Local Government Energy Audit:
Energy Audit Report

Howell Bus Garage

1251 U.S. Highway 9

Howell, NJ 07731

NJ Transit

August 20, 2018

Final Report by:

TRC Energy Services

Disclaimer

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

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

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

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

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1 EXECUTIVE SUMMARY

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

1.1 Facility Summary

Howell Bus Garage is a 125,000 square foot facility constructed in 1983. The building is a one story commercial facility including bus maintenance areas, stock room, maintenance offices, bus bays, hallways, and locker/rest room areas.

Lighting at the facility consists mainly of 32-Watt T8 linear fluorescent, 40-Watt T12 linear fluorescent fixtures and 32-Watt T8 U-bend fluorescent fixtures; all of which are inefficient in performance when compared to the latest lighting technology available in the market. In addition to linear fluorescent technology, the facility also has a significant number of high pressure sodium (HPS) and a few LED fixtures. All the exit signs are LED fixtures. Exterior lighting is provided by a combination of sources, including HPS, LED, and compact fluorescent (CFL) fixtures. Interior lighting control is provided by manual switches. Exterior fixture control is provided by photocells.

Cooling and ventilation is provided by package air conditioning (AC) systems. Heating is provided by a non-condensing hot water boiler system supplemented by gas furnaces located in some of the building's heating ventilating (HV) units. Heat for other HV units is provided by the boiler system.

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

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC Energy Services evaluated 13 measures and recommends 12 measures which together represent an opportunity for Howell Bus Garage to reduce annual energy costs by roughly $153,346 and annual greenhouse gas emissions by 1,593,225 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 3.5 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 Howell Bus Garage's annual energy use by 4%.

Figure 1 – Previous 12 Month Utility Costs

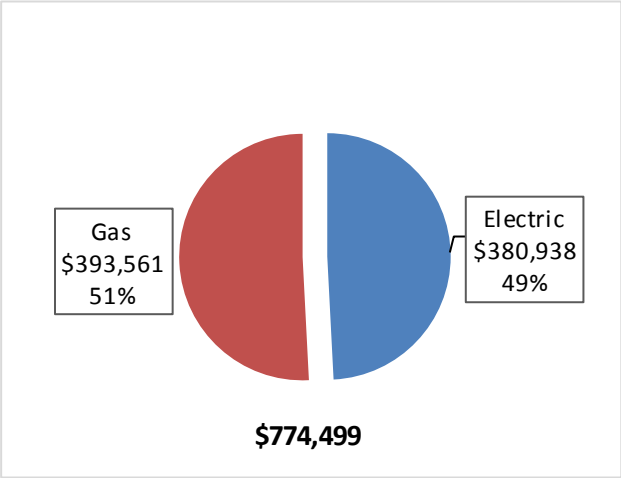
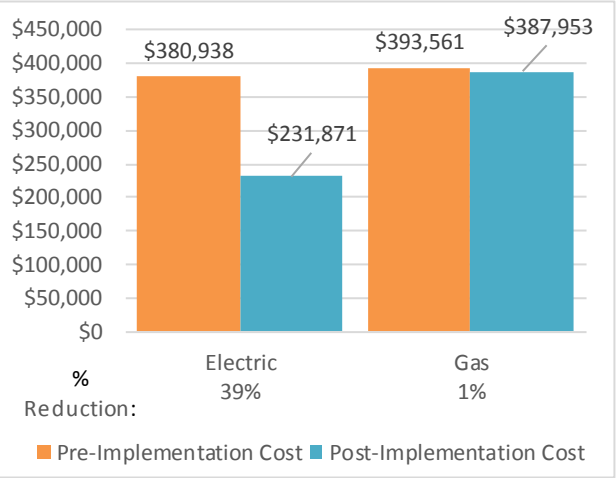


Figure 2 – Potential Post-Implementation Costs



A detailed description of Howell Bus 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_2e Emissions Reduction (lbs)
Lighting Upgrades			**784,232**	**57.1**	**0.0**	**$76,101.63**	**$189,677.90**	**$3,350.00**	**$186,327.90**	**2.4**	**789,716**
ECM 1	Install LED Fixtures	Yes	571,442	41.7	0.0	$55,452.56	$141,400.00	$0.00	$141,400.00	2.5	575,438
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	100,939	7.3	0.0	$9,795.11	$21,350.00	$1,900.00	$19,450.00	2.0	101,645
ECM 3	Retrofit Fixtures with LED Lamps	Yes	111,851	8.1	0.0	$10,853.97	$26,927.90	$1,450.00	$25,477.90	2.3	112,633
Lighting Control Measures			**25,019**	**1.8**	**0.0**	**$2,427.79**	**$7,794.00**	**$1,745.00**	**$6,049.00**	**2.5**	**25,194**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	13,985	1.0	0.0	$1,357.12	$6,794.00	$745.00	$6,049.00	4.5	14,083
ECM 5	Install High/Low Lighitng Controls	Yes	11,033	0.8	0.0	$1,070.67	$1,000.00	$1,000.00	$0.00	0.0	11,111
Motor Upgrades			**198,794**	**36.8**	**0.0**	**$19,290.94**	**$83,268.60**	**$0.00**	**$83,268.60**	**4.3**	**200,184**
ECM 6	Premium Efficiency Motors	Yes	198,794	36.8	0.0	$19,290.94	$83,268.60	$0.00	$83,268.60	4.3	200,184
Variable Frequency Drive (VFD) Measures			**500,771**	**101.5**	**0.0**	**$48,594.65**	**$137,837.68**	**$29,040.00**	**$108,797.68**	**2.2**	**504,273**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	Yes	454,597	97.9	0.0	$44,113.92	$120,137.15	$29,040.00	$91,097.15	2.1	457,776
ECM 8	Install VFDs on Hot Water Pumps	Yes	46,174	3.7	0.0	$4,480.72	$17,700.53	$0.00	$17,700.53	4.0	46,497
Electric Unitary HVAC Measures			**13,691**	**8.1**	**0.0**	**$1,328.57**	**$66,479.15**	**$0.00**	**$66,479.15**	**50.0**	**13,787**
	Install High Efficiency Electric AC	No	13,691	8.1	0.0	$1,328.57	$66,479.15	$0.00	$66,479.15	50.0	13,787
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**472.5**	**$5,160.71**	**$143,388.37**	**$0.00**	**$143,388.37**	**27.8**	**55,329**
ECM 9	Install High Efficiency Hot Water Boilers	Yes	0	0.0	472.5	$5,160.71	$143,388.37	$0.00	$143,388.37	27.8	55,329
HVAC System Improvements			**10,478**	**2.4**	**0.0**	**$1,016.77**	**$1,100.00**	**$250.00**	**$850.00**	**0.8**	**10,551**
ECM 10	Install Dual Enthalpy Outside Economizer Control	Yes	10,478	2.4	0.0	$1,016.77	$1,100.00	$250.00	$850.00	0.8	10,551
Domestic Water Heating Upgrade			**0**	**0.0**	**40.9**	**$447.04**	**$143.40**	**$0.00**	**$143.40**	**0.3**	**4,793**
ECM 11	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	40.9	$447.04	$143.40	$0.00	$143.40	0.3	4,793
Plug Load Equipment Control - Vending Machine			**3,163**	**0.0**	**0.0**	**$306.96**	**$690.00**	**$0.00**	**$690.00**	**2.2**	**3,185**
ECM 12	Vending Machine Control	Yes	3,163	0.0	0.0	$306.96	$690.00	$0.00	$690.00	2.2	3,185
TOTALS (ALL MEASURES)			**1,536,149**	**207.7**	**513.5**	**$154,675.06**	**$630,379.11**	**$34,385.00**	**$595,994.11**	**3.9**	**1,607,011**
TOTALS (RECOMMENDED ONLY MEASURES)			**1,522,458**	**199.6**	**513.5**	**$153,346.49**	**$563,899.96**	**$34,385.00**	**$529,514.96**	**3.5**	**1,593,225**

