Local Government Energy Audit Report

Newark Bus Garage

August 2, 2019

Prepared for:

NJ Transit
601 Doremus Avenue
Newark, NJ 07105

Prepared by:

TRC Energy Services
900 Route 9 North
Woodbridge, NJ 07095

Disclaimer

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information about financial incentives that may be available. Most energy conservation measures have received preliminary analysis of feasibility that identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to establish a basis for further discussion and to help prioritize energy measures.

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

TRC bases estimated installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. We encourage the owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual 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. Please review all available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

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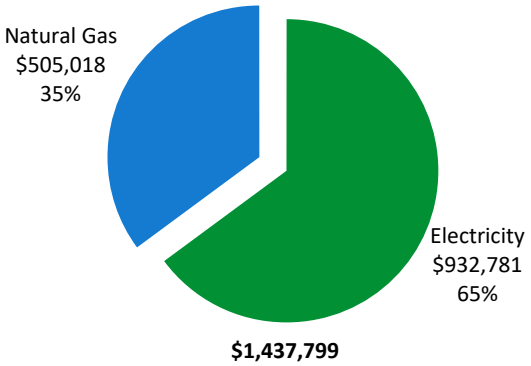
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Newark Bus Garage. This report provides you with information about your facility's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in your facility. TRC Energy Services (TRC) conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $1,437,799 Electricity: 9,848,465 kWh Natural Gas: 651,745 Therms	
ENERGY STAR® Benchmarking Score	N/A *(1-100 scale)*	A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.

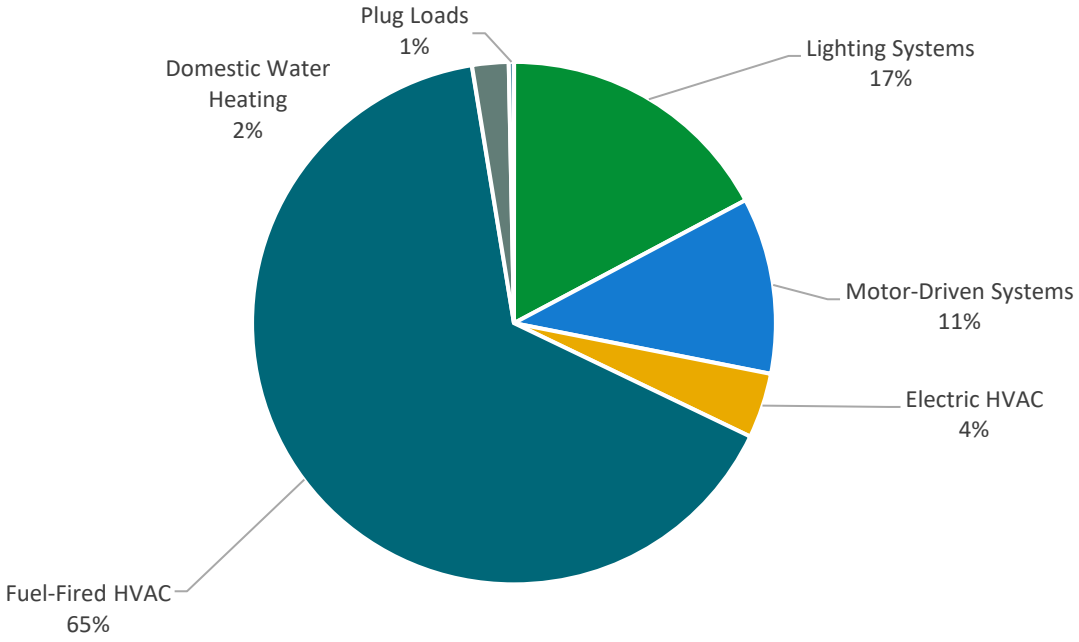


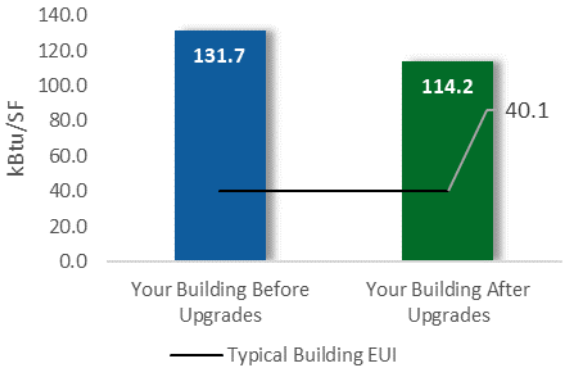
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

This energy audit considered a range of potential energy improvements in your building. Costs and savings will vary between improvements. Presented below are two potential scopes of work for your consideration.

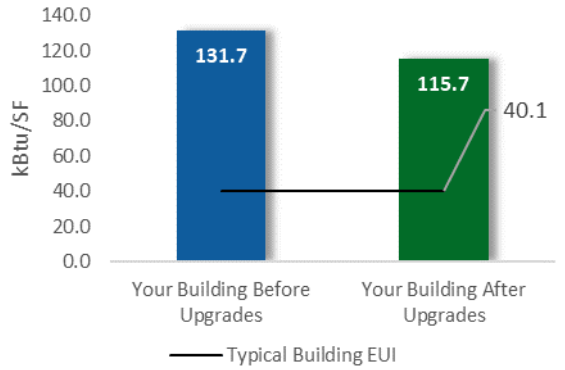
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$1,878,116
Potential Rebates & Incentives[1]	$264,227
Annual Cost Savings	$364,546
Annual Energy Savings	Electricity: 3,851,723 kWh
Greenhouse Gas Emission Savings	1,937 Tons
Simple Payback	4.4 Years
Site Energy Savings (all utilities)	13%



Scenario 2: Cost Effective Package[2]

Installation Cost	$1,281,197
Potential Rebates & Incentives	$238,637
Annual Cost Savings	$348,617
Annual Energy Savings	Electricity: 3,742,172 kWh
Greenhouse Gas Emission Savings	1,840 Tons
Simple Payback	3.0 Years
Site Energy Savings (all utilities)	12%



On-site Generation Potential

Photovoltaic	High
Combined Heat and Power	None

[1] Incentives are based on current SmartStart Prescriptive incentives. Other program incentives may apply.

[2] A cost-effective measure is defined as one where the simple payback does not exceed two-thirds of the expected proposed equipment useful life. Simple payback is based on the net measure cost after potential incentives.

#	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		**3,251,706**	**352.0**	**-720**	**$302,400**	**$1,031,744**	**$194,042**	**$837,702**	**2.8**	**3,190,130**
ECM 1	Install LED Fixtures	3,241,921	350.9	-718	$301,491	$1,030,559	$193,800	$836,759	2.8	3,180,536
ECM 2	Retrofit Fixtures with LED Lamps	9,784	1.2	-2	$910	$1,185	$242	$943	1.0	9,594
Lighting Control Measures		**135,709**	**14.7**	**-31**	**$12,616**	**$103,476**	**$17,675**	**$85,801**	**6.8**	**133,075**
ECM 3	Install Occupancy Sensor Lighting Controls	134,828	14.6	-30	$12,534	$103,076	$17,675	$85,401	6.8	132,211
ECM 4	Install High/Low Lighting Controls	881	0.1	0	$82	$400	$0	$400	4.9	864
Motor Upgrades		**11,015**	**2.5**	**0**	**$1,043**	**$49,541**	**$0**	**$49,541**	**47.5**	**11,092**
	Premium Efficiency Motors	11,015	2.5	0	$1,043	$49,541	$0	$49,541	47.5	11,092
Variable Frequency Drive (VFD) Measures		**342,715**	**96.4**	**0**	**$32,460**	**$148,824**	**$26,920**	**$121,904**	**3.8**	**345,112**
ECM 5	Install VFDs on Constant Volume (CV) Fans	341,862	96.2	0	$32,379	$144,137	$26,920	$117,217	3.6	344,252
	Install VFDs on Heating Water Pumps	853	0.2	0	$81	$4,687	$0	$4,687	58.0	859
Electric Unitary HVAC Measures		**97,682**	**17.4**	**0**	**$9,252**	**$258,772**	**$12,469**	**$246,302**	**26.6**	**98,365**
	Install High Efficiency Air Conditioning Units	97,682	17.4	0	$9,252	$258,772	$12,469	$246,302	26.6	98,365
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**522**	**$4,045**	**$74,485**	**$5,810**	**$68,675**	**17.0**	**61,124**
	Install High Efficiency Hot Water Boilers	0	0.0	522	$4,045	$74,485	$5,810	$68,675	17.0	61,124
Domestic Water Heating Upgrade		**0**	**0.0**	**195**	**$1,508**	**$209,435**	**$7,311**	**$202,124**	**134.1**	**22,783**
	Install High Efficiency Gas-Fired Water Heater	0	0.0	195	$1,508	$209,435	$7,311	$202,124	134.1	22,783
Food Service & Refrigeration Measures		**12,895**	**1.5**	**0**	**$1,221**	**$1,840**	**$0**	**$1,840**	**1.5**	**12,985**
ECM 6	Vending Machine Control	12,895	1.5	0	$1,221	$1,840	$0	$1,840	1.5	12,985
TOTALS		**3,851,723**	**484.6**	**-34**	**$364,546**	**$1,878,116**	**$264,227**	**$1,613,889**	**4.4**	**3,874,667**

* - All incentives presented in this table are based on NJ SmartStart 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).

Figure 2 – Evaluated Energy Improvements

1.1 Planning Your Project

Careful planning makes for a successful energy project. When considering this scope of work, you will have some decisions to make, such as:

- How will the project be funded and/or financed?
- Is it best to pursue individual ECMs, groups of ECMs, or use a comprehensive approach where all ECMs are installed together?
- Are there other facility improvements that should happen at the same time?

Pick Your Installation Approach

New Jersey's Clean Energy Programs give you the flexibility to do a little or a lot. Rebates, incentives, and financing are available to help reduce both your installation costs and your energy bills. If you are planning to take advantage of these programs, make sure to review incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives before purchasing materials or starting installation.

The potential ECMs identified for this building likely qualify for multiple incentive and funding programs. Based on current program rules and requirements, your measures are likely to qualify for the following programs:

Energy Conservation Measure		SmartStart	Pay For Performance
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	Install High/Low Lighting Controls		x
ECM 5	Install VFDs on Constant Volume (CV) HVAC	x	x
ECM 6	Vending Machine Control	x	x

Figure 3 – Funding Options

New Jersey's Clean Energy Programs At-A-Glance

	SmartStart Flexibility to install at your own pace	**Direct Install** Turnkey installation	**Pay for Performance** Whole building upgrades
Who should use it?	Buildings installing individual measures or small group of measures.	Small to mid-size facilities that can bundle multiple measures together. Average peak demand should be below 200 kW. Not suitable for significant building shell issues.	Mid to large size facilities looking to implement as many measures as possible at one time. Peak demand should be over 200 kW.
How does it work?	Use in-house staff or your preferred contractor.	Pre-approved contractors pass savings along to you via reduced material and labor costs.	Whole-building approach to energy upgrades designed to reduce energy use by at least 15%. The more you save, the higher the incentives.
What are the Incentives?	Fixed incentives for specific energy efficiency measures.	Incentives pay up to 70% of eligible costs, up to $125,000 per project. You pay the remaining 30% directly to the contractor.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
How do I participate?	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified Partner to develop your Energy Reduction Plan and set your energy savings targets.

Take the next step by visiting **www.njcleanenergy.com** for program details, applications, and to contact a qualified contractor.

Individual Measures with SmartStart

For facilities wishing 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, you can use internal resources or an outside firm or contractor to perform the final design of the ECM(s) and install the equipment. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation.

Turnkey Installation with Direct Install

The Direct Install program provides turnkey installation of multiple measures through an authorized network of participating contractors. This program can provide substantially higher incentives than SmartStart, up to 70% of the cost of selected measures. Direct Install contractors will assess and verify individual measure eligibility and, in most cases, they perform the installation work. The Direct Install program is available to sites with an average peak demand of less than 200 kW.

Whole Building Approach with Pay for Performance

Pay for Performance can be a good option for medium to large sized facilities to achieve deep energy savings. Pay for Performance allows you to install as many measures as possible under a single project as well as address measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also use this program. Pay for Performance works for larger customers with a peak demand over 200 kW. 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.

More Options from Around the State

Financing and Planning Support with the Energy Savings Improvement Program (ESIP)

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the 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. You have already taken the first step as an LGEA customer, because this report is required to participate in ESIP.

Resiliency with Return on Investment through Combined Heat & Power (CHP)

The CHP program provides incentives for combined heat and power (aka cogeneration) and waste heat to power projects. Combined heat and power systems generate power on-site and recover heat from the generation system to meet on-site thermal loads. Waste heat to power systems use waste heat to generate power. You will work with a qualified developer who will design a system that meets your building's heating and cooling needs.

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces 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. By enabling commercial facilities to reduce their electric demand 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 demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Newark Bus Garage. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs. This report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

TRC conducted this study as part of a comprehensive effort to assist New Jersey educational and local government facilities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

2.1 Site Overview

TRC performed an energy audit at Newark Bus Garage located in Newark, New Jersey starting on January 15, 2019. TRC met with Joe Martins to review the facility operations and help focus our investigation on specific energy-using systems.

Newark Bus Garage is a one-story, 750,000 square foot building built in 1970. Spaces include: garage, bus parking bays, shop floors (mechanical, paint shop, etc.) offices, restrooms, storage closets, and mechanical spaces. Most of the lighting and HVAC equipment at the facility are original to the building and in need of replacement as identified in this report.

2.2 Building Occupancy

The facility is occupied year-round and a typical weekday occupancy is 300 staff.

Building Name	Weekday/Weekend	Operating Schedule
Iron Bound Garage	Weekday	12:00 AM - 12:00 AM
	Weekend	12:00 AM - 12:00 AM
Shop	Weekday	6:00 AM - 12:00 AM
	Weekend	No Operation
2nd floor offices	Weekday	12:00 AM - 12:00 AM
	Weekend	12:00 AM - 12:00 AM

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel with a concrete façade in some parts and metal cladding in the garage areas. The roof is flat and covered with gravel layering.

Most of the windows are double glazed and have metal frames. The exterior doors are also metal frame with glass doors that are in good condition and show no signs of air leakage. The garage and shops in the facility have overhead doors which increase drafts and outside air infiltration if kept open for a longer duration other than vehicle entry and exit.

Facade

Exterior Doors

Roof with Gravel Finish

High Bay Parts Storage Area

2.4 Lighting Systems

The primary interior lighting system uses 14-Watt LED linear tubes in spaces such as offices, stores, and storage areas; and 400-Watt metal halide fixtures in high bay areas such as the bus barns, fuel aisles, bus wash area, and maintenance shops.

Other lighting fixtures include 32-Watt linear T8 lamps, 60-Watt incandescent lamps (in the showers), and 10-Watt linear screw-in lamps in various spaces. Typically, T8 fluorescent lamps use electronic ballasts. Fixture types include 2-lamp or 4-lamp, 2-foot or 4-foot long troffers fixtures and 2-foot fixtures with U-bend tube lamps.

The majority of the light fixtures in the facility are controlled using manual switches. The lighting in the battery storage rooms is controlled using wall-mounted occupancy sensors. Most fixtures are in fair condition. All exit signs are LED units.

Interior lighting levels in closed spaces and lower ceiling areas was generally sufficient.

Exterior fixtures include wall packs with (250-Watt, 1000-Watt) metