



Local Government Energy Audit: Energy Audit Report



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Public Works Garage

1360 Route 70

Whiting, NJ 08759

Manchester Township

August 7, 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 (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Public Works 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 Public Works Garage is an 8,812 square foot facility comprised of a garage and office space. The facility is generally in fair condition and was built in 1975. The garage is in operation year round except for a two week closing. The building is in operation Monday through Friday between 8:00 AM and 6:00 PM. This building is electric only. Heating systems operate on waste oil which saves on utility costs. The office and lunch room are the only areas cooled in the facility.

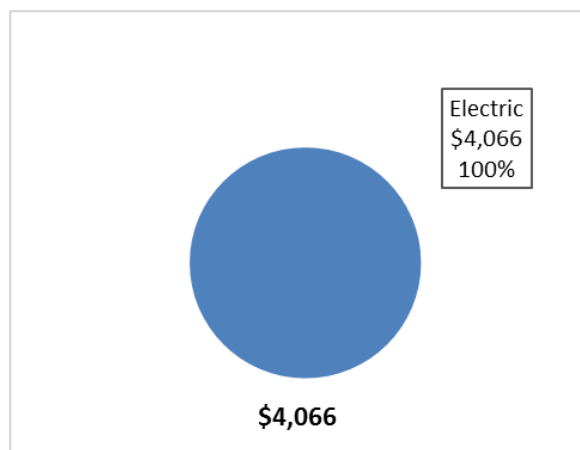
Lighting at the Public Works Garage consists of aging and inefficient lighting, however, light fixtures are normally not turned on during the day due to ample daylight. A thorough description of the facility and our observations are located in Section 2.

I.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated seven measures and recommends three measures which together represent an opportunity for the Public Works Garage to reduce annual energy costs by \$1,756 and annual greenhouse gas emissions by 12,515 lbs CO₂e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 12 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 Public Works Garage’s annual energy use by 46%.

Figure 1 –Utility Costs



A detailed description of the Public Works 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 2. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 2 – Summary of Energy Reduction Opportunities

Energy Conservation Measure	Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Natural Gas Savings (MMBtu)	Annual N/A Savings (MMBtu)	Annual N/A Savings (MMBtu)	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		11,438	4.4	0.0	0.0	0.0	0.0	\$1,624.54	\$28,759.51	\$1,415.00	\$27,344.51	16.8	11,518
ECM 1 Install LED Fixtures	Yes	10,546	0.9	0.0	0.0	0.0	0.0	\$1,497.86	\$20,856.07	\$265.00	\$20,591.07	13.7	10,620
Retrofit Fluorescent Fixtures with LED Lamps and Drivers	No	259	1.8	0.0	0.0	0.0	0.0	\$36.74	\$4,170.17	\$500.00	\$3,670.17	99.9	260
Retrofit Fixtures with LED Lamps	No	138	1.7	0.0	0.0	0.0	0.0	\$19.64	\$3,195.51	\$650.00	\$2,545.51	129.6	139
ECM 2 Install LED Exit Signs	Yes	495	0.0	0.0	0.0	0.0	0.0	\$70.30	\$537.78	\$0.00	\$537.78	7.6	498
Lighting Control Measures		73	0.5	0.0	0.0	0.0	0.0	\$10.35	\$2,006.00	\$265.00	\$1,741.00	168.2	73
Install Occupancy Sensor Lighting Controls	No	73	0.5	0.0	0.0	0.0	0.0	\$10.35	\$2,006.00	\$265.00	\$1,741.00	168.2	73
Motor Upgrades		180	0.1	0.0	0.0	0.0	0.0	\$25.51	\$2,556.94	\$0.00	\$2,556.94	100.2	181
Premium Efficiency Motors	No	180	0.1	0.0	0.0	0.0	0.0	\$25.51	\$2,556.94	\$0.00	\$2,556.94	100.2	181
Domestic Water Heating Upgrade		1,387	0.0	0.0	0.0	0.0	0.0	\$197.05	\$28.68	\$0.00	\$28.68	0.1	1,397
ECM 3 Install Low-Flow Domestic Hot Water Devices	Yes	1,387	0.0	0.0	0.0	0.0	0.0	\$197.05	\$28.68	\$0.00	\$28.68	0.1	1,397
TOTALS		13,077	5.0	0.0	0.0	0.0	0.0	\$1,857.45	\$33,351.13	\$1,680.00	\$31,671.13	17.1	13,169
TOTALS (High Priority)		12,428	0.9	0.0	0.0	0.0	0.0	\$1,765.21	\$21,422.52	\$265.00	\$21,157.52	12.0	12,515

* - 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.

