Local Government Energy Audit:
Energy Audit Report

Hamilton Bus Garage

600 Sloan Ave

Hamilton, NJ 08619

NJ Transit

August 22, 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.

Table of Contents

Table of Figures

1 EXECUTIVE SUMMARY

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

Hamilton Bus Garage is a 141,000 square foot facility constructed in 1998. The building is a one story commercial facility including bus maintenance areas, maintenance offices, bus bays, hallways, and locker/rest room areas.

Lighting at the facility consists mainly of LED linear lamp fixtures. LED fixtures include a combination of linear 2-foot and 4-foot lamps. In addition to the LED fixtures, the facility also has a few linear fluorescent fixtures with 32-Watt T8 linear fluorescent lamps. Several shop areas are illuminated by HID sources including metal halide and high pressure sodium lamps. All the exit signs are LED fixtures. Interior lighting control is primarily provided manual switches. Exterior lighting is provided by metal halide fixtures. Exterior fixture control is provided by photocells.

Heating, ventilation, and cooling is provided by a variety of gas fired heating ventilating (HV) units and package air conditioning (AC). A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated nine measures and recommended eight measures which together represent an opportunity for Hamilton Bus Garage to reduce annual energy costs by roughly $109,495 and annual greenhouse gas emissions by 1,189,583 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 6.6 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 Hamilton Bus Garage's annual energy use by 17%.

Figure 1 – Previous 12 Month Utility Costs

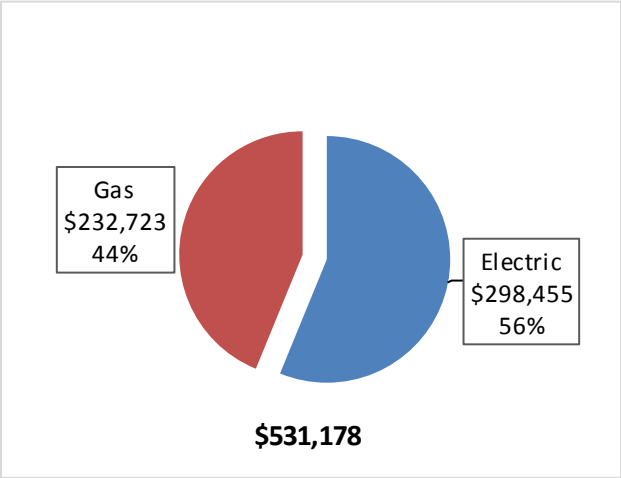
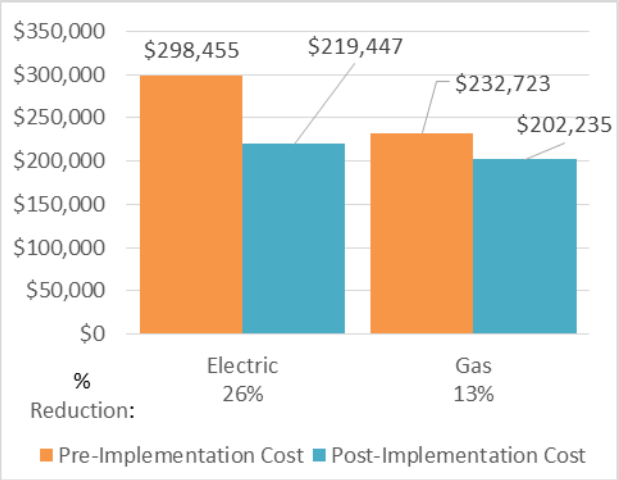


Figure 2 – Potential Post-Implementation Costs



A detailed description of Hamilton 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 Natural Gas Savings (MMBtu)	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			**608,626**	**67.0**	**0.0**	**0.0**	**$63,295.42**	**$482,388.29**	**$35,230.00**	**$447,158.29**	**7.1**	**612,881**
ECM 1	Install LED Fixtures	Yes	606,473	66.8	0.0	0.0	$63,071.55	$481,646.97	$35,200.00	$446,446.97	7.1	610,714
ECM 2	Retrofit Fixtures with LED Lamps	Yes	2,153	0.2	0.0	0.0	$223.87	$741.32	$30.00	$711.32	3.2	2,168
Lighting Control Measures			**75,201**	**8.1**	**0.0**	**0.0**	**$7,820.65**	**$70,112.00**	**$10,750.00**	**$59,362.00**	**7.6**	**75,726**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	75,201	8.1	0.0	0.0	$7,820.65	$70,112.00	$10,750.00	$59,362.00	7.6	75,726
Motor Upgrades			**31,941**	**5.0**	**0.0**	**0.0**	**$3,321.75**	**$21,629.65**	**$0.00**	**$21,629.65**	**6.5**	**32,164**
ECM 4	Premium Efficiency Motors	Yes	31,941	5.0	0.0	0.0	$3,321.75	$21,629.65	$0.00	$21,629.65	6.5	32,164
Variable Frequency Drive (VFD) Measures			**40,774**	**9.7**	**0.0**	**0.0**	**$4,240.40**	**$29,424.85**	**$5,960.00**	**$23,464.85**	**5.5**	**41,059**
ECM 5	Install VFDs on Constant Volume (CV) HVAC	Yes	40,774	9.7	0.0	0.0	$4,240.40	$29,424.85	$5,960.00	$23,464.85	5.5	41,059
Electric Unitary HVAC Measures			**2,101**	**1.2**	**0.0**	**0.0**	**$218.47**	**$32,474.65**	**$1,321.20**	**$31,153.45**	**142.6**	**2,115**
	Install High Efficiency Electric AC	No	2,101	1.2	0.0	0.0	$218.47	$32,474.65	$1,321.20	$31,153.45	142.6	2,115
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**3,601.3**	**3,601.3**	**$30,280.01**	**$177,751.31**	**$2,800.00**	**$174,951.31**	**5.8**	**421,666**
ECM 6	Install High Efficiency Furnaces	Yes	0	0.0	3,601.3	3,601.3	$30,280.01	$177,751.31	$2,800.00	$174,951.31	5.8	421,666
Domestic Water Heating Upgrade			**0**	**0.0**	**24.8**	**24.8**	**$208.26**	**$443.24**	**$0.00**	**$443.24**	**2.1**	**2,900**
ECM 7	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	24.8	24.8	$208.26	$443.24	$0.00	$443.24	2.1	2,900
Plug Load Equipment Control - Vending Machine			**3,163**	**0.0**	**0.0**	**0.0**	**$328.97**	**$690.00**	**$0.00**	**$690.00**	**2.1**	**3,185**
ECM 8	Vending Machine Control	Yes	3,163	0.0	0.0	0.0	$328.97	$690.00	$0.00	$690.00	2.1	3,185
TOTALS OF ALL RECOMMENDED MEASURES			**759,704**	**89.8**	**3,626.1**	**3,626.1**	**$109,495.45**	**$782,439.35**	**$54,740.00**	**$727,699.35**	**6.6**	**1,189,583**
TOTALS OF ALL EVALUATED MEASURES			**761,805**	**91.1**	**3,626.1**	**3,626.1**	**$109,713.92**	**$814,914.00**	**$56,061.20**	**$758,852.80**	**6.9**	**1,191,698**