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

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

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

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

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

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

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

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

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

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

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

Energy Efficient Practices

TRC Energy Services 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 Howell Bus Garage include:

- Close Doors and Windows
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Turn Off Unneeded Motors
- Install Destratification Fans
- Clean and/or Replace HVAC Filters
- Perform Proper Boiler Maintenance
- Perform Proper Furnace Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these Energy Efficient Practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Howell Bus Garage. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	561	kW DC STC
Electric Generation	668,359	kWh/yr
Displaced Cost	$58,150	/yr
Installed Cost	$2,333,800	

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
- Pay for Performance - Existing Building (P4P)
- 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 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

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

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

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

Additional information on relevant incentive programs is located in Section 8 or: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Steven Jenks	Manager, Energy	sjenks@njtransit.com	(973) 491-8589
TRC Energy Services			
Vish Nimbalkar	Auditor	VNaikNimbalkar@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On November 9, 2017, TRC performed an energy audit at Howell Bus Garage located in Howell, New Jersey. TRC's team met with Paul Suckragh to review the facility operations and help focus our investigation on specific energy-using systems.

Howell Bus Garage is a 125,000 square foot facility constructed in 1983. The building is a one story commercial facility including bus maintenance areas, stock room, maintenance offices, bus bays, hallways, and locker/rest room areas.

2.3 Building Occupancy

The typical schedule is presented in the table below.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Howell Bus Garage	Weekday	12:00AM to 12:00AM
Howell Bus Garage	Weekend	12:00AM to 12:00AM

2.4 Building Envelope

New Jersey Transit Howell Bus Garage is a one story building. The construction is of concrete masonry block with brick type exterior and double pane tinted windows with fixed frames. The flat roof is constructed of built-up roofing material.

Figure 7 – Building Façade

2.5 On-Site Generation

Howell Bus 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 lighting equipment.

Lighting System

Lighting consists mainly of 32-Watt T8 linear fluorescent, 40-Watt T12 linear fluorescent fixtures and 32-Watt T8 U-bend fluorescent fixtures; all of which are inefficient in performance when compared to the latest lighting technology available in the market. Linear fluorescent T12 fixtures are 4-foot long linear, mainly industrial fixtures having 2-lamp configuration. Linear fluorescent T8 fixtures are 4-foot and 8-foot fixtures with 2-lamp configuration. The facility also has a significant quantity of 150-Watt, 250-Watt, and 400-Watt HPS fixtures, primarily in the shop and bus bays. Several LED fixtures were noted, most of which are located in the Runway areas. All the exit signs are LED fixtures.

Interior lighting control in the building is provided by manual switches.

Figure 8 - Building Lighting Systems

T12 Fluorescent Fixture	*High Pressure Sodium Fixtures*
	

Exterior lighting is provided by a combination of 150-Watt HPS, LED and CFL sources. Interior lighting control is provided by manual switches. Exterior fixture control is provided by photocells.

Hot Water Heating System

The hot water system consists of two Cleaver Brooks 4,184 kBtu/hr capacity, non-condensing hot water boilers. The boilers have a nominal combustion efficiency of 75%. Each boiler has a 3 hp forced draft fan. The boilers are configured in a constant flow primary distribution with three 3 hp hot water pumps. The boilers provide hot water to air handlers and heating ventilation units.

The boilers are in good condition and well maintained.

Figure 9 – Hot Water System

Hot Water Boilers	*Forced Air Fan Motor*
	

Heating Ventilation System

In addition to the hot water heating system, the facility also has several natural gas based rooftop heating ventilation (HV) units. The HV units operate using 100% outside air, with heating provided by either gas furnace or hot water coils. Such units are predominantly used in high bay areas and maintenance spaces with high outside air (ventilation) requirements.

Furnaces at Howell bus garage have capacities between 380 MBH and 3087 MBH with operating efficiencies of approximately 75%.

Figure 10 – Furnace System

Heating Ventilation Unit	*Heating Ventilation EMS Screenshot*
	

Direct Expansion Air Conditioning System (DX)

The facility is served by several rooftop package units serving office areas and the driver's lounge. Package units having capacities between 0.8 tons and 30 tons. Unit efficiencies are between 7.2 and 9 EER. Units range from 10 years to 20 years old. The package units have minimum outside and economizing sections.

Figure 11 – Direct Expansion AC System

Rooftop Package Unit	*Split Systems*
	

In addition to package units, facility also has a 0.78 ton split system with indoor evaporator unit and an outdoor condensing unit. Split system operates at an efficiency of 11 EER.

Building Energy Management System (BEMS)

The facility is controlled by Johnsons Controls Explorer building energy management system (BEMS). The BEMS aggregates the DDC points from throughout the building. The system is capable of providing trends and advanced control strategies and scheduling capabilities.

Figure 12 – Building Energy Management System

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of one Aquaplex gas fired hot water heater with an input rating of 270 kBtu/hr and a nominal efficiency of 81%. The water heater has a 250 gallon storage tank.

Figure 13 – Domestic Hot Water System

Domestic Hot Water Heater	*Water Heater Nameplate*
	

Process Equipment

The facility has several large process equipment used for bus maintenance and repairs. This includes a 75 hp and a 100 hp large air compressor systems. Notably, these large loads are equipped with variable speed drives and controls that provide the means for reduced energy use relative to operation at full, constant speed.

In addition to the air compressors, the facility also has other process equipment such as blowers, process pumps, process fans, and water supply pumps. All the process equipment combined contributes significantly to the building energy use.

Figure 14 – Process Equipment

Air Compressor	*Air Dryer*
	

Building Plug Load

There are roughly 21 computer work stations throughout the facility. All the computers are desktop units with LCD monitors. There is no centralized PC power management software installed.

The facility also contains several systems which contribute to plug load including printers, microwave, refrigerator, toaster, dishwasher, and televisions.

2.7 Water-Using Systems

Facility also has 20 faucet aerators with a flow capacity of 2.2 gallons per minute (gpm).

3 SITE ENERGY USE AND COSTS

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

3.1 Total Cost of Energy

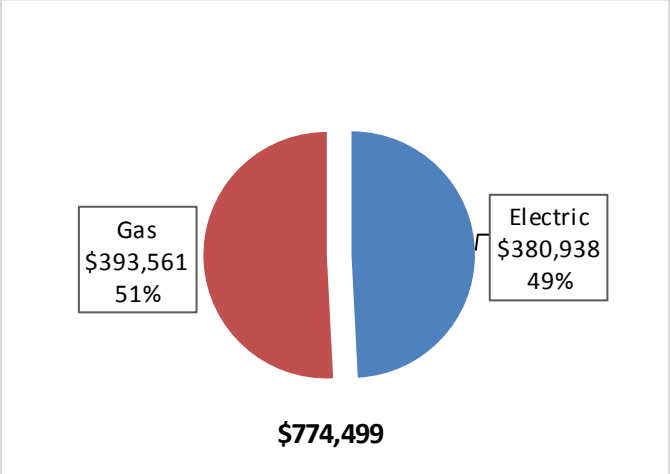
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 15 - Utility Summary

Utility Summary for Howell Bus Garage		
Fuel	**Usage**	**Cost**
Electricity	3,925,597 kWh	$380,938
Natural Gas	360,368 Therms	$393,561
Total		**$774,499**

The current annual energy cost for this facility is $774,499 as shown in the chart below.

Figure 16 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.097/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 17 - Electric Usage & Demand

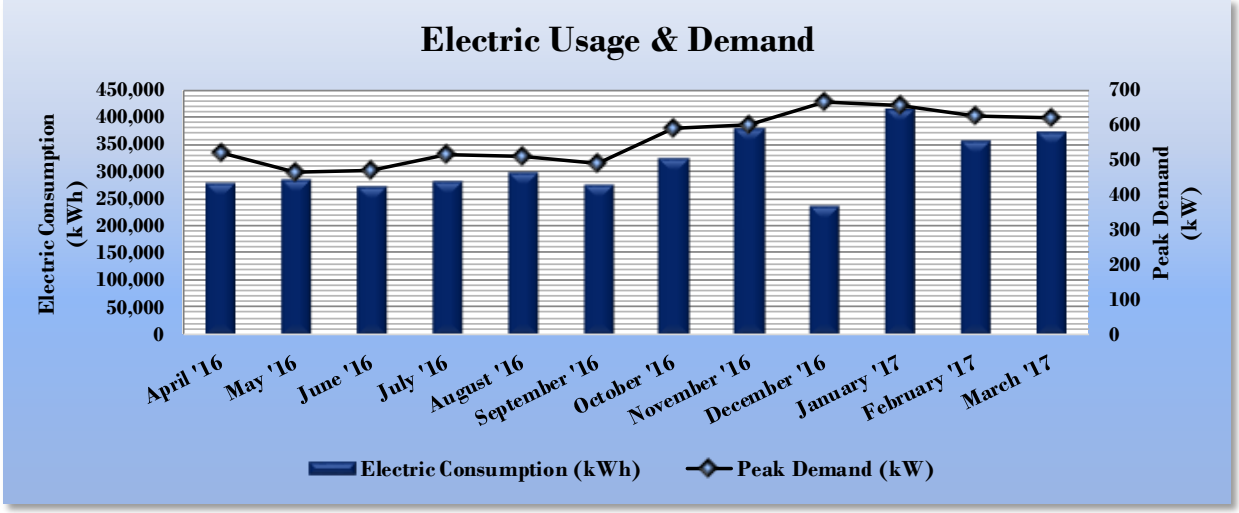


Figure 18 - Electric Usage & Demand

Electric Billing Data for Howell Bus Garage					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
5/12/16	28	278,532	520	$0	$25,253
6/13/16	30	287,167	467	$0	$25,905
7/13/16	29	272,670	471	$0	$24,741
8/12/16	29	281,184	516	$0	$25,713
9/13/16	31	299,392	511	$0	$27,513
10/12/16	28	275,807	489	$0	$25,621
11/11/16	29	325,603	593	$0	$30,298
12/13/16	31	381,120	602	$0	$34,949
1/13/17	30	238,212	665	$0	$38,118
2/14/17	31	415,914	655	$0	$39,264
3/14/17	27	355,559	625	$0	$34,201
4/13/17	29	374,621	620	$0	$35,795
Totals	**352**	**3,785,781**	**665.3**	**$0**	**$367,371**
Annual	**365**	**3,925,597**	**665.3**	**$0**	**$380,938**

3.3 Natural Gas Usage

Natural gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.092/therm, which is the blended rate used throughout the analyses in this report. Please note that an additional gas account is assigned to this building, however, that count is solely meters to as used to generate compressed natural gas (CNG) bus fuel and has not been included in the utility analysis in the building energy balance or benchmarking results. The monthly gas consumption for the building is shown in the chart below.

Figure 19 - Natural Gas Usage

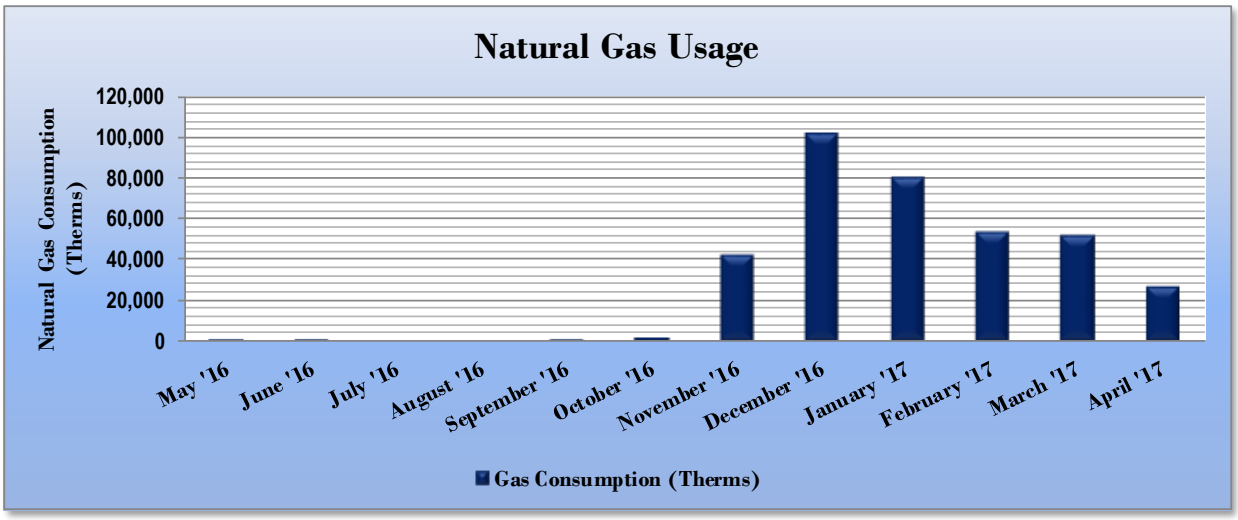


Figure 20 - Natural Gas Usage

Gas Billing Data for Howell Bus Garage			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
5/26/16	29	320	$3,700
6/29/16	34	107	$3,537
7/28/16	29	0	$3,455
8/25/16	28	0	$3,455
9/26/16	32	214	$3,617
10/25/16	29	1,819	$42,996
11/23/16	29	42,364	$38,995
12/28/16	35	102,181	$91,039
1/27/17	30	80,293	$71,632
2/27/17	31	54,117	$52,116
3/29/17	30	52,307	$50,558
4/27/17	29	26,646	$28,460
Totals	**365**	**360,368**	**$393,561**
Annual	**365**	**360,368**	**$393,561**

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.

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. There is no Statement of Energy Performance (SEP) for this property based on the applicant's request. NJ Transit is working with a 3rd party utility manager to update their web-based platform to include dashboard metrics for each individual building account which can track EUIs over time and other key energy metrics.

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 21 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Howell Bus Garage	National Median Building Type: Garage
Source Energy Use Intensity (kBtu/ft^2)	639.2	123.1
Site Energy Use Intensity (kBtu/ft^2)	395.4	78.8