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

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 Practices

TRC also identified five 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 Public Works Garage include:

- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Perform Maintenance on Compressed Air Systems

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 Public Works 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
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- 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 2 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. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 3 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Joe Veni	Supervising Engineer	jveni@manchestertwp.com	732-65-8121
Jeff Ruerup	Maintainence Supervisor	jruerup@manchestertwp.com	908-963-6242
TRC Energy Services			
Vish Nimbalkar	Auditor	VNaikNimbalkar@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On April 18, 2017, TRC performed an energy audit at the Public Works Garage located in Whiting, New Jersey. TRC’s team met with Kevin to review the facility operations and help focus our investigation on specific energy-using systems.

The Public Works Garage is an 8,812 square foot facility comprised a garage and office space. The facility is generally in fair condition and was built in 1975. This building is electric only. Heating systems operate on waste oil which saves on utility costs. Lighting at the Public Works Garage consists of aging and inefficient lighting, however, light fixtures are normally not turned on during the day due to ample daylight.

2.3 Building Occupancy

The garage is in operation year round except for a two week closing. The building is in operation Monday through Friday between 8:00 AM and 6:00 PM. The typical schedule is presented in the table below.

Figure 4 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Public Works Garage	Weekday	8:00 AM to 6:00 PM
Public Works Garage	Weekend	No Operation

2.4 Building Envelope

The building is constructed of concrete block and structural steel. The building has flat roofs and in fair condition. The buildings have double pane windows which are in good condition and show little sign of excessive infiltration. The exterior doors are constructed of aluminum and glass and are in good condition except that the door seals have worn out which increases the level of outside air infiltration.

2.5 On-Site Generation

The Public Works Garage 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

Lighting at the facility is provided by linear fluorescent fixtures with T12 lamps and magnetic ballasts or T8 lamps with electronic ballasts. General purpose lighting is provided by incandescent lamps. The garage is lit by T5 fluorescent fixtures with electronic ballasts and are controlled with occupancy sensors. There is ample amount of daylight in the building and the lights are rarely used. This is provided through glass parts of the façade and skylights. Due to this low use, there is limited potential for lighting upgrades to be justified by energy savings alone. Lighting control in most spaces is provided by manual wall switches.

The building's exterior lighting is provided by metal halide lamp fixtures which are controlled by photocells.



HVAC Systems

The break room is conditioned by a forced air furnace which operates with waste oil for heating and has an electric direct expansion (DX) cooling coil. This system is controlled by a programmable thermostat that is on average set at 73 degrees. The garage units are also controlled by programmable thermostats and are set at a minimum 55°F to 65°F. There is a private office that is conditioned by a split heat pump system.



The garage is heated by four forced air furnaces which operate on waste oil. They contain supply fan motors and fuel oil pump motors. This equipment is in fair condition. The garage is not cooled. The building also includes the use of exhaust fan motors. All motors in the facility are fractional horsepower, assumed to be of standard efficiency and fair condition.



Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of an electric 30 gallon storage tank water heater that has a 4.5kW heating element. This is in good condition.

Building Plug Load

Plug loads in the facility include general office and café equipment. There is also an electric load for shop tool equipment.

2.7 Water-Using Systems

There are four faucets in restrooms at this facility. A sampling of restrooms found that the faucets are rated for 2.2 gallons per minute (gpm) or higher.

3 SITE ENERGY USE AND COSTS

Utility data for electricity was analyzed to identify opportunities for savings. In addition, data for electricity 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 3.3 for additional information.

3.1 Total Cost of Energy

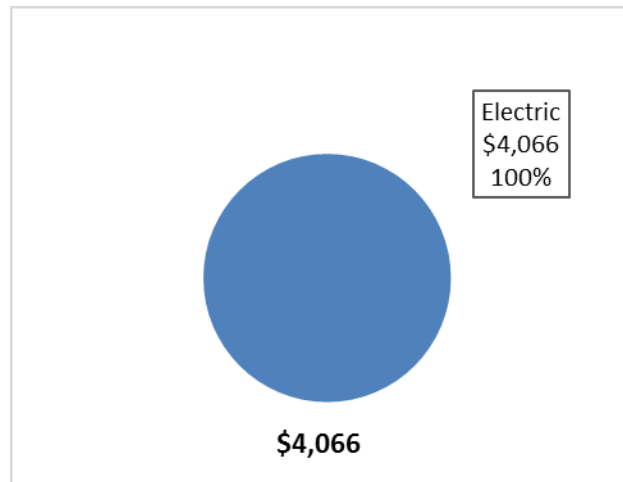
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 5 - Utility Summary

Utility Summary for Public Works Garage		
Fuel	Usage	Cost
Electricity	28,629 kWh	\$4,066
Total		\$4,066

The current annual energy cost for this facility is \$4,066 as shown in the chart below.