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

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

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

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

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

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

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

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

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

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 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 Hamilton Bus Garage include:

- Perform Routine Motor Maintenance
- Install Destratification Fans
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Perform Proper Furnace Maintenance
- Perform Proper Water Heater Maintenance
- Perform Maintenance on Compressed Air Systems
- Install Plug Load Controls
- Water Conservation

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

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Hamilton 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	350	kW DC STC
Electric Generation	416,980	kWh/yr
Displaced Cost	$36,280	/yr
Installed Cost	$1,365,000	

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 and Sustainability	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 14, 2017, TRC performed an energy audit at Hamilton Bus Garage located in Hamilton, New Jersey. TRC's team met with Steven Jenks to review the facility operations and help focus our investigation on specific energy-using systems.

Hamilton Bus Garage is a 141,000 square foot facility constructed in the year 1998. The building is a one story commercial facility including bus maintenance areas, 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
Hamilton Bus Garage	Weekday	12:00AM to 12:00AM
Hamilton Bus Garage	Weekend	12:00AM to 12:00AM

2.4 Building Envelope

Hamilton Bus Garage is a one story building. The construction is of concrete masonry block with concrete finish 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

Hamilton 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 equipment.

Lighting System

Lighting consists mainly of LED fixtures. Interior LED fixtures have linear lamps with lengths varying between 2- and 8-foot. Fixtures have 2-lamp, 3-lamp, and 4-lamp configurations. In addition to the LED fixtures, the facility also has a few linear fluorescent fixtures with 32-Watt T8 linear fluorescent lamps. The facility also has a significant quantity of 150-Watt and 250-Watt HPS and metal halide fixtures primarily in the shop areas and wash areas. All the exit signs are LED fixtures. Interior lighting control is provided primarily with manual switches.

Exterior lighting is provided by 250-Watt metal halide fixtures which are controlled by photocells.

Figure 8 - Building Lighting Systems

Linear LED Fixtures	*Exterior Fixtures*
	

Heating Ventilation and Unit Heater Systems

The facility has several natural gas fired rooftop heating ventilation (HV) units. The HV units operate using 100% outside air and are predominantly used in high bay areas and maintenance spaces with high outside air (ventilation) requirements. The gas fired furnaces at Hamilton bus garage have capacities between 1,936 MBH and 2,629 MBH with operating efficiencies of approximately 80% on average. Four packaged AC units equipped with small gas fired furnace sections provide heat for the office areas.

Figure 9 – Air Side Heating System

Heating Ventilation Unit	*HV Unit Nameplate*
	

Direct Expansion Air Conditioning System (DX)

Selected areas of the facility such as offices, locker rooms, and lounge space are served by rooftop package units. The package unit has a capacities range between 2-ton and 6-ton includes an outside air economizing section.

Figure 10 – Direct Expansion AC System

Rooftop Package Unit	*Package Unit Nameplate*
	

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of one Bradford White gas fired hot water heater with an input rating of 400 kBtu/hr and a nominal efficiency of 80%. The water heater has a 100 gallon storage tank.

Figure 11 – Domestic Hot Water System

Domestic Hot Water Heater	*Water Heater Nameplate*
	

Building Plug Load

The facility has several types of process equipment used for bus maintenance and repairs. This includes two air compressors each having a capacity of 80 hp. Notably, both large air compressors are equipped with variable speed drive and controls that provide the means for reduced energy use when operating at part load.

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

Figure 12 – Process Equipment

Air Compressor	*Air Dryer*
	

2.7 Water-Using Systems

The facility has three faucet aerators with a flow capacity of 1.5 gallons per minute (gpm), nine faucet aerators of 2.5 gpm, and four showerheads of 2.5 gpm flow capacity each. Significant water use is attributed to cleaning and other process tasks.

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

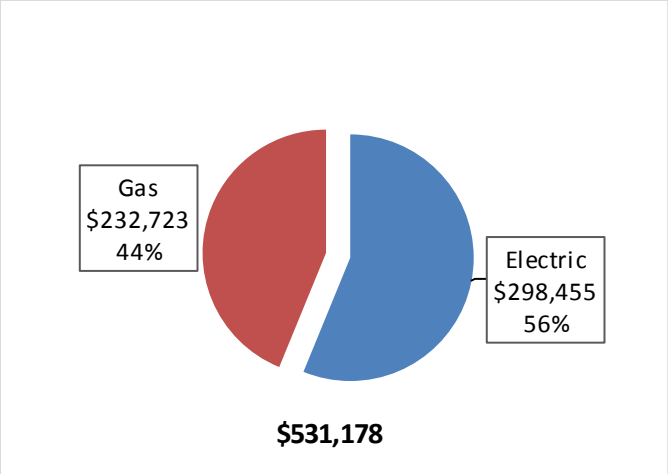
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 13 - Utility Summary

Utility Summary for Hamilton Bus Garage		
Fuel	**Usage**	**Cost**
Electricity	2,869,831 kWh	$298,455
Natural Gas	276,785 Therms	$232,723
Total		**$531,178**

The current annual energy cost for this facility is $531,178 as shown in the chart below.

Figure 14 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was $0.104/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 15 - Electric Usage & Demand

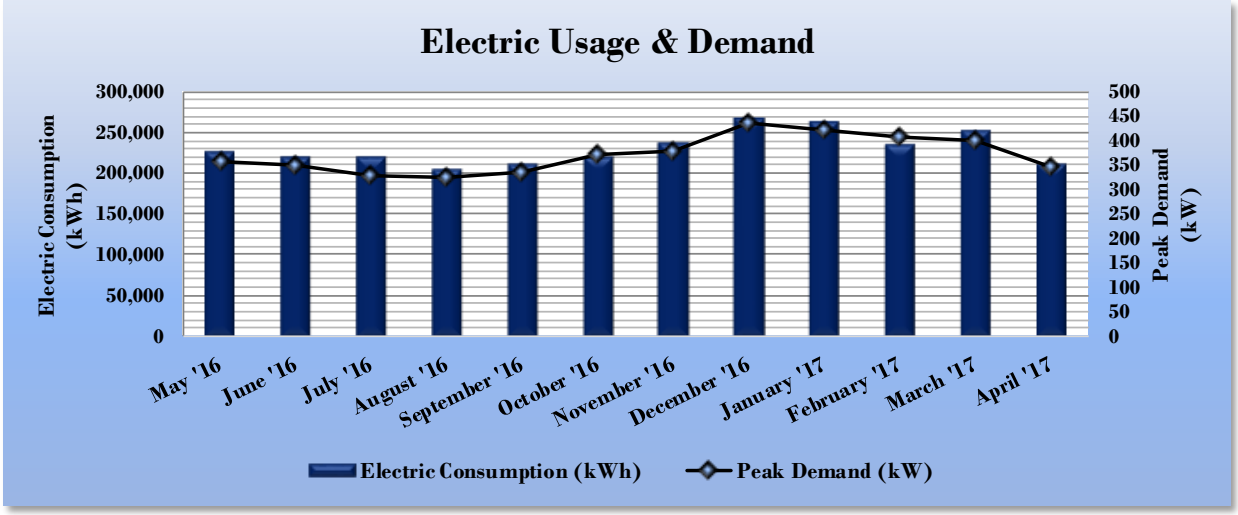


Figure 16 - Electric Usage & Demand

Electric Billing Data for Hamilton Bus Garage					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
5/31/16	30	227,234	357	$0	$22,819
6/30/16	29	220,749	351	$0	$25,196
7/31/16	30	220,041	328	$0	$24,900
8/31/16	30	204,858	325	$0	$23,395
9/30/16	29	211,603	334	$0	$24,257
10/31/16	30	220,529	372	$0	$21,723
11/30/16	29	237,918	378	$0	$23,320
12/31/16	30	267,446	435	$0	$26,651
1/31/17	30	262,986	422	$0	$26,188
2/28/17	27	236,404	409	$0	$23,696
3/31/17	30	252,862	402	$0	$25,200
4/30/17	29	212,850	345	$0	$21,295
Totals	**353**	**2,775,480**	**435.2**	**$0**	**$288,642**
Annual	**365**	**2,869,831**	**435.2**	**$0**	**$298,455**

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.841/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 17 - Natural Gas Usage

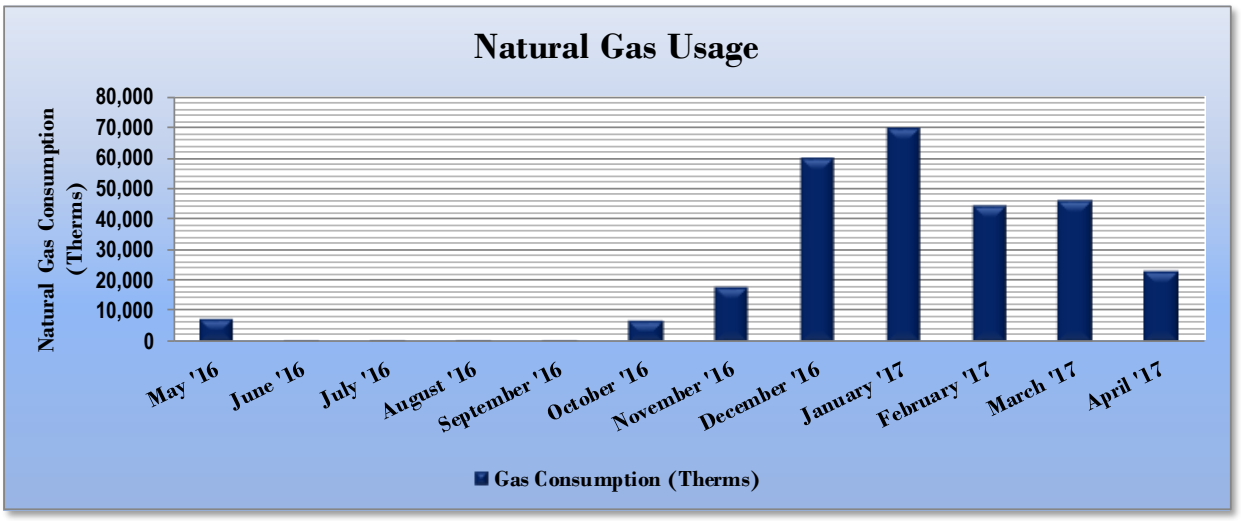


Figure 18 - Natural Gas Usage

Gas Billing Data for Hamilton Bus Garage				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
5/19/16	29	7,414	$4,231	No
6/19/16	31	256	$250	Yes
7/20/16	31	256	$250	Yes
8/18/16	29	16	$116	No
9/19/16	32	735	$519	No
10/18/16	29	7,314	$4,208	No
11/16/16	29	17,886	$21,125	No
12/19/16	33	60,105	$49,682	No
1/21/17	33	69,507	$56,145	No
2/17/17	27	44,747	$38,158	No
3/21/17	32	46,225	$39,154	No
4/21/17	31	23,084	$19,522	No
Totals	**366**	**277,543**	**$233,361**	2
Annual	**365**	**276,785**	**$232,723**	

3.4 Benchmarking

The 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 19 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Hamilton Bus Garage	National Median Building Type: Garage
Source Energy Use Intensity (kBtu/ft^2)	424.2	123.1
Site Energy Use Intensity (kBtu/ft^2)	265.7	78.8

