PV panels. In our opinion, the facility does appear not meet these minimum criteria for cost-effective PV installation.

Figure 19 - Photovoltaic Screening



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:

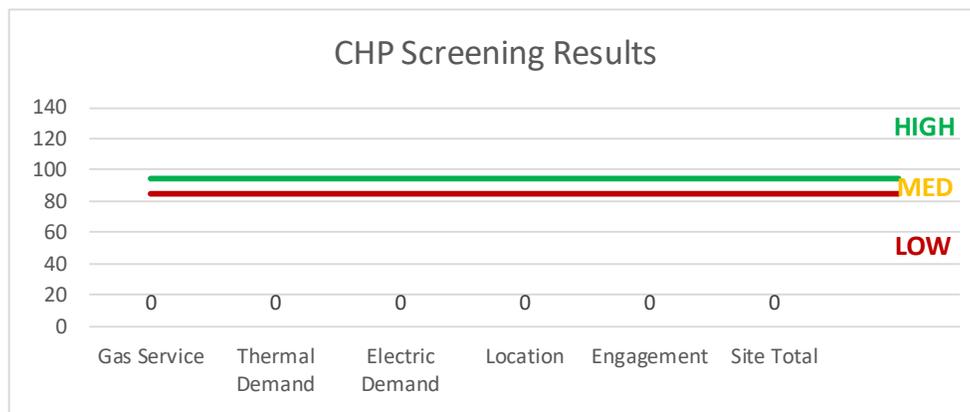
- **Basic Info on Solar PV in NJ:** <http://www.njcleanenergy.com/whysolar>
- **NJ Solar Market FAQs:** <http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs>
- **Approved Solar Installers in the NJ Market:** http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/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. The lack of gas service and low thermal load are the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation. For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/ni-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.

Figure 20 - Combined Heat and Power Screening



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.

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

Figure 21 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	x		x			
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x		x			
ECM 3	Retrofit Fixtures with LED Lamps	x		x			
ECM 4	Install Occupancy Sensor Lighting Controls	x		x			
ECM 5	Vending Machine Control			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 any 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.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	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
Entrance Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,290	0.18	1,086	0.0	\$136.02	\$380.53	\$80.00	2.21
Electrical Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,290	0.03	160	0.0	\$20.04	\$58.50	\$10.00	2.42
Office Hall	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.07	404	0.0	\$50.64	\$233.00	\$40.00	3.81
Supervisors Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.20	1,213	0.0	\$151.93	\$621.00	\$95.00	3.46
Supervisor Secretary's Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.07	404	0.0	\$50.64	\$233.00	\$40.00	3.81
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.07	404	0.0	\$50.64	\$233.00	\$40.00	3.81
Office Suite	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.17	1,011	0.0	\$126.61	\$408.50	\$70.00	2.67
Women's Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,290	0.03	160	0.0	\$20.04	\$58.50	\$10.00	2.42
Men's Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,290	0.03	160	0.0	\$20.04	\$58.50	\$10.00	2.42
Kitchen and Dining	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.30	1,779	0.0	\$222.85	\$745.67	\$135.00	2.74
Kitchen and Dining	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp	Yes	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.42	2,491	0.0	\$311.99	\$935.93	\$175.00	2.44
Mechanic Shop	20	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	4,290	None	No	20	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	4,290	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Upstairs Mech. Shop	6	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	4,290	Relamp & Reballast	No	6	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,290	0.15	916	0.0	\$114.77	\$588.00	\$30.00	4.86
Tech Closet	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.10	606	0.0	\$75.96	\$291.50	\$50.00	3.18
Tire Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.07	404	0.0	\$50.64	\$233.00	\$40.00	3.81
Storage	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.24	1,415	0.0	\$177.25	\$679.50	\$70.00	3.44
Break Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.10	606	0.0	\$75.96	\$291.50	\$50.00	3.18
Offices Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 4L	Wall Switch	63	4,290	Relamp	No	1	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	4,290	0.02	141	0.0	\$17.61	\$76.53	\$20.00	3.21
Various	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	0.0	\$0.00	\$0.00	\$0.00	0.00
Wall Packs	3	High-Pressure Sodium: 250 W HP Na	Wall Switch	250	5,250	Fixture Replacement	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	75	5,250	0.43	3,115	0.0	\$390.13	\$1,172.03	\$300.00	2.24
Entrance above Doors	5	High-Pressure Sodium: 70 W HP Na	Wall Switch	70	5,250	Fixture Replacement	No	5	LED - Fixtures: Downlight Surface Mount	Wall Switch	21	5,250	0.20	1,453	0.0	\$182.06	\$1,411.20	\$25.00	7.61
Canopy Fixtures	2	Compact Fluorescent: 18 W CFL- 2 Lamp	Wall Switch	36	5,250	Relamp	No	2	LED - Fixtures: Downlight Surface Mount	Wall Switch	25	5,250	0.02	128	0.0	\$16.05	\$200.00	\$0.00	12.46
Canopy Fixtures	1	Incandescent: 40 W Incandescent	Wall Switch	40	5,250	Relamp	No	1	LED - Fixtures: Downlight Surface Mount	Wall Switch	8	5,250	0.03	190	0.0	\$23.78	\$100.00	\$0.00	4.21