Figure 6 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was \$0.142/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The facility pays electric demand charges, however these were not provided. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 7 - Electric Usage & Demand

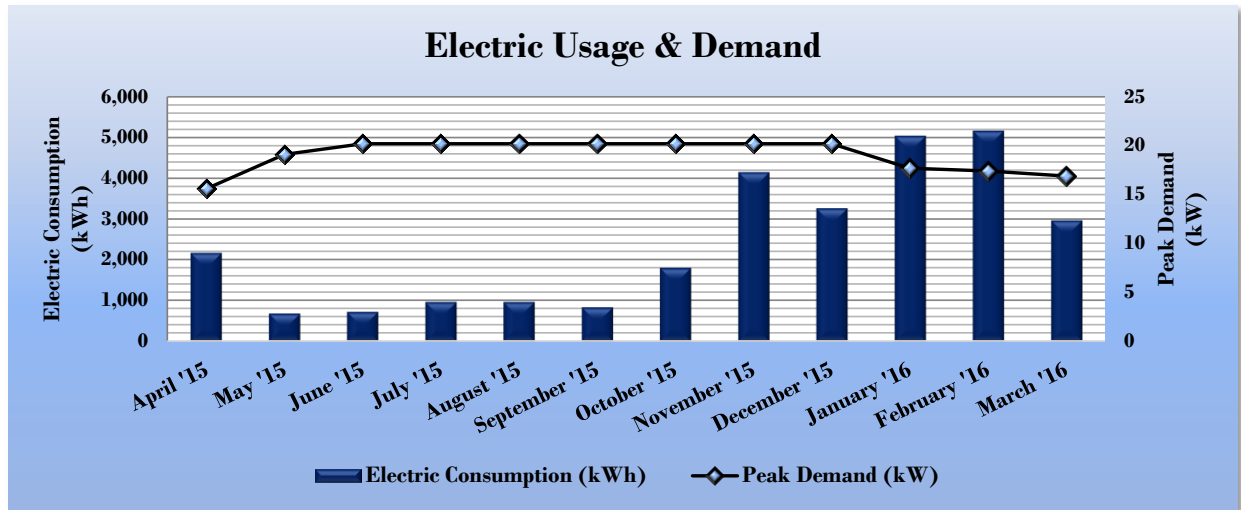


Figure 8 - Electric Usage & Demand

Electric Billing Data for Public Works Garage					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
5/1/15	31	2,167	16		\$307
6/2/15	32	681	19		\$163
7/2/15	30	728	20		\$146
7/31/15	29	966	20		\$184
9/1/15	32	970	20		\$185
10/1/15	30	837	20		\$160
10/30/15	29	1,804	20		\$273
12/3/15	34	4,143	20		\$527
1/4/16	32	3,258	20		\$431
2/2/16	29	5,031	18		\$639
3/2/16	29	5,160	17		\$652
3/31/16	29	2,962	17		\$410
Totals	366	28,707	20.2	\$0	\$4,077
Annual	365	28,629	20.2	\$0	\$4,066

3.3 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 9 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Public Works Garage	National Median Building Type: Garage
Source Energy Use Intensity (kBtu/ft ²)	34.8	123.1
Site Energy Use Intensity (kBtu/ft ²)	11.1	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 10 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Public Works Garage	National Median Building Type: Garage
Source Energy Use Intensity (kBtu/ft ²)	19.7	123.1
Site Energy Use Intensity (kBtu/ft ²)	6.3	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% of all similar buildings nationwide and may be eligible for ENERGY STAR[®] certification. Your building is not is one of the building categories that are eligible to receive a score.

This building type does not currently qualify 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.

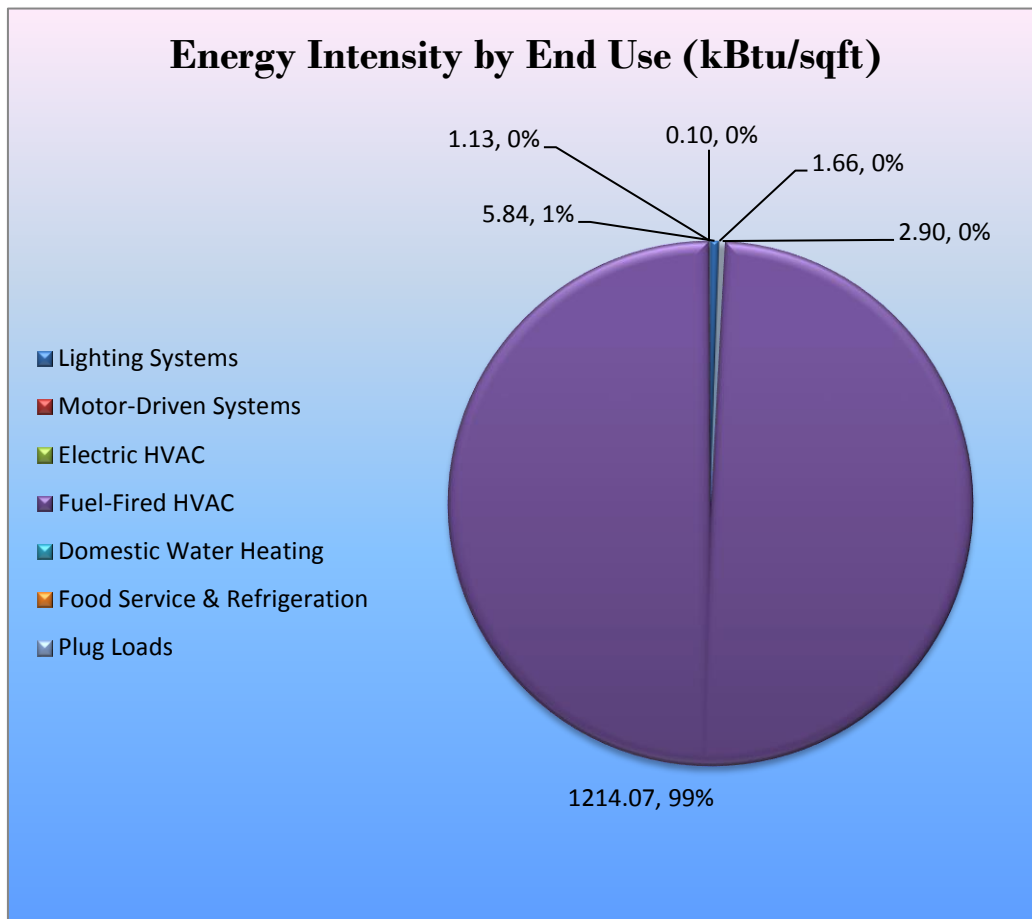
For more information on ENERGY STAR[®] certification go to: <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1>.

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>.

3.4 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 11 - Energy Balance (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 Public Works 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 12 – 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		11,041	0.9	0.0	\$1,568.16	\$21,393.84	\$265.00	\$21,128.84	13.5	11,118
ECM 1	Install LED Fixtures	10,546	0.9	0.0	\$1,497.86	\$20,856.07	\$265.00	\$20,591.07	13.7	10,620
ECM 2	Install LED Exit Signs	495	0.0	0.0	\$70.30	\$537.78	\$0.00	\$537.78	7.6	498
Domestic Water Heating Upgrade		1,387	0.0	0.0	\$197.05	\$28.68	\$0.00	\$28.68	0.1	1,397
ECM 3	Install Low-Flow Domestic Hot Water Devices	1,387	0.0	0.0	\$197.05	\$28.68	\$0.00	\$28.68	0.1	1,397
TOTALS		12,428	0.9	0.0	\$1,765.21	\$21,422.52	\$265.00	\$21,157.52	12.0	12,515

* - 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 13 below.