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

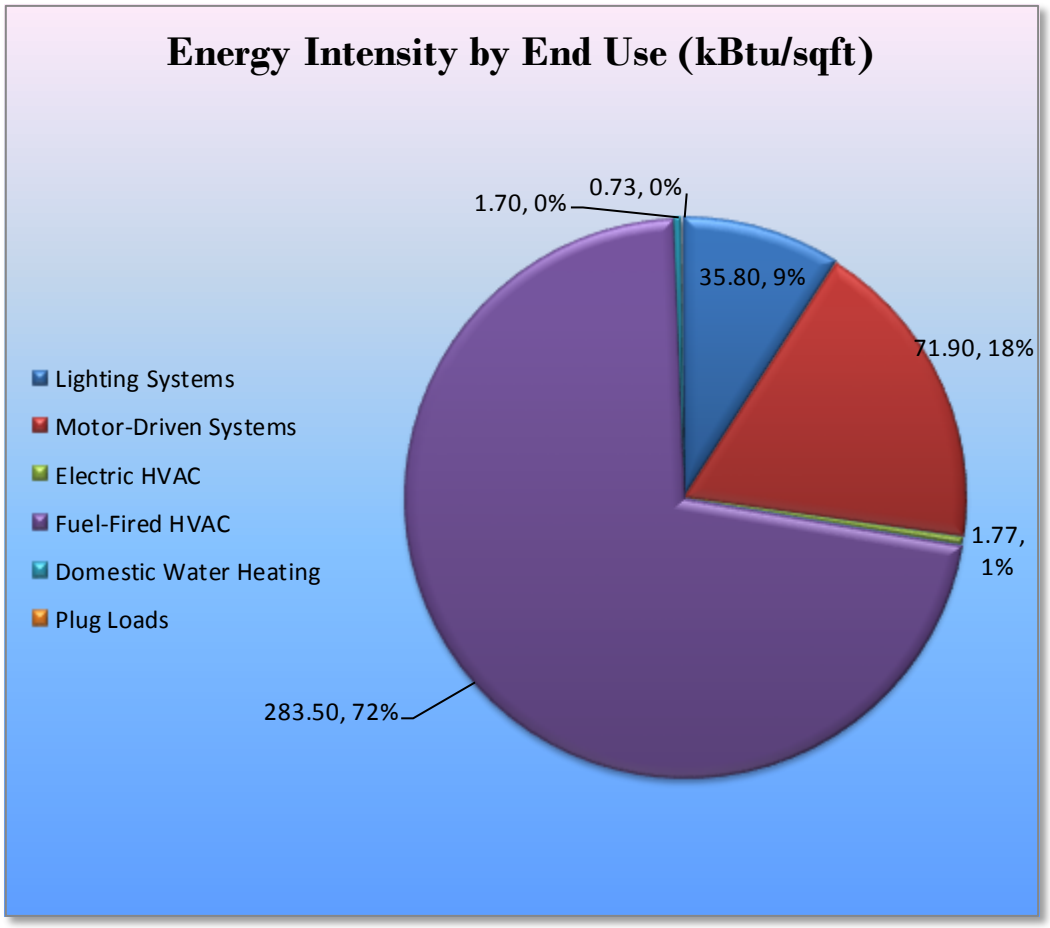
Figure 22 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Howell Bus Garage	National Median Building Type: Garage
Source Energy Use Intensity (kBtu/ft^2)	504.4	123.1
Site Energy Use Intensity (kBtu/ft^2)	349.8	78.8

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 23 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Howell Bus 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 24 – Summary of Recommended ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**784,232**	**57.1**	**0.0**	**$76,101.63**	**$189,677.90**	**$3,350.00**	**$186,327.90**	**2.4**	**789,716**
ECM 1	Install LED Fixtures	Yes	571,442	41.7	0.0	$55,452.56	$141,400.00	$0.00	$141,400.00	2.5	575,438
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	100,939	7.3	0.0	$9,795.11	$21,350.00	$1,900.00	$19,450.00	2.0	101,645
ECM 3	Retrofit Fixtures with LED Lamps	Yes	111,851	8.1	0.0	$10,853.97	$26,927.90	$1,450.00	$25,477.90	2.3	112,633
Lighting Control Measures			**25,019**	**1.8**	**0.0**	**$2,427.79**	**$7,794.00**	**$1,745.00**	**$6,049.00**	**2.5**	**25,194**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	13,985	1.0	0.0	$1,357.12	$6,794.00	$745.00	$6,049.00	4.5	14,083
ECM 5	Install High/Low Lighitng Controls	Yes	11,033	0.8	0.0	$1,070.67	$1,000.00	$1,000.00	$0.00	0.0	11,111
Motor Upgrades			**198,794**	**36.8**	**0.0**	**$19,290.94**	**$83,268.60**	**$0.00**	**$83,268.60**	**4.3**	**200,184**
ECM 6	Premium Efficiency Motors	Yes	198,794	36.8	0.0	$19,290.94	$83,268.60	$0.00	$83,268.60	4.3	200,184
Variable Frequency Drive (VFD) Measures			**500,771**	**101.5**	**0.0**	**$48,594.65**	**$137,837.68**	**$29,040.00**	**$108,797.68**	**2.2**	**504,273**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	Yes	454,597	97.9	0.0	$44,113.92	$120,137.15	$29,040.00	$91,097.15	2.1	457,776
ECM 8	Install VFDs on Hot Water Pumps	Yes	46,174	3.7	0.0	$4,480.72	$17,700.53	$0.00	$17,700.53	4.0	46,497
Electric Unitary HVAC Measures			**13,691**	**8.1**	**0.0**	**$1,328.57**	**$66,479.15**	**$0.00**	**$66,479.15**	**50.0**	**13,787**
	Install High Efficiency Electric AC	No	13,691	8.1	0.0	$1,328.57	$66,479.15	$0.00	$66,479.15	50.0	13,787
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**472.5**	**$5,160.71**	**$143,388.37**	**$0.00**	**$143,388.37**	**27.8**	**55,329**
ECM 9	Install High Efficiency Hot Water Boilers	Yes	0	0.0	472.5	$5,160.71	$143,388.37	$0.00	$143,388.37	27.8	55,329
HVAC System Improvements			**10,478**	**2.4**	**0.0**	**$1,016.77**	**$1,100.00**	**$250.00**	**$850.00**	**0.8**	**10,551**
ECM 10	Install Dual Enthalpy Outside Economizer Control	Yes	10,478	2.4	0.0	$1,016.77	$1,100.00	$250.00	$850.00	0.8	10,551
Domestic Water Heating Upgrade			**0**	**0.0**	**40.9**	**$447.04**	**$143.40**	**$0.00**	**$143.40**	**0.3**	**4,793**
ECM 11	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	40.9	$447.04	$143.40	$0.00	$143.40	0.3	4,793
Plug Load Equipment Control - Vending Machine			**3,163**	**0.0**	**0.0**	**$306.96**	**$690.00**	**$0.00**	**$690.00**	**2.2**	**3,185**
ECM 12	Vending Machine Control	Yes	3,163	0.0	0.0	$306.96	$690.00	$0.00	$690.00	2.2	3,185
TOTALS (ALL MEASURES)			**1,536,149**	**207.7**	**513.5**	**$154,675.06**	**$630,379.11**	**$34,385.00**	**$595,994.11**	**3.9**	**1,607,011**
TOTALS (RECOMMENDED ONLY MEASURES)			**1,522,458**	**199.6**	**513.5**	**$153,346.49**	**$563,899.96**	**$34,385.00**	**$529,514.96**	**3.5**	**1,593,225**

* - 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 25 below.

Figure 25 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**784,232**	**57.1**	**0.0**	**$76,101.63**	**$189,677.90**	**$3,350.00**	**$186,327.90**	**2.4**	**789,716**
ECM 1	Install LED Fixtures	571,442	41.7	0.0	$55,452.56	$141,400.00	$0.00	$141,400.00	2.5	575,438
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	100,939	7.3	0.0	$9,795.11	$21,350.00	$1,900.00	$19,450.00	2.0	101,645
ECM 3	Retrofit Fixtures with LED Lamps	111,851	8.1	0.0	$10,853.97	$26,927.90	$1,450.00	$25,477.90	2.3	112,633

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

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	564,060	40.7	0.0	$54,736.22	$136,850.00	$0.00	$136,850.00	2.5	568,004
Exterior	7,382	1.1	0.0	$716.34	$4,550.00	$0.00	$4,550.00	6.4	7,434

Measure Description

We recommend replacing existing fixtures containing high pressure sodium and induction sources 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 high pressure sodium sources.

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_2e Emissions Reduction (lbs)
Interior	100,939	7.3	0.0	$9,795.11	$21,350.00	$1,900.00	$19,450.00	2.0	101,645
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing T12 fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (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 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_2e Emissions Reduction (lbs)
Interior	111,233	8.0	0.0	$10,794.01	$26,502.90	$1,450.00	$25,052.90	2.3	112,011
Exterior	618	0.1	0.0	$59.95	$425.00	$0.00	$425.00	7.1	622

Measure Description

We recommend retrofitting existing T8 linear fluorescent and compact fluorescent 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.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 26 below.

Figure 26 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**25,019**	**1.8**	**0.0**	**$2,427.79**	**$7,794.00**	**$1,745.00**	**$6,049.00**	**2.5**	**25,194**
ECM 4	Install Occupancy Sensor Lighting Controls	13,985	1.0	0.0	$1,357.12	$6,794.00	$745.00	$6,049.00	4.5	14,083
ECM 5	Install High/Low Lighitng Controls	11,033	0.8	0.0	$1,070.67	$1,000.00	$1,000.00	$0.00	0.0	11,111

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_2e Emissions Reduction (lbs)
13,985	1.0	0.0	$1,357.12	$6,794.00	$745.00	$6,049.00	4.5	14,083

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in areas such as maintenance office, training room, locker rooms, etc. 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.

ECM 5: Install High/Low Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
11,033	0.8	0.0	$1,070.67	$1,000.00	$1,000.00	$0.00	0.0	11,111

Measure Description

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Typical areas for such lighting control are stairwells, interior corridors, parking lots, and parking garages.

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

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage needs to be provided to ensure that lights turn on in each area as an occupant approaches.

Additional savings from reduced lighting maintenance may also result from this measure, due to reduced lamp operation.

4.1.3 Motor Upgrades

Our recommendations for motor upgrade measures are summarized in Figure 27 below.

Figure 27 – Summary of Motor Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**198,794**	**36.8**	**0.0**	**$19,290.94**	**$83,268.60**	**$0.00**	**$83,268.60**	**4.3**	**200,184**
ECM 6	Premium Efficiency Motors	198,794	36.8	0.0	$19,290.94	$83,268.60	$0.00	$83,268.60	4.3	200,184

ECM 6: Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
198,794	36.8	0.0	$19,290.94	$83,268.60	$0.00	$83,268.60	4.3	200,184

Measure Description

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

4.1.4 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 28 below.

Figure 28 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**500,771**	**101.5**	**0.0**	**$48,594.65**	**$137,837.68**	**$29,040.00**	**$108,797.68**	**2.2**	**504,273**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	454,597	97.9	0.0	$44,113.92	$120,137.15	$29,040.00	$91,097.15	2.1	457,776
ECM 8	Install VFDs on Hot Water Pumps	46,174	3.7	0.0	$4,480.72	$17,700.53	$0.00	$17,700.53	4.0	46,497

ECM 7: Install VFDs on Constant Volume (CV) HVAC

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
454,597	97.9	0.0	$44,113.92	$120,137.15	$29,040.00	$91,097.15	2.1	457,776

Measure Description

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

ECM 8: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
46,174	3.7	0.0	$4,480.72	$17,700.53	$0.00	$17,700.53	4.0	46,497

Measure Description

We recommend installing variable frequency drives (VFD) to control a hot water pumps. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.5 Gas-Fired Heating System Replacements

Our recommendations for gas-fired heating system replacements are summarized in Figure 29 below.

Figure 29 - Summary of Gas-Fired Heating Replacement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**472.5**	**$5,160.71**	**$143,388.37**	**$0.00**	**$143,388.37**	**27.8**	**55,329**
ECM 9	Install High Efficiency Hot Water Boilers	0	0.0	472.5	$5,160.71	$143,388.37	$0.00	$143,388.37	27.8	55,329

ECM 9: Install High Efficiency Hot Water Boilers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	472.5	$5,160.71	$143,388.37	$0.00	$143,388.37	27.8	55,329

Measure Description

We recommend replacing older inefficient hot water boiler with high efficiency hot water boilers. Significant improvements have been made in combustion technology resulting in increased overall boiler efficiency. Energy savings results from improved combustion efficiency and reduced standby losses at low loads. This measure considers replacement of both boilers with a new boiler system. Boiler design should consider use of a modular approach and whether loops temperatures can be configured to where condensing boilers are cost effective. Notable efficiency improvements are witnessed even in non-condensing hydronic boilers that can achieve up to 85-90% efficiency under the proper conditions.

4.1.6 HVAC System Upgrades

Our recommendation for HVAC system improvement are summarized in Figure 30 below.

Figure 30 - Summary of HVAC System Improvement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**10,478**	**2.4**	**0.0**	**$1,016.77**	**$1,100.00**	**$250.00**	**$850.00**	**0.8**	**10,551**
ECM 10	Install Dual Enthalpy Outside Economizer Control	10,478	2.4	0.0	$1,016.77	$1,100.00	$250.00	$850.00	0.8	10,551

ECM 10: Install Dual-Enthalpy Economizers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
10,478	2.4	0.0	$1,016.77	$1,100.00	$250.00	$850.00	0.8	10,551

Measure Description

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

This measure is specific to the packaged AC unit that serves the office area and driver's lounge. Savings result from using outside air instead of mechanical cooling when outside air conditions permit.

4.1.7 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 31 below.

Figure 31 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**40.9**	**$447.04**	**$143.40**	**$0.00**	**$143.40**	**0.3**	**4,793**
ECM 11	Install Low-Flow Domestic Hot Water Devices	0	0.0	40.9	$447.04	$143.40	$0.00	$143.40	0.3	4,793

ECM 11: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	40.9	$447.04	$143.40	$0.00	$143.40	0.3	4,793

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators can reduce hot water usage, relative to standard 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.

4.1.8 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment controls are summarized in Figure 32 below.

Figure 32 - Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		**3,163**	**0.0**	**0.0**	**$306.96**	**$690.00**	**$0.00**	**$690.00**	**2.2**	**3,185**
ECM 12	Vending Machine Control	3,163	0.0	0.0	$306.96	$690.00	$0.00	$690.00	2.2	3,185

ECM 12: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
3,163	0.0	0.0	$306.96	$690.00	$0.00	$690.00	2.2	3,185

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.

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 33 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures	**13,691**	**8.1**	**0.0**	**$1,328.57**	**$66,479.15**	**$0.00**	**$66,479.15**	**50.0**	**13,787**
Install High Efficiency Electric AC	13,691	8.1	0.0	$1,328.57	$66,479.15	$0.00	$66,479.15	50.0	13,787
TOTALS	**13,691**	**8.1**	**0.0**	**$1,328.57**	**$66,479.15**	**$0.00**	**$66,479.15**	**50.0**	**13,787**

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

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

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
13,691	8.1	0.0	$1,328.57	$66,479.15	$0.00	$66,479.15	50.0	13,787

Measure Description

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

Reasons for not Recommending

The facility has relatively low hours of use for air conditioning units resulting in a long payback for the measure, more than the rated useful life of the replacement equipment. The measure is not recommended for implementation on the basis of 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.

Close Doors and Windows

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

Develop a Lighting Maintenance Schedule

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

Ensure Lighting Controls Are Operating Properly

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

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.

Install Destratification Fans

Allowing air to thermally stratify in spaces with high ceilings results in additional energy consumption by requiring the heating system to heat a volume of space much larger than the actual occupied space. Additional inefficiencies also occur because there are higher temperatures at the ceiling level than at the floor level. Higher temperatures at the ceiling accelerate heat loss through the roof, requiring additional energy consumption by the heating equipment in order to compensate for the accelerated heat transfer.

Destratification fans are specially designed to deliver a columnar, laminar flow of air balancing the air temperature from floor to ceiling. In addition to fuel savings, the use of destratification fans will reduce the recovery time necessary to warm the space after nightly temperature setbacks and will increase the comfort level of the occupants.

Clean and/or Replace HVAC Filters

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

Perform Proper Boiler Maintenance

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

Perform Proper 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.

Plug Load Controls

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

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 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.7 for any low-flow ECM recommendations.

6 On-Site Generation Measures

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

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

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

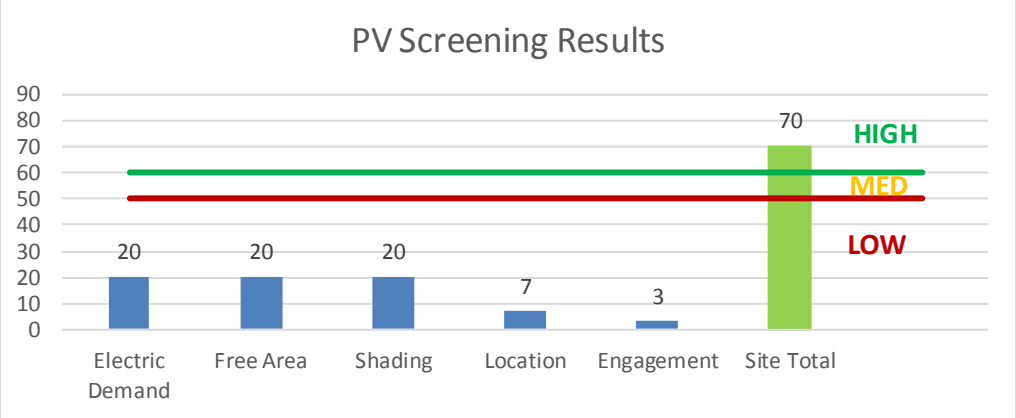
6.1 Photovoltaic

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

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

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the **high** potential for PV at the site. A PV array located on the roof of the building may be feasible. If Howell Bus Garage is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 34 - Photovoltaic Screening



Potential	High	
System Potential	561	kW DC STC
Electric Generation	668,359	kWh/yr
Displaced Cost	$58,150	/yr
Installed Cost	$2,333,800	

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.

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.

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 facility has a low potential for DR curtailment. Most of major load, ventilation, needs to be constant.

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

Figure 35 - 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	Install High/Low Lighitng Controls				X		
ECM 6	Premium Efficiency Motors				X		
ECM 7	Install VFDs on Constant Volume (CV) HVAC	X			X		
ECM 8	Install VFDs on Hot Water Pumps	X			X		
ECM 9	Install High Efficiency Hot Water Boilers	X			X		
ECM 10	Install Dual Enthalpy Outside Economizer Control				X		
ECM 11	Install Low-Flow Domestic Hot Water Devices				X		
ECM 12	Vending Machine Control	X			X		

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 Pay for Performance - Existing Buildings

Overview

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

Incentives

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

How to Participate

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

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

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

8.3 SREC Registration Program

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

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

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

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

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

8.4 Energy Savings Improvement Program

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

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

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

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

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

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

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Electrical Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.33	4,546	0.0	$441.18	$818.00	$140.00	1.54
Maintenance Shop	4	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	110	8,736	Relamp	Yes	4	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	6,115	0.16	2,166	0.0	$210.18	$710.00	$35.00	3.21
Maintenance Shop	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.38	5,304	0.0	$514.71	$1,359.00	$210.00	2.23
Stock Room	8	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	110	8,736	Relamp	Yes	8	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	6,115	0.31	4,332	0.0	$420.37	$1,150.00	$35.00	2.65
Stock Room	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stock Room	53	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	110	8,736	Relamp	Yes	53	LED - Linear Tubes: (2) 8' Lamps	High/Low Control	72	6,115	2.07	28,699	0.0	$2,784.95	$6,630.00	$1,855.00	1.71
Boiler Room	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.66	9,093	0.0	$882.35	$2,214.00	$345.00	2.12
Boiler Room	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Shop Floor	101	High-Pressure Sodium: (1) 250W Lamp	None	295	8,736	Fixture Replacement	No	101	LED - Fixtures: 103W LED	None	103	8,736	12.71	176,185	0.0	$17,096.91	$35,350.00	$0.00	2.07
Shop Floor	1	LED - Fixtures: High-Bay	Wall Switch	52	8,736	None	No	1	LED - Fixtures: High-Bay	Wall Switch	52	8,736	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Shop Floor Electrical Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.16	2,273	0.0	$220.59	$467.00	$80.00	1.75
Shop Floor Pits	114	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	8,736	Relamp & Reballast	No	114	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	4.41	61,109	0.0	$5,929.96	$13,338.00	$1,140.00	2.06
Men's Restroom	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.15	2,099	0.0	$203.66	$409.50	$70.00	1.67
Men's Restroom	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	8,736	0.08	1,054	0.0	$102.27	$252.80	$0.00	2.47
Locker Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.14	1,894	0.0	$183.82	$562.50	$85.00	2.60
Locker Room	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.15	2,121	0.0	$205.78	$649.20	$35.00	2.98
Locker Room	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	19	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	19	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	8,736	0.36	5,006	0.0	$485.79	$1,200.80	$0.00	2.47
Hallway	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen / Café	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.19	2,698	0.0	$261.85	$526.50	$90.00	1.67
Kitchen / Café	12	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	12	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	8,736	0.23	3,162	0.0	$306.81	$758.40	$0.00	2.47
File Storage	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	6,115	0.22	3,031	0.0	$294.12	$668.00	$360.00	1.05
Tool Carts	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.17	2,399	0.0	$232.76	$468.00	$80.00	1.67
Foreman's Office	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.15	2,121	0.0	$205.78	$495.20	$20.00	2.31
Foreman's Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.03	379	0.0	$36.76	$298.50	$10.00	7.85

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Bus Maintenance Office	5	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	5	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.13	1,767	0.0	$171.48	$432.00	$20.00	2.40
Bus Maintenance Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.03	379	0.0	$36.76	$298.50	$10.00	7.85
Washer	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.22	2,998	0.0	$290.94	$585.00	$100.00	1.67
Washer Area	11	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	8,736	Fixture Replacement	No	11	LED - Fixtures: 103W LED	Wall Switch	103	8,736	2.61	36,178	0.0	$3,510.72	$3,850.00	$0.00	1.10
Diesel Fuel Pump	34	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	295	8,736	Fixture Replacement	No	34	LED - Fixtures: 103W LED	Wall Switch	103	8,736	4.28	59,310	0.0	$5,755.40	$11,900.00	$0.00	2.07
Power Wash	28	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	8,736	Relamp & Reballast	No	28	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	1.08	15,009	0.0	$1,456.48	$3,276.00	$280.00	2.06
A - Bay	40	High-Pressure Sodium: (1) 150W Lamp	Wall Switch	188	8,736	Fixture Replacement	No	40	LED - Fixtures: 103W LED	Wall Switch	103	8,736	2.23	30,890	0.0	$2,997.60	$14,000.00	$0.00	4.67
B - Bay	40	High-Pressure Sodium: (1) 150W Lamp	Wall Switch	188	8,736	Fixture Replacement	No	40	LED - Fixtures: 103W LED	Wall Switch	103	8,736	2.23	30,890	0.0	$2,997.60	$14,000.00	$0.00	4.67
C - Bay	40	High-Pressure Sodium: (1) 150W Lamp	Wall Switch	188	8,736	Fixture Replacement	No	40	LED - Fixtures: 103W LED	Wall Switch	103	8,736	2.23	30,890	0.0	$2,997.60	$14,000.00	$0.00	4.67
D - Bay	40	High-Pressure Sodium: (1) 150W Lamp	Wall Switch	188	8,736	Fixture Replacement	No	40	LED - Fixtures: 103W LED	Wall Switch	103	8,736	2.23	30,890	0.0	$2,997.60	$14,000.00	$0.00	4.67
Runway (A)	11	High-Pressure Sodium: (1) 150W Lamp	Wall Switch	188	8,736	Fixture Replacement	No	11	LED - Fixtures: 103W LED	Wall Switch	103	8,736	0.61	8,495	0.0	$824.34	$3,850.00	$0.00	4.67
Runway (B, C, D)	22	LED - Fixtures: High-Bay	Wall Switch	52	8,736	None	No	22	LED - Fixtures: High-Bay	Wall Switch	52	8,736	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Runway (B, C, D)	33	High-Pressure Sodium: (1) 150W Lamp	Wall Switch	188	8,736	Fixture Replacement	No	33	LED - Fixtures: 103W LED	Wall Switch	103	8,736	1.84	25,485	0.0	$2,473.02	$11,550.00	$0.00	4.67
CNG Fueling	15	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	8,736	Fixture Replacement	No	15	LED - Fixtures: 103W LED	Wall Switch	103	8,736	3.56	49,334	0.0	$4,787.35	$5,250.00	$0.00	1.10
Dyno Area	12	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	8,736	Fixture Replacement	No	12	LED - Fixtures: 103W LED	Wall Switch	103	8,736	2.85	39,467	0.0	$3,829.88	$4,200.00	$0.00	1.10
Dyno Area	18	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	8,736	Relamp & Reballast	No	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.70	9,649	0.0	$936.31	$2,106.00	$180.00	2.06
Tire Area	14	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	8,736	Fixture Replacement	No	14	LED - Fixtures: 103W LED	Wall Switch	103	8,736	3.32	46,045	0.0	$4,468.19	$4,900.00	$0.00	1.10
Paint Room	20	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Wall Switch	127	8,736	Relamp & Reballast	No	20	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	8,736	1.09	15,173	0.0	$1,472.35	$2,630.00	$300.00	1.58
Shop	11	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	11	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Training Room	12	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	12	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.31	4,241	0.0	$411.55	$1,298.40	$70.00	2.98
Driver's Lounge	60	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	60	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	8,736	1.14	15,809	0.0	$1,534.07	$3,792.00	$0.00	2.47
Driver's Lounge	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Driver's Lounge	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.39	5,397	0.0	$523.70	$1,053.00	$180.00	1.67
Locker Room	10	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	10	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	8,736	0.19	2,635	0.0	$255.68	$632.00	$0.00	2.47
Break Room	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	8	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	8,736	0.15	2,108	0.0	$204.54	$505.60	$0.00	2.47

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Break Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.06	899	0.0	$87.28	$175.50	$30.00	1.67
Private Office	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.10	1,414	0.0	$137.18	$522.80	$35.00	3.56
Driver HR Office	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.30	4,167	0.0	$404.41	$1,183.50	$180.00	2.48
Driver HR Office	10	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.25	3,534	0.0	$342.96	$1,172.00	$70.00	3.21
P&G Office	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.15	2,121	0.0	$205.78	$649.20	$35.00	2.98
Super's Office	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.05	707	0.0	$68.59	$366.40	$0.00	5.34
Super's Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.05	758	0.0	$73.53	$357.00	$20.00	4.58
Garage Manager's Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,115	0.11	1,515	0.0	$147.06	$504.00	$75.00	2.92
Garage Manager's Office	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.05	707	0.0	$68.59	$366.40	$0.00	5.34
Storage	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	6,115	0.15	2,121	0.0	$205.78	$649.20	$35.00	2.98
Restrooms (2)	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,736	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.04	600	0.0	$58.19	$117.00	$20.00	1.67
Restrooms (2)	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Building Exterior	5	High-Pressure Sodium: (1) 150W Lamp	Daylight Dimming	188	4,368	Fixture Replacement	No	5	LED - Fixtures: 103W LED	Daylight Dimming	103	4,368	0.28	1,931	0.0	$187.35	$1,750.00	$0.00	9.34
Building Exterior Cluster Pole Lights	2	Halogen Incandescent: Induction Lamp	Daylight Dimming	1,000	4,368	Fixture Replacement	No	2	LED - Fixtures: 400W LED	Daylight Dimming	400	4,368	0.79	5,451	0.0	$528.99	$2,800.00	$0.00	5.29
Building Exterior	17	Compact Fluorescent: 23W CFL	Daylight Dimming	23	4,368	Relamp	No	17	LED - Fixtures: 15W LED	Daylight Dimming	15	4,368	0.09	618	0.0	$59.95	$425.00	$0.00	7.09
Building Exterior Pole Lights	13	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	150	4,368	None	No	13	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	150	4,368	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Building Exterior Pole Lights	5	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	150	4,368	None	No	5	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	150	4,368	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Shop Floor	Shop Equipment	1	Other	1.0	75.0%	No	2,745	No	75.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Shop Floor	Shop Equipment	5	Other	5.0	81.0%	No	2,745	No	81.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Shop Floor	Shop Equipment	1	Other	1.0	86.0%	No	2,745	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Air Compressor	1	Air Compressor	75.0	86.0%	Yes	4,957	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Air Compressor	1	Process Fan	5.0	86.0%	No	4,957	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Air Compressor	1	Air Compressor	100.0	86.0%	Yes	4,957	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Air Compressor	1	Process Fan	5.0	86.0%	No	2,745	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Refrigerated Air Dryer	1	Other	7.5	86.0%	No	3,391	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Air Compressor	2	Air Compressor	5.0	89.5%	No	4,957	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Refrigerated Air Dryer	1	Other	0.8	76.0%	No	2,745	No	76.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Heating System	3	Heating Hot Water Pump	3.0	84.0%	No	4,380	Yes	89.5%	Yes	3	1.38	15,745	0.0	$1,527.90	$11,437.47	$0.00	7.49
Boiler Room	Heating System	1	Heating Hot Water Pump	0.8	86.0%	No	4,380	Yes	81.1%	Yes	1	0.08	1,198	0.0	$116.28	$2,879.70	$0.00	24.77
Boiler Room	Heating System	1	Heating Hot Water Pump	20.0	86.0%	No	4,380	Yes	93.0%	Yes	1	3.07	34,427	0.0	$3,340.82	$8,850.23	$0.00	2.65
Boiler Room	Boilers	1	Combustion Air Fan	3.0	86.0%	No	4,380	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Boilers	1	Combustion Air Fan	3.0	86.0%	No	4,380	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Shop Floor	Hydrolic Lift	8	Process Pump	7.5	87.0%	No	1,460	No	87.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Driver's lounge, offices	1	Supply Fan	10.0	86.0%	No	6,132	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Driver's lounge, offices	1	Process Blower	3.0	86.0%	No	6,132	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Driver's lounge, offices	2	Process Fan	0.8	86.0%	No	6,132	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Driver's lounge, offices	1	Process Blower	15.0	86.0%	No	6,132	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Whole Building	1	Exhaust Fan	15.0	86.0%	No	6,132	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pump Room	Wash Area	2	Other	40.0	91.0%	No	4,067	Yes	94.1%	No		1.20	6,590	0.0	$639.51	$8,413.80	$0.00	13.16
Pump Room	Wash Area	1	Process Pump	10.0	80.0%	No	3,391	Yes	91.7%	No		0.66	3,026	0.0	$293.63	$1,567.05	$0.00	5.34
Pump Room	Wash Area	2	Water Supply Pump	7.5	86.5%	No	3,391	Yes	89.5%	No		0.24	1,103	0.0	$107.02	$2,106.81	$0.00	19.69
Pump Room	Wash Area	2	Process Pump	7.5	87.5%	No	3,391	Yes	89.5%	No		0.16	727	0.0	$70.53	$2,106.81	$0.00	29.87
Rooftop	HV 1-1, HV1-2	2	Supply Fan	20.0	80.0%	No	4,380	Yes	93.0%	Yes	2	13.39	65,481	0.0	$6,354.29	$17,700.46	$3,200.00	2.28
Rooftop	HV 1-3, HV 1-4	2	Supply Fan	25.0	80.0%	No	4,380	Yes	93.6%	Yes	2	16.77	82,211	0.0	$7,977.69	$22,942.06	$4,000.00	2.37
Rooftop	HV 1-5, HV 1-6, HV 1-7, HV 1-8	4	Supply Fan	20.0	80.0%	No	4,380	Yes	93.0%	Yes	4	26.77	130,963	0.0	$12,708.57	$35,400.92	$6,400.00	2.28
Rooftop	HV 1-9	1	Supply Fan	10.0	80.0%	No	4,380	Yes	91.7%	Yes	1	3.33	16,212	0.0	$1,573.17	$5,375.00	$800.00	2.91
Rooftop	HVE 2-1, HVE 2-2	2	Supply Fan	15.0	80.0%	No	4,380	Yes	92.4%	Yes	2	10.01	48,893	0.0	$4,744.54	$14,171.74	$2,400.00	2.48
Rooftop	HV 2-3	1	Supply Fan	3.0	80.0%	No	4,380	Yes	89.5%	Yes	1	0.99	4,780	0.0	$463.82	$3,812.49	$240.00	7.70
Rooftop	HV 3, HV 4	2	Supply Fan	7.5	80.0%	No	4,380	Yes	91.7%	Yes	2	4.99	24,317	0.0	$2,359.75	$9,521.18	$1,200.00	3.53
Rooftop	HVE 5	1	Supply Fan	10.0	80.0%	No	4,380	Yes	91.7%	Yes	1	3.33	16,212	0.0	$1,573.17	$5,375.00	$800.00	2.91
Rooftop	HV 6	1	Supply Fan	15.0	80.0%	No	4,380	Yes	92.4%	Yes	1	5.01	24,446	0.0	$2,372.27	$7,085.87	$1,200.00	2.48
Rooftop	HVE 6 (Supply)	1	Supply Fan	40.0	80.0%	No	4,380	Yes	94.1%	Yes	1	13.45	66,005	0.0	$6,405.10	$13,572.95	$3,200.00	1.62
Rooftop	HVE 6 (Return)	1	Return Fan	20.0	80.0%	No	4,380	Yes	93.0%	Yes	1	6.69	32,741	0.0	$3,177.14	$8,850.23	$1,600.00	2.28
Rooftop	HVE4	1	Supply Fan	15.0	80.0%	No	4,380	Yes	92.4%	Yes	1	5.01	24,446	0.0	$2,372.27	$7,085.87	$1,200.00	2.48
Rooftop	HVE3	1	Supply Fan	10.0	80.0%	No	4,380	Yes	91.7%	Yes	1	3.33	16,212	0.0	$1,573.17	$5,375.00	$800.00	2.91
Rooftop	HV 5	1	Supply Fan	25.0	80.0%	No	4,380	Yes	93.6%	Yes	1	8.39	41,105	0.0	$3,988.84	$11,471.03	$2,000.00	2.37
Celing Mounted	Shop Floor Unit Heaters	20	Supply Fan	0.5	80.0%	No	2,745	No	80.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Exhaust Fan	Bus Storage Bay A	1	Exhaust Fan	5.0	70.0%	No	2,745	Yes	89.5%	No		0.64	2,390	0.0	$231.94	$1,229.49	$0.00	5.30
Exhaust Fan	Bus Storage Bay B	1	Exhaust Fan	5.0	70.0%	No	2,745	Yes	89.5%	No		0.64	2,390	0.0	$231.94	$1,229.49	$0.00	5.30
Exhaust Fan	Bus Storage Bay C	1	Exhaust Fan	10.0	70.0%	No	3,391	Yes	91.0%	No		1.36	6,255	0.0	$606.96	$1,977.64	$0.00	3.26
Exhaust Fan	Bus Storage Bay A	1	Exhaust Fan	5.0	70.0%	No	2,745	Yes	89.5%	No		0.64	2,390	0.0	$231.94	$1,229.49	$0.00	5.30
Exhaust Fan	Bus Storage Bay B	1	Exhaust Fan	5.0	70.0%	No	2,745	Yes	89.5%	No		0.64	2,390	0.0	$231.94	$1,229.49	$0.00	5.30
Exhaust Fan	Bus Storage Bay C	1	Exhaust Fan	10.0	70.0%	No	3,391	Yes	91.0%	No		1.36	6,255	0.0	$606.96	$1,977.64	$0.00	3.26
Exhaust Fan	Bus Storage Bay A	1	Exhaust Fan	5.0	70.0%	No	2,745	Yes	89.5%	No		0.64	2,390	0.0	$231.94	$1,229.49	$0.00	5.30
Exhaust Fan	Bus Storage Bay B	1	Exhaust Fan	5.0	70.0%	No	2,745	Yes	89.5%	No		0.64	2,390	0.0	$231.94	$1,229.49	$0.00	5.30
Exhaust Fan	Bus Storage Bay C	1	Exhaust Fan	10.0	70.0%	No	3,391	Yes	91.0%	No		1.36	6,255	0.0	$606.96	$1,977.64	$0.00	3.26
Exhaust Fan	Shop Floor	1	Exhaust Fan	15.0	70.0%	No	3,391	Yes	91.7%	No		2.10	9,621	0.0	$933.60	$2,694.76	$0.00	2.89

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Driver's lounge, offices	1	Packaged AC	30.00		Yes	1	Packaged AC	30.00		9.50		Yes	10.47	24,169	0.0	$2,345.35	$67,579.15	$250.00	28.71
Roof	Driver's lounge, offices	1	Packaged AC	0.80		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Driver's lounge, offices	1	Split-System AC	0.78		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Driver's lounge, offices	1	Packaged AC	4.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Whole Building	1	Non-Condensing Hot Water Boiler	4,184.00	Yes	1	Non-Condensing Hot Water Boiler	4,184.00	85.00%	Ec	0.00	0	472.5	$5,160.71	$71,694.19	$0.00	13.89
Boiler Room	Whole Building	1	Non-Condensing Hot Water Boiler	4,184.00	Yes	1	Non-Condensing Hot Water Boiler	4,184.00	85.00%	Ec	0.00	0	0.0	$0.00	$71,694.19	$0.00	0.00
Roof	Whole Building	2	Furnace	1,250.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Whole Building	2	Furnace	3,025.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Whole Building	4	Furnace	2,200.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Whole Building	1	Furnace	650.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Whole Building	2	Furnace	1,250.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Whole Building	1	Furnace	380.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Whole Building	2	Furnace	1,000.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Whole Building	1	Furnace	2,000.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Whole Building	1	Furnace	1,200.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Whole Building	1	Furnace	3,087.30	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Whole Building	1	Furnace	1,250.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Whole Building	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

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	20	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	40.9	$447.04	$143.40	$0.00	0.32

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Whole Building	21	Desktop Computers	150.0	No
Whole Building	1	Small Printer	20.0	No
Whole Building	5	Medium Printer	60.0	Yes
Whole Building	2	Large Printer	100.0	Yes
Whole Building	8	Microwave	1,000.0	No
Whole Building	1	Medium Refrigerator	153.0	No
Whole Building	3	Large Refrigerator w/ freezer	172.0	Yes
Whole Building	3	Coffee Machine	900.0	No
Whole Building	2	Toaster	850.0	No
Whole Building	1	Dishwasher	800.0	No
Whole Building	1	CRT TV	80.0	No
Whole Building	3	Plasma TV	120.0	No
Whole Building	2	LCD TV	100.0	Yes
Whole Building	1	LED TV	80.0	Yes
Whole Building	1	Hot/Cold Water Dispenser	500.0	No
Whole Building	21	Space Heaters	1,500.0	No

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
Break Room	1	Refrigerated	Yes	0.00	1,612	0.0	$156.41	$230.00	$0.00	1.47
Break Room	1	Non-Refrigerated	Yes	0.00	343	0.0	$33.24	$230.00	$0.00	6.92
Break Room	1	Glass Fronted Refrigerated	Yes	0.00	1,209	0.0	$117.31	$230.00	$0.00	1.96

Appendix B: ENERGY STAR® Statement of Energy Performance

There is no Statement of Energy Performance (SEP) for this property based on the applicant's request. NJ Transit is working with a 3rd party utility manager to update their web-based platform to include dashboard metrics for each individual building account which can track EUIs over time and other key energy metrics.