Motor Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
		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
Garage	Air Compressor	1	Air Compressor	10.0	91.7%	No	4,957	No	91.7%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Garage	Garage Area	4	Supply Fan	0.8	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Garage	Garage Hoist Doors	4	Other	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Electric HVAC Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
		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
Garage	AC Unit	2	Split-System AC	3.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Storage Room	Electric Heater	1	Electric Resistance Heat		25.60	No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Various	Electric Heater	2	Electric Resistance Heat		5.12	No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Fuel Heating Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
		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	
Garage	Offices	2	Furnace	120.00	No							0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Garage	Garage	4	Warm Air Unit Heater	250.00	No							0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

DHW Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
		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
Garage	Building	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Plug Load Inventory

Location	Existing Conditions			
	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Various	7	Computers	75.0	No
Various	1	Small Printer/ Copier	20.0	No
Various	2	Medium Printer/ Copier	200.0	No
Various	1	Large Printer/ Copier	515.0	No
Various	1	Paper Shredder	360.0	No
Various	3	Microwaves	1,000.0	No
Various	2	Large Refrigerators	600.0	No
Various	3	Coffee Machines	400.0	No
Various	1	Toaster	850.0	No
Various	1	Toaster Oven	1,200.0	No
Various	1	Dishwasher	1,500.0	No
Various	1	LED 30" TV	75.0	No
Various	1	Hot and Cold Water Dispenser	500.0	No
Various	2	Standing Fans	150.0	No
Various	1	Cooking Range	1,500.0	No

Vending Machine Inventory & Recommendations

Location	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Refrigerated	Yes	0.00	1,612	0.0	\$201.90	\$230.00	\$0.00	1.14

Appendix B: ENERGY STAR® Statement of Energy Performance



ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

Transportation Building

Primary Property Type: Repair Services (Vehicle, Shoe, Locksmith, etc.)
 Gross Floor Area (ft²): 9,060
 Built: 1980

ENERGY STAR®
 Score¹

For Year Ending: April 30, 2017
 Date Generated: April 04, 2018

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

Property & Contact Information

Property Address Transportation Building 1 Lotta Burke Way Marlboro, New Jersey 07746	Property Owner Marlboro Township Board of Education 1980 Township Drive Marlboro, NJ 07746 (732) 972-2000	Primary Contact Cindy Barr-Rague 1980 Township Drive Marlboro, NJ 07746 (732) 972-2000 Ext. 2010 cbarr-rague@mtps.org
Property ID: 6275470		

Energy Consumption and Energy Use Intensity (EUI)

Site EUI 103 kBtu/ft ²	Annual Energy by Fuel Electric - Grid (kBtu) 402,498 (43%) Fuel Oil (No. 2) (kBtu) 530,831 (57%)	National Median Comparison National Median Site EUI (kBtu/ft ²) 52.1 National Median Source EUI (kBtu/ft ²) 100.4 % Diff from National Median Source EUI 98%
Source EUI 198.7 kBtu/ft ²	Annual Emissions Greenhouse Gas Emissions (Metric Tons CO ₂ e/year) 84	

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)