Figure 13 – 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		11,041	0.9	0.0	\$1,568.16	\$21,393.84	\$265.00	\$21,128.84	13.5	11,118
ECM 1	Install LED Fixtures	10,546	0.9	0.0	\$1,497.86	\$20,856.07	\$265.00	\$20,591.07	13.7	10,620
ECM 2	Install LED Exit Signs	495	0.0	0.0	\$70.30	\$537.78	\$0.00	\$537.78	7.6	498

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	127	0.9	0.0	\$18.02	\$13,280.96	\$0.00	\$13,280.96	736.9	128
Exterior	10,419	0.0	0.0	\$1,479.84	\$7,575.11	\$265.00	\$7,310.11	4.9	10,492

Measure Description

We recommend replacing existing interior 8’ linear fluorescent fixtures with T12 lamps that are in poor condition with new high performance LED light fixtures. This measure also includes replacing existing exterior metal halide fixtures with new high performance LED 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 traditional HID technologies.

ECM 2: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
Interior	495	0.0	0.0	\$70.30	\$537.78	\$0.00	\$537.78	7.6	498
Exterior	0	0.0	0.0	\$0.00	\$0.00	\$0.00	\$0.00	0.0	0

Measure Description

We recommend replacing all compact fluorescent exit signs with LED exit signs. LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output.

4.1.2 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 14 below.

Figure 14 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		1,387	0.0	0.0	\$197.05	\$28.68	\$0.00	\$28.68	0.1	1,397
ECM 3	Install Low-Flow Domestic Hot Water Devices	1,387	0.0	0.0	\$197.05	\$28.68	\$0.00	\$28.68	0.1	1,397

ECM 3: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
1,387	0.0	0.0	\$197.05	\$28.68	\$0.00	\$28.68	0.1	1,397

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Low flow sink aerators can reduce hot water usage, relative to standard aerators, which saves energy. Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

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 15 – 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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades	397	3.5	0.0	\$56.37	\$7,365.67	\$1,150.00	\$6,215.67	110.3	400
Retrofit Fluorescent Fixtures with LED Lamps and Drivers	259	1.8	0.0	\$36.74	\$4,170.17	\$500.00	\$3,670.17	99.9	260
Retrofit Fixtures with LED Lamps	138	1.7	0.0	\$19.64	\$3,195.51	\$650.00	\$2,545.51	129.6	139
Lighting Control Measures	73	0.5	0.0	\$10.35	\$2,006.00	\$265.00	\$1,741.00	168.2	73
Install Occupancy Sensor Lighting Controls	73	0.5	0.0	\$10.35	\$2,006.00	\$265.00	\$1,741.00	168.2	73
Motor Upgrades	180	0.1	0.0	\$25.51	\$2,556.94	\$0.00	\$2,556.94	100.2	181
Premium Efficiency Motors	180	0.1	0.0	\$25.51	\$2,556.94	\$0.00	\$2,556.94	100.2	181
TOTALS	649	4.1	0.0	\$92.24	\$11,928.61	\$1,415.00	\$10,513.61	114.0	654

* - 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).

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	259	1.8	0.0	\$36.74	\$4,170.17	\$500.00	\$3,670.17	99.9	260
Exterior	0	0.0	0.0	\$0.00	\$0.00	\$0.00	\$0.00	0.0	0

Measure Description

We recommend retrofitting existing T12 lamp 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 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 ten times longer than many incandescent lamps.

Reasons for not Recommending

Due to the low run hours of these fixtures, this measure cannot be justified by energy savings alone.

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	138	1.7	0.0	\$19.64	\$3,195.51	\$650.00	\$2,545.51	129.6	139
Exterior	0	0.0	0.0	\$0.00	\$0.00	\$0.00	\$0.00	0.0	0

Measure Description

We recommend retrofitting existing T5 and T8 lamp fixtures as well as incandescent with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than ten times longer than many incandescent lamps.

Reasons for not Recommending

Due to the low run hours of these fixtures, this measure cannot be justified by energy savings alone.

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)
73	0.5	0.0	\$10.35	\$2,006.00	\$265.00	\$1,741.00	168.2	73

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in offices, the mezzanine, locker rooms and the break room. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

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

Reasons for not Recommending

Due to the low run hours of these fixtures, this measure cannot be justified by energy savings alone.

Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
180	0.1	0.0	\$25.51	\$2,556.94	\$0.00	\$2,556.94	100.2	181

Measure Description

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

Reasons for not Recommending

This measure is cost prohibitive and cannot be justified by energy savings alone.

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.

Ensure Lighting Controls Are Operating Properly

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

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Clean Evaporator/Condenser Coils on AC Systems

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

Clean and/or Replace HVAC Filters

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

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.

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

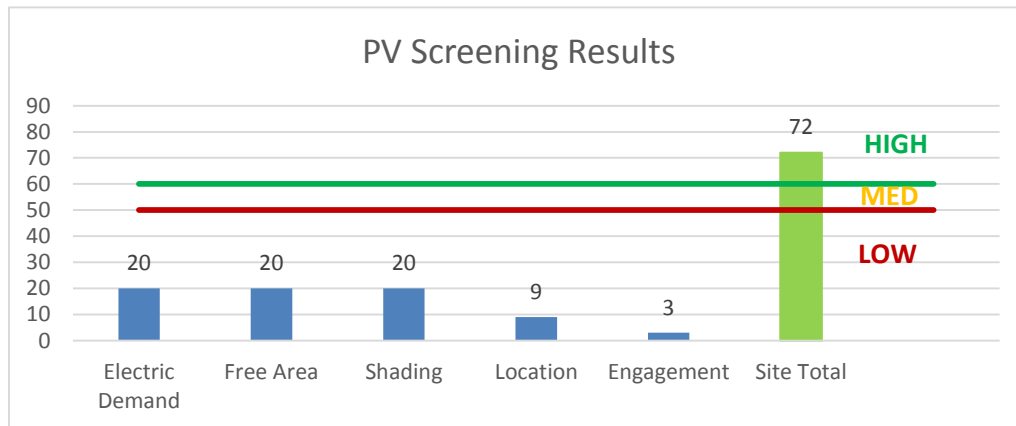
Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical 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.

The facility requested TRC to analyze the solar potential at a former landfill site owned by the township located at 1360 Route 70, Whiting, New Jersey. The image below shows the area considered for the solar PV. The area is approximately 117,000 sq. feet.



A preliminary screening based on the facility’s electric demand, size and location of free area, and shading elements shows that the site has a high potential for cost-effective installation of a PV array. Please refer to the Municipal Building energy audit report for further details on the cost and savings analysis of installing solar PV at the location shown above. TRC recommends that the site be assessed by a qualified solar installer. Site conditions need to be assessed and options for sale of power or usage by municipal buildings need to be more fully explored in order to determine project cost-effectiveness.

Figure 16 - Photovoltaic Screening



Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (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 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. As garages do not have a need for heat constantly or have a natural gas connection, a CHP is not suitable at these locations.

7 DEMAND RESPONSE

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

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

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

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

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

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

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

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey’s Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 17 for a list of the eligible programs identified for each recommended ECM.appendix

Figure 17 - 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	Install LED Exit Signs	x		x			
ECM 3	Install Low-Flow Domestic Hot Water Devices			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 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. SRECs 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 SRECs 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 description 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

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
Supervisor's office	8	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	144	105	Relamp & Reballast	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	74	0.67	98	0.0	\$13.98	\$1,564.67	\$195.00	97.98
Gail's office	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	72	105	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	74	0.08	12	0.0	\$1.75	\$350.00	\$40.00	177.41
Gail's office	2	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	105	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	105	0.09	13	0.0	\$1.86	\$214.00	\$20.00	104.37
Gail's office	1	Exit Signs: Fluorescent	None	16	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	99	0.0	\$14.06	\$107.56	\$0.00	7.65
Restroom	2	Incandescent Screw in Lamp	Wall Switch	60	105	Relamp	No	2	LED Screw-In Lamps: 10W LED	Wall Switch	10	105	0.08	12	0.0	\$1.69	\$107.51	\$10.00	57.70
Break room	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	144	105	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	74	0.34	49	0.0	\$6.99	\$917.33	\$115.00	114.79
Restroom (Garage)	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	105	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	105	0.05	8	0.0	\$1.12	\$117.00	\$20.00	86.97
Garage mezzanine	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	105	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	105	0.05	8	0.0	\$1.12	\$117.00	\$20.00	86.97
Garage mezzanine	5	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	129	105	Fixture Replacement	Yes	5	LED - Fixtures: Ambient - 4' - Direct/Indirect Fixture	Occupancy Sensor	50	74	0.38	56	0.0	\$7.94	\$5,013.20	\$35.00	626.79
Locker room	10	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	144	105	Relamp & Reballast	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	74	0.84	123	0.0	\$17.47	\$2,158.33	\$270.00	108.07
Locker room	8	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	129	105	Fixture Replacement	Yes	8	LED - Fixtures: Ambient - 4' - Direct/Indirect Fixture	Occupancy Sensor	50	74	0.61	89	0.0	\$12.71	\$7,859.12	\$35.00	615.70
Garage	30	Linear Fluorescent - T5: 4' T5 (28W) - 4L	Daylight Dimming	120	53	Relamp	No	30	LED - Linear Tubes: (4) 4' Lamps	Daylight Dimming	58	53	1.51	111	0.0	\$15.72	\$2,854.00	\$600.00	143.42
Garage	1	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	129	53	Fixture Replacement	No	1	LED - Fixtures: Ambient - 4' - Direct/Indirect Fixture	Wall Switch	50	53	0.06	5	0.0	\$0.67	\$948.64	\$0.00	1421.19
Garage	4	Exit Signs: Fluorescent	None	16	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	396	0.0	\$56.24	\$430.22	\$0.00	7.65
Rodney office	1	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	144	105	Relamp & Reballast	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	74	0.08	12	0.0	\$1.75	\$431.83	\$55.00	215.66
Exterior	13	Metal Halide: (1) 175W Lamp	None	215	4,015	Fixture Replacement	No	13	LED - Fixtures: Other	None	50	4,015	-0.53	-2,949	0.0	-\$418.86	\$3,669.12	\$65.00	-8.60
Exterior	2	Metal Halide: (1) 250W Lamp	None	295	4,015	Fixture Replacement	No	2	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	70	4,015	-0.11	-635	0.0	-\$90.22	\$3,905.99	\$200.00	-41.08

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	Office and Break Room Furnace	1	Supply Fan	0.8	74.0%	No	1,373	Yes	81.1%	No		0.04	68	0.0	\$9.68	\$536.42	\$0.00	55.43
Garage	Garage Unit Heaters	4	Supply Fan	0.5	74.0%	No	1,373	Yes	78.2%	No		0.06	111	0.0	\$15.83	\$2,020.52	\$0.00	127.62
Garage	Waste Oil Pumps	2	Other	0.3	74.0%	No	1,373	No	74.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Garage	Exhaust Fans	2	Exhaust Fan	0.3	74.0%	No	2,059	No	74.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Garage	Office and Break Room Furnace	1	Exhaust Fan	0.1	74.0%	No	1,373	No	74.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

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	Lunch Room	1	Split-System AC	5.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Garage	Office	1	Ductless Mini-Split HP	2.00	75.00	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	Office and Break Room	1	Furnace	99.00	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
Garage	Garage	2	Furnace	1,500.00	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	Garage	1	Storage Tank Water Heater (≤ 50 Gal)	No							0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Low-Flow Device Recommendations

Location	Recommendation Inputs				Energy Impact & Financial Analysis						
	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	4	Faucet Aerator (Lavatory)	2.20	1.00	0.00	1,387	0.0	\$197.05	\$28.68	\$0.00	0.15


Plug Load Inventory

Existing Conditions				
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Office & Garage	7	Computer	120.0	
Office & Garage	1	TV	100.0	
Office & Garage	2	Fridge	660.0	
Office & Garage	1	Microwave	1,100.0	
Office & Garage	1	Misc Tool Loads	2,000.0	
Office & Garage	1	Mini Fridge	260.0	
Office & Garage	2	Fans	100.0	

Vending Machine Inventory & Recommendations

Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lunch Room	1	Non-Refrigerated	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Appendix B: ENERGY STAR® Statement of Energy Performance


ENERGY STAR® Statement of Energy Performance

N/A

Public Works Garage
Primary Property Type: Other - Public Services
Gross Floor Area (ft²): 8,812
Built: 1975

ENERGY STAR® Score¹

For Year Ending: March 31, 2016
Date Generated: January 19, 2018

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

Property & Contact Information			
Property Address	Property Owner	Primary Contact	
Public Works Garage 1380 Route 70 Whiting, New Jersey 08750	_____	_____	
Property ID: 6203818	() - _____	() - _____	
Energy Consumption and Energy Use Intensity (EUI)			
Site EUI	Annual Energy by Fuel	National Median Comparison	
11.1 kBtu/ft ²	Electric - Grid (kBtu) 97,710 (100%)	National Median Site EUI (kBtu/ft ²)	39.2
		National Median Source EUI (kBtu/ft ²)	123.1
		% Diff from National Median Source EUI	-72%
Source EUI		Annual Emissions	
34.8 kBtu/ft ²		Greenhouse Gas Emissions (Metric Tons CO ₂ e/year)	11

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)