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

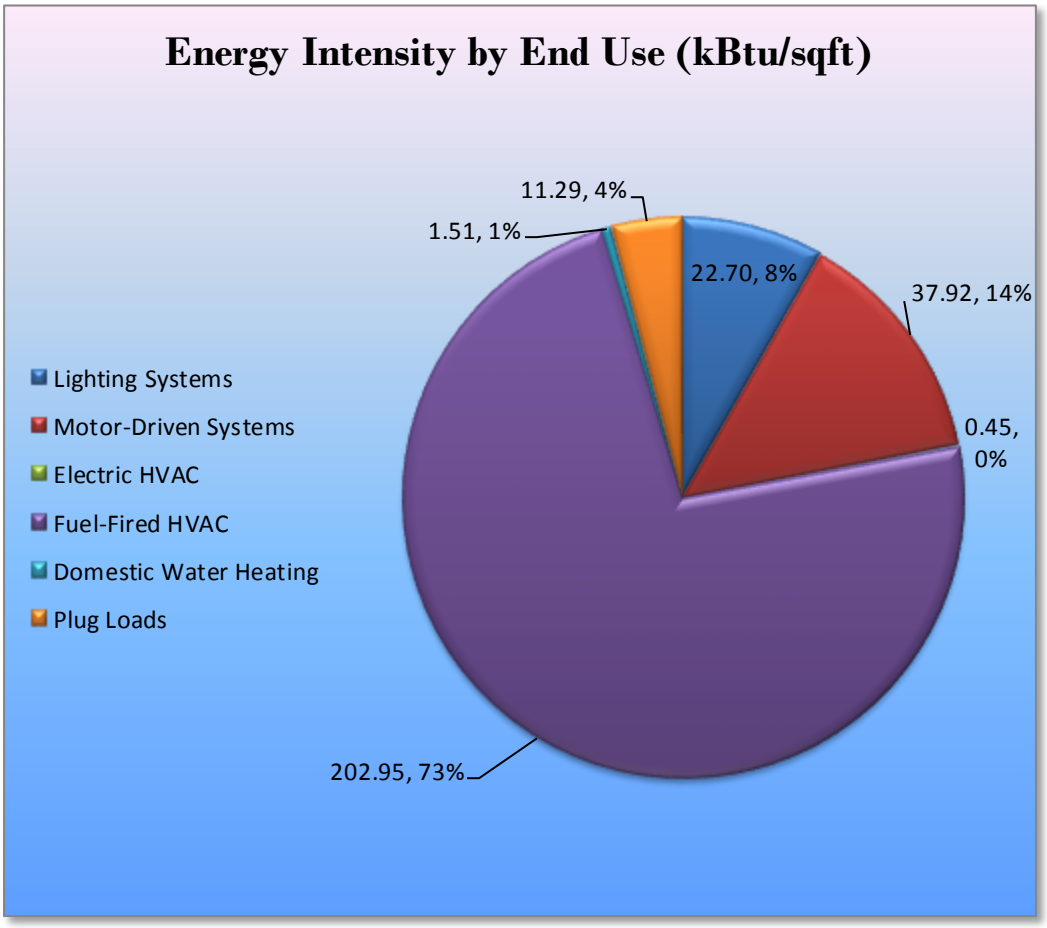
Figure 20 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Hamilton Bus Garage	National Median Building Type: Garage
Source Energy Use Intensity (kBtu/ft^2)	339.4	123.1
Site Energy Use Intensity (kBtu/ft^2)	221.6	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 21 - 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 Hamilton 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 22 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**608,626**	**67.0**	**0.0**	**$63,295.42**	**$482,388.29**	**$35,230.00**	**$447,158.29**	**7.1**	**612,881**
ECM 1	Install LED Fixtures	606,473	66.8	0.0	$63,071.55	$481,646.97	$35,200.00	$446,446.97	7.1	610,714
ECM 2	Retrofit Fixtures with LED Lamps	2,153	0.2	0.0	$223.87	$741.32	$30.00	$711.32	3.2	2,168
Lighting Control Measures		**75,201**	**8.1**	**0.0**	**$7,820.65**	**$70,112.00**	**$10,750.00**	**$59,362.00**	**7.6**	**75,726**
ECM 3	Install Occupancy Sensor Lighting Controls	75,201	8.1	0.0	$7,820.65	$70,112.00	$10,750.00	$59,362.00	7.6	75,726
Motor Upgrades		**31,941**	**5.0**	**0.0**	**$3,321.75**	**$21,629.65**	**$0.00**	**$21,629.65**	**6.5**	**32,164**
ECM 4	Premium Efficiency Motors	31,941	5.0	0.0	$3,321.75	$21,629.65	$0.00	$21,629.65	6.5	32,164
Variable Frequency Drive (VFD) Measures		**40,774**	**9.7**	**0.0**	**$4,240.40**	**$29,424.85**	**$5,960.00**	**$23,464.85**	**5.5**	**41,059**
ECM 5	Install VFDs on Constant Volume (CV) HVAC	40,774	9.7	0.0	$4,240.40	$29,424.85	$5,960.00	$23,464.85	5.5	41,059
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**3,601.3**	**$30,280.01**	**$177,751.31**	**$2,800.00**	**$174,951.31**	**5.8**	**421,666**
ECM 6	Install High Efficiency Furnaces	0	0.0	3,601.3	$30,280.01	$177,751.31	$2,800.00	$174,951.31	5.8	421,666
Domestic Water Heating Upgrade		**0**	**0.0**	**24.8**	**$208.26**	**$443.24**	**$0.00**	**$443.24**	**2.1**	**2,900**
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	24.8	$208.26	$443.24	$0.00	$443.24	2.1	2,900
Plug Load Equipment Control - Vending Machine		**3,163**	**0.0**	**0.0**	**$328.97**	**$690.00**	**$0.00**	**$690.00**	**2.1**	**3,185**
ECM 8	Vending Machine Control	3,163	0.0	0.0	$328.97	$690.00	$0.00	$690.00	2.1	3,185
TOTALS		**759,704**	**89.8**	**3,626.1**	**$109,495.45**	**$782,439.35**	**$54,740.00**	**$727,699.35**	**6.6**	**1,189,583**

* - 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 23 below.

Figure 23 – 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		**608,626**	**67.0**	**0.0**	**$63,295.42**	**$482,388.29**	**$35,230.00**	**$447,158.29**	**7.1**	**612,881**
ECM 1	Install LED Fixtures	606,473	66.8	0.0	$63,071.55	$481,646.97	$35,200.00	$446,446.97	7.1	610,714
ECM 2	Retrofit Fixtures with LED Lamps	2,153	0.2	0.0	$223.87	$741.32	$30.00	$711.32	3.2	2,168

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	568,485	61.3	0.0	$59,120.93	$467,107.20	$33,100.00	$434,007.20	7.3	572,460
Exterior	37,988	5.5	0.0	$3,950.62	$14,539.77	$2,100.00	$12,439.77	3.1	38,253

Measure Description

We recommend replacing existing fixtures containing high pressure sodium and metal halide lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a metal halide or high pressure sodium lamp.

ECM 2: 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	2,153	0.2	0.0	$223.87	$741.32	$30.00	$711.32	3.2	2,168
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing incandescent, compact fluorescent, and U-bend 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 lamp and more than 10 times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 24 below.

Figure 24 – 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		**75,201**	**8.1**	**0.0**	**$7,820.65**	**$70,112.00**	**$10,750.00**	**$59,362.00**	**7.6**	**75,726**
ECM 3	Install Occupancy Sensor Lighting Controls	75,201	8.1	0.0	$7,820.65	$70,112.00	$10,750.00	$59,362.00	7.6	75,726

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

ECM 3: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
75,201	8.1	0.0	$7,820.65	$70,112.00	$10,750.00	$59,362.00	7.6	75,726

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in bus bays, shop areas, conference rooms, private offices, 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. Consider purchasing replacement LED fixtures equipped with onboard sensors for installation in production areas, such as the on shop floor. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Motor Upgrades

Our recommendations for motor upgrade measures are summarized in Figure 25 below.

Figure 25 – 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		**31,941**	**5.0**	**0.0**	**$3,321.75**	**$21,629.65**	**$0.00**	**$21,629.65**	**6.5**	**32,164**
ECM 4	Premium Efficiency Motors	31,941	5.0	0.0	$3,321.75	$21,629.65	$0.00	$21,629.65	6.5	32,164

ECM 4: 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)
31,941	5.0	0.0	$3,321.75	$21,629.65	$0.00	$21,629.65	6.5	32,164

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 26 below.

Figure 26 – 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		**40,774**	**9.7**	**0.0**	**$4,240.40**	**$29,424.85**	**$5,960.00**	**$23,464.85**	**5.5**	**41,059**
ECM 5	Install VFDs on Constant Volume (CV) HVAC	40,774	9.7	0.0	$4,240.40	$29,424.85	$5,960.00	$23,464.85	5.5	41,059

ECM 5: 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)
40,774	9.7	0.0	$4,240.40	$29,424.85	$5,960.00	$23,464.85	5.5	41,059

Measure Description

We recommend installing variable frequency drives (VFDs) to control supply fan motor speeds to convert a constant-volume, single-zone air handling system 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.

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing will have to be determined during the final project design. The control system should be programmed to maintain the minimum air flow whenever the compressor is operating.

4.1.5 Gas-Fired Heating System Replacements

Our recommendations for gas-fired heating system replacements are summarized in Figure 27 below.

Figure 27 - 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**	**3,601.3**	**$30,280.01**	**$177,751.31**	**$2,800.00**	**$174,951.31**	**5.8**	**421,666**
ECM 6	Install High Efficiency Furnaces	0	0.0	3,601.3	$30,280.01	$177,751.31	$2,800.00	$174,951.31	5.8	421,666

ECM 6: Install High Efficiency Furnaces

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	3,601.3	$30,280.01	$177,751.31	$2,800.00	$174,951.31	5.8	421,666

Measure Description

We recommend replacing existing standard efficiency furnaces with condensing furnaces. Improved combustion technology and heat exchanger design optimize heat recovery from the combustion gases which can significantly improve furnace efficiency. Savings result from improved system efficiency.

4.1.6 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 28 below.

Figure 28 - 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**	**24.8**	**$208.26**	**$443.24**	**$0.00**	**$443.24**	**2.1**	**2,900**
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	24.8	$208.26	$443.24	$0.00	$443.24	2.1	2,900

ECM 7: 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	24.8	$208.26	$443.24	$0.00	$443.24	2.1	2,900

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 and low-flow showerheads can reduce hot water usage, relative to standard showerheads and 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.

4.1.7 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment control measures are summarized in Figure 29 below.

Figure 29 - Summary of Plug Load Equipment 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**	**$328.97**	**$690.00**	**$0.00**	**$690.00**	**2.1**	**3,185**
ECM 8	Vending Machine Control	3,163	0.0	0.0	$328.97	$690.00	$0.00	$690.00	2.1	3,185

ECM 8: 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	$328.97	$690.00	$0.00	$690.00	2.1	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 30 – 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	**2,101**	**1.2**	**0.0**	**$218.47**	**$32,474.65**	**$1,321.20**	**$31,153.45**	**142.6**	**2,115**
Install High Efficiency Electric AC	2,101	1.2	0.0	$218.47	$32,474.65	$1,321.20	$31,153.45	142.6	2,115
TOTALS	**2,101**	**1.2**	**0.0**	**$218.47**	**$32,474.65**	**$1,321.20**	**$31,153.45**	**142.6**	**2,115**

* - 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)
2,101	1.2	0.0	$218.47	$32,474.65	$1,321.20	$31,153.45	142.6	2,115

Measure Description

We typically 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

Replacing existing package units with more efficient units will result in energy savings, however, the cost of installation will outweigh the energy saving advantages resulting in a very long payback. This makes the measure financially not viable therefore not recommended based on energy savings alone.

TRC recommends that NJ Transit review options for replacement and select high efficiency equipment when planning for upgrading this capital equipment.

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.

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

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.

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Clean Evaporator/Condenser Coils on AC Systems

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

Clean and/or Replace HVAC Filters

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

Perform Proper Furnace Maintenance

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

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Perform Maintenance on Compressed Air Systems

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

Plug Load Controls

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

Water Conservation

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

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 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 4.1.6 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.

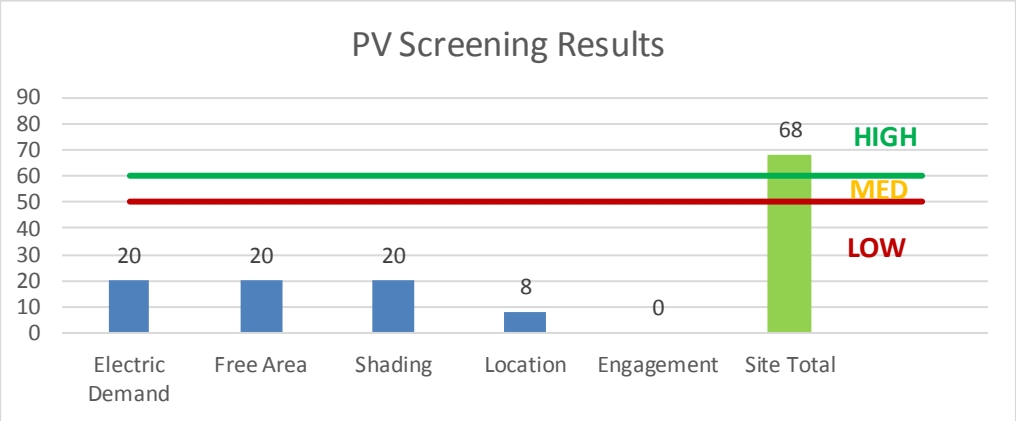
6.1 Photovoltaic

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 and the parking lot may be feasible. If Hamilton Bus Garage is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 31 - Photovoltaic Screening



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

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

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

6.2 Combined Heat and Power

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

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

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.

This facility is not a good candidate for DR curtailment.

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

Figure 32 - 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 Fixtures with LED Lamps	X			X		
ECM 3	Install Occupancy Sensor Lighting Controls	X			X		
ECM 4	Premium Efficiency Motors				X		
ECM 5	Install VFDs on Constant Volume (CV) HVAC	X			X		
ECM 6	Install High Efficiency Furnaces	X			X		
ECM 7	Install Low-Flow Domestic Hot Water Devices				X		
ECM 8	Vending Machine Control				X		

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 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
Maintenance Shop	12	Metal Halide: (1) 400W Lamp	None	458	5,840	Fixture Replacement	Yes	12	LED - Fixtures: Parking Garage Fixture	Occupancy Sensor	137	4,088	2.74	25,356	0.0	$2,636.99	$17,374.40	$1,270.00	6.11
Maintenance Shop	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
Bus Bay	65	Metal Halide: (1) 400W Lamp	None	458	5,840	Fixture Replacement	Yes	65	LED - Fixtures: Parking Garage Fixture	Occupancy Sensor	137	4,088	15.41	142,841	0.0	$14,855.05	$106,028.00	$8,775.00	6.55
Bus Wash	42	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	295	5,840	Fixture Replacement	Yes	42	LED - Fixtures: Parking Garage Fixture	Occupancy Sensor	89	4,088	6.41	59,449	0.0	$6,182.53	$68,510.40	$5,670.00	10.16
Bus Wash	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Fuel Monitoring Room	6	LED - Linear Tubes: (2) 2' Lamps	None	17	5,840	None	No	6	LED - Linear Tubes: (2) 2' Lamps	None	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Restroom	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Steam Drying Area	7	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	7	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Steam Drying Area	5	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	295	5,840	Fixture Replacement	No	5	LED - Fixtures: Parking Garage Fixture	Wall Switch	89	5,840	0.68	6,271	0.0	$652.17	$7,056.00	$500.00	10.05
Steam Drying Area	1	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	295	5,840	Fixture Replacement	No	1	LED - Fixtures: Parking Garage Fixture	Wall Switch	89	5,840	0.14	1,254	0.0	$130.43	$1,411.20	$100.00	10.05
Pull Out Area	10	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	295	5,840	Fixture Replacement	No	10	LED - Fixtures: Parking Garage Fixture	Wall Switch	89	5,840	1.35	12,542	0.0	$1,304.33	$14,112.00	$1,000.00	10.05
Pull Out Area	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pull Out Area	1	LED - Linear Tubes: (2) 8' Lamps	None	72	5,840	None	No	1	LED - Linear Tubes: (2) 8' Lamps	None	72	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
DHW Room	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	5,840	None	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
DHW Room	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
Lunch Hallway	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Lunch Room	9	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	Yes	9	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,088	0.03	279	0.0	$28.99	$270.00	$35.00	8.11
Foreman's Lunch Room	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Men's Shower	9	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	9	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Men's Shower	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Men's Shower	3	Compact Fluorescent: Screw-In (13W) - 1L	Wall Switch	13	5,840	Relamp	No	3	LED Screw-In Lamps: Screw-In (9W) - 1L	Wall Switch	9	5,840	0.01	71	0.0	$7.39	$161.26	$0.00	21.82
Women's Shower	6	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	6	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Women's Shower	1	Compact Fluorescent: Screw-In (13W) - 1L	Wall Switch	13	5,840	Relamp	No	1	LED Screw-In Lamps: Screw-In (9W) - 1L	Wall Switch	9	5,840	0.00	24	0.0	$2.46	$53.75	$0.00	21.82
Janitor Room	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Janitor Room	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

	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
Shop Floor	59	Metal Halide: (1) 400W Lamp	None	458	5,840	Fixture Replacement	Yes	59	LED - Fixtures: Parking Garage Fixture	Occupancy Sensor	137	4,088	13.99	129,655	0.0	$13,483.81	$96,240.80	$7,965.00	6.55
Shop Floor	13	LED - Fixtures: High-Bay	None	100	5,840	None	Yes	13	LED - Fixtures: High-Bay	Occupancy Sensor	100	4,088	0.26	2,369	0.0	$246.34	$2,860.00	$455.00	9.76
Shop Floor Stairwell	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Water Reclaim Room	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Battery Room	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Floor Equipment Room	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Maintenance Supervisor Room	8	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	Yes	8	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,088	0.03	248	0.0	$25.77	$220.00	$0.00	8.54
Restroom	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Air Compressor Room	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Conference Room	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Conference Room	4	LED - Fixtures: High-Bay	Wall Switch	100	5,840	None	Yes	4	LED - Fixtures: High-Bay	Occupancy Sensor	100	4,088	0.08	729	0.0	$75.80	$270.00	$35.00	3.10
Training Room	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bus Pit	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	4	LED - Fixtures: High-Bay	Wall Switch	100	5,840	None	Yes	4	LED - Fixtures: High-Bay	Occupancy Sensor	100	4,088	0.08	729	0.0	$75.80	$270.00	$35.00	3.10
Training Room	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electrical Room	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	5,840	None	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Telephone Room	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Dyno Room	9	High-Pressure Sodium: (1) 150W Lamp	Wall Switch	188	5,840	Fixture Replacement	Yes	9	LED - Fixtures: Parking Garage Fixture	Occupancy Sensor	56	4,088	0.88	8,118	0.0	$844.30	$12,970.80	$935.00	14.26
Dyno Room	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
Shop Floor	19	Metal Halide: (1) 400W Lamp	Wall Switch	458	5,840	Fixture Replacement	No	19	LED - Fixtures: Parking Garage Fixture	Wall Switch	137	5,840	3.99	36,997	0.0	$3,847.56	$26,812.80	$1,900.00	6.47
Paint Storage	2	Incandescent: Screw-In (60W) - 1L	Wall Switch	60	5,840	Relamp	No	2	LED Screw-In Lamps: Screw-In (9W) - 1L	Wall Switch	9	5,840	0.07	620	0.0	$64.43	$107.51	$10.00	1.51
Tire Room	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Tire Room	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
Lube Room	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,088	0.04	370	0.0	$38.47	$270.00	$35.00	6.11

	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
Hoist #3	14	Metal Halide: (1) 400W Lamp	Wall Switch	458	5,840	Fixture Replacement	Yes	14	LED - Fixtures: Parking Garage Fixture	Occupancy Sensor	137	4,088	3.32	30,766	0.0	$3,199.55	$22,836.80	$1,890.00	6.55
Hoist #3	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
Electrical Room	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Generator Room	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Machinist Shop	2	Metal Halide: (1) 400W Lamp	Wall Switch	458	5,840	Fixture Replacement	Yes	2	LED - Fixtures: Parking Garage Fixture	Occupancy Sensor	137	4,088	0.47	4,395	0.0	$457.08	$3,092.40	$235.00	6.25
Machinist Shop	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	None	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Tire Room	4	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	295	5,840	Fixture Replacement	Yes	4	LED - Fixtures: Parking Garage Fixture	Occupancy Sensor	89	4,088	0.61	5,662	0.0	$588.81	$5,914.80	$435.00	9.31
Tire Room	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
Hoist #1 & #2	47	Metal Halide: (1) 400W Lamp	Wall Switch	458	5,840	Fixture Replacement	Yes	47	LED - Fixtures: Parking Garage Fixture	Occupancy Sensor	137	4,088	11.14	103,285	0.0	$10,741.34	$76,666.40	$6,345.00	6.55
Body Shop	48	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	5,840	None	Yes	48	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,088	0.55	5,073	0.0	$527.54	$10,560.00	$1,680.00	16.83
Body Shop	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	5,840	None	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Body Shop	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Body Shop	6	Metal Halide: (1) 400W Lamp	Wall Switch	458	5,840	Fixture Replacement	Yes	6	LED - Fixtures: Parking Garage Fixture	Occupancy Sensor	137	4,088	1.42	13,185	0.0	$1,371.23	$8,737.20	$635.00	5.91
Parts Storage	14	Metal Halide: (1) 400W Lamp	Wall Switch	458	5,840	Fixture Replacement	Yes	14	LED - Fixtures: Parking Garage Fixture	Occupancy Sensor	137	4,088	3.32	30,766	0.0	$3,199.55	$20,026.80	$1,435.00	5.81
Parts Storage	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
Tool Room	5	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	5	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Welding Room	22	Metal Halide: (1) 400W Lamp	Wall Switch	458	5,840	Fixture Replacement	No	22	LED - Fixtures: Parking Garage Fixture	Wall Switch	137	5,840	4.62	42,838	0.0	$4,455.07	$31,046.40	$2,200.00	6.47
Clerk's Office	10	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	Yes	10	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,088	0.03	310	0.0	$32.21	$220.00	$0.00	6.83
Foreman's Office	7	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	Yes	7	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,088	0.02	217	0.0	$22.55	$220.00	$0.00	9.76
Depot Office	15	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	5,840	None	Yes	15	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	4,088	0.08	697	0.0	$72.48	$540.00	$70.00	6.48
Depot Office Restroom	5	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	5,840	None	No	5	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Depot Office Restroom	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,840	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	4,088	0.10	945	0.0	$98.28	$368.80	$20.00	3.55
Depot Office Conference Room	6	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	Yes	6	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,088	0.02	186	0.0	$19.33	$220.00	$0.00	11.38
Super's Private Office	6	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	Yes	6	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,088	0.02	186	0.0	$19.33	$220.00	$0.00	11.38
File Storage	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	5,840	None	No	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Assistant Supervisor's Office	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	5,840	None	Yes	4	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	4,088	0.02	186	0.0	$19.33	$220.00	$0.00	11.38
Private Office	5	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	Yes	5	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,088	0.02	155	0.0	$16.11	$220.00	$0.00	13.66
Vestibule	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	40	5,840	None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	40	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rec Room	6	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	5,840	None	Yes	6	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	4,088	0.03	279	0.0	$28.99	$220.00	$0.00	7.59
Quiet Room	9	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	5,840	None	Yes	9	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	4,088	0.05	418	0.0	$43.49	$270.00	$35.00	5.40
Training Office	9	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	5,840	None	Yes	9	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	4,088	0.05	418	0.0	$43.49	$116.00	$20.00	2.21
Vestibule	6	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	6	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Vestibule	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Credit Union	9	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	5,840	None	Yes	9	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	4,088	0.05	418	0.0	$43.49	$270.00	$35.00	5.40
Lockers	33	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	5,840	None	Yes	33	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	4,088	0.17	1,533	0.0	$159.46	$810.00	$105.00	4.42
Restrooms (2)	8	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	None	No	8	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,840	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Restrooms (2)	2	Incandescent: Screw-In (60W) - 1L	Wall Switch	60	5,840	Relamp	No	2	LED Screw-In Lamps: Screw-In (9W) - 1L	Wall Switch	9	5,840	0.07	620	0.0	$64.43	$107.51	$10.00	1.51
Janitor	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,840	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,840	0.02	200	0.0	$20.84	$58.50	$10.00	2.33
Pole	42	Metal Halide: (1) 250W Lamp	Daylight Dimming	295	4,380	Fixture Replacement	No	42	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Daylight Dimming	89	4,380	5.68	39,507	0.0	$4,108.65	$14,539.77	$2,100.00	3.03

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
Maintenance Shop	Maintenace Shop	2	Other	0.6	75.0%	No	2,745	No	75.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Maintenance Shop	Door Area	15	Exhaust Fan	0.3	75.0%	No	2,745	No	75.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
DHW Room	Whole Building	1	Process Pump	0.5	75.0%	No	2,745	No	75.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pump Room	Whole Building	1	Process Pump	40.0	91.7%	No	4,067	Yes	94.1%	No		0.46	2,532	0.0	$263.27	$4,206.90	$0.00	15.98
Pump Room	Whole Building	1	Process Pump	10.0	90.2%	No	3,391	No	90.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pump Room	Whole Building	2	Process Pump	15.0	91.7%	No	3,391	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pump Room	Whole Building	1	Process Pump	7.5	87.5%	No	3,391	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
AC-2	Whole Building	2	Air Compressor	80.0	90.0%	Yes	4,957	Yes	95.4%	No		4.17	27,909	0.0	$2,902.44	$15,855.70	$0.00	5.46
Air Dryer	Whole Building	1	Other	1.7	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Air Dryer	Whole Building	1	Process Fan	0.2	85.5%	No	2,745	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Maintenance Shop	Maintenace Shop	2	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
Maintenance Shop	Maintenace Shop	1	Process Pump	10.0	85.5%	No	3,391	Yes	91.7%	No		0.33	1,500	0.0	$156.03	$1,567.05	$0.00	10.04
Maintenance Shop	Maintenace Shop	3	Other	10.0	91.7%	No	3,391	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Offices	ACU-1	1	Supply Fan	10.0	91.7%	No	3,391	No	91.7%	Yes	1	1.32	4,966	0.0	$516.41	$3,807.95	$800.00	5.82
Toilets/Lockers	ACU-2	1	Supply Fan	5.0	89.5%	No	2,745	No	89.5%	Yes	1	0.68	2,059	0.0	$214.15	$3,275.85	$400.00	13.43
Main.Offices	ACU-3	1	Supply Fan	1.0	85.5%	No	2,745	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Service Offices	ACU-4	1	Supply Fan	2.0	86.5%	No	2,745	No	86.5%	Yes	1	0.28	852	0.0	$88.63	$2,728.85	$160.00	28.98
Garage	UH 1 -8	8	Supply Fan	0.0	85.5%	No	2,745	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Garage	GUH 1 - 18	18	Supply Fan	0.3	85.5%	No	2,745	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Garage	HER 1 - 9	9	Exhaust Fan	3.0	89.5%	No	2,745	No	89.5%	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
Garage	HV 1	1	Supply Fan	25.0	93.6%	No	4,067	No	93.6%	Yes	1	3.23	14,586	0.0	$1,516.95	$8,002.70	$2,000.00	3.96
Garage	HV 2	1	Supply Fan	25.0	93.6%	No	4,067	No	93.6%	Yes	1	3.23	14,586	0.0	$1,516.95	$8,002.70	$2,000.00	3.96
Garage	HV 3	1	Supply Fan	7.5	91.7%	No	3,391	No	91.7%	Yes	1	0.99	3,724	0.0	$387.30	$3,606.80	$600.00	7.76
Bus Storage	EF 1 - 8	8	Exhaust Fan	5.0	89.5%	No	8,760	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bus Storage	EF 9, 10	2	Exhaust Fan	3.0	89.5%	No	8,760	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Service Lane	EF 11 - 13	3	Exhaust Fan	5.0	89.5%	No	8,760	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Chassic Wash	EF-14	1	Exhaust Fan	0.8	82.5%	No	2,920	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bypass	EF-15	1	Exhaust Fan	0.8	82.5%	No	2,920	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bus Wash	EF-16	1	Exhaust Fan	0.8	82.5%	No	2,920	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bus Maintenance	EF-17	1	Exhaust Fan	3.0	89.5%	No	8,760	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Paint Storage	EF-18	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electric Rm	EF-19	1	Exhaust Fan	0.5	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bus Maintenance	EF 20 -22	3	Exhaust Fan	3.0	89.5%	No	8,760	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Toilet Rooms	EF-23	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Compressor Rm	EF-24	1	Exhaust Fan	0.5	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cyclone	EF-25	1	Exhaust Fan	0.3	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Battery Room	EF-26	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electric Rm	EF-27	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Lockers/Toilets	EF-28	1	Exhaust Fan	1.0	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Lunch Rm	EF-29	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	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
Electric Repair	EF-30	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Parts Storage	EF-31	1	Exhaust Fan	1.0	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hand Tools	EF-32	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Machine Shop	EF-33	1	Exhaust Fan	1.0	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Tool Carts	EF-34	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Welding	EF-35	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bus Maintenance	EF 36, 37	2	Exhaust Fan	3.0	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Dynamometer	EF-38	1	Exhaust Fan	1.0	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Tire Bay	EF-39	1	Exhaust Fan	1.5	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Tire Storage	EF-40	1	Exhaust Fan	0.5	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Brake	EF-41	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Emergency Generator	EF-42	1	Exhaust Fan	0.5	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electric Rm	EF-43	1	Exhaust Fan	1.0	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Lube Rm	EF-44	1	Exhaust Fan	0.5	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Building & Grounds	EF-45	1	Exhaust Fan	1.0	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Water Treatment	EF-46	1	Exhaust Fan	2.0	88.5%	No	8,760	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Conference Rm	EF-47	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Recreation Rm	EF-48	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Conference Rm	EF-49	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Electric Rm	EF-50	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	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
Service Pit	EF-51	1	Exhaust Fan	0.8	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Loading Dock	EF-52	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Paint Booth Bay	EF-53	1	Exhaust Fan	0.5	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Water Reclaim	EF-54	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Compressor Rm	DV-1	1	Exhaust Fan	0.3	82.5%	No	8,760	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Foreman and Clerk Office	1	Packaged AC	4.00		Yes	1	Packaged AC	4.00		14.00		No	0.18	298	0.0	$31.02	$9,075.84	$368.00	280.71
Roof	Offices	1	Packaged AC	6.00		Yes	1	Packaged AC	6.00		11.50		No	0.19	322	0.0	$33.47	$10,692.63	$438.00	306.35
Roof	Locker Room	1	Packaged AC	2.00		Yes	1	Packaged AC	2.00		14.00		No	0.31	529	0.0	$54.99	$4,537.92	$184.00	79.17
Roof	Driver Lounge	1	Packaged AC	3.60		Yes	1	Packaged AC	3.60		14.00		No	0.56	952	0.0	$98.98	$8,168.26	$331.20	79.17

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
Roof	Whole Building	1	Furnace	93.00	Yes	1	Furnace	93.00	95.00%	AFUE	0.00	0	39.5	$332.33	$2,107.13	$400.00	5.14
Roof	Whole Building	1	Furnace	1,936.00	Yes	1	Furnace	1,936.00	95.00%	AFUE	0.00	0	892.6	$7,505.04	$43,864.60	$400.00	5.79
Roof	Whole Building	1	Furnace	2,629.60	Yes	1	Furnace	2,629.60	95.00%	AFUE	0.00	0	1,212.4	$10,193.83	$59,579.72	$400.00	5.81
Roof	Whole Building	1	Furnace	93.00	Yes	1	Furnace	93.00	95.00%	AFUE	0.00	0	39.5	$332.33	$2,107.13	$400.00	5.14
Roof	Whole Building	1	Furnace	2,629.60	Yes	1	Furnace	2,629.60	95.00%	AFUE	0.00	0	1,212.4	$10,193.83	$59,579.72	$400.00	5.81
Roof	Whole Building	1	Furnace	251.00	Yes	1	Furnace	251.00	95.00%	AFUE	0.00	0	106.7	$896.94	$5,686.99	$400.00	5.89
Roof	Whole Building	1	Furnace	213.00	Yes	1	Furnace	213.00	95.00%	AFUE	0.00	0	98.2	$825.71	$4,826.01	$400.00	5.36

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
DHW 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
Men's Shower	1	Faucet Aerator (Lavatory)	1.50	1.00	0.00	0	0.9	$7.17	$7.17	$0.00	1.00
Women's Shower	2	Faucet Aerator (Lavatory)	1.50	1.00	0.00	0	1.7	$14.34	$14.34	$0.00	1.00
Men's Shower	3	Showerhead	2.50	2.00	0.00	0	2.8	$23.90	$267.90	$0.00	11.21
Women's Shower	1	Showerhead	2.50	2.00	0.00	0	0.9	$7.97	$89.30	$0.00	11.21
Other Restrooms	9	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	18.4	$154.88	$64.53	$0.00	0.42

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Whole Building	9	Microwave	1,000.0	No
Lunch Room	1	Toaster Oven	1,200.0	No
Lunch Room	1	Oven	800.0	No
Lunch Room	1	Refrigerator	172.0	No
Offices	2	Large Printer	600.0	No
Offices	17	Medium Printer	200.0	No
Whole Building	1	Space Heaters	5,000.0	No
Whole Building	25	Computers	150.0	No
Offices	2	Small Printers	20.0	No
Offices	1	Paper Shredder	150.0	No
Whole Building	4	Refrigerators (Medium)	156.0	No
Whole Building	5	Refrigerators (Large)	172.0	No
Whole Building	4	Coffee Machine	900.0	No
Whole Building	2	Toaster	850.0	No
Whole Building	1	Ceiling Fan	100.0	No
Whole Building	2	CRT Television	120.0	No
Whole Building	1	LCD Television	50.0	No
Whole Building	1	Miscellaneous Process Load	100,000.0	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
unknown	1	Refrigerated	Yes	0.00	1,612	0.0	$167.63	$230.00	$0.00	1.37
unknown	1	Glass Fronted Refrigerated	Yes	0.00	1,209	0.0	$125.72	$230.00	$0.00	1.83
unknown	1	Non-Refrigerated	Yes	0.00	343	0.0	$35.62	$230.00	$0.00	6.46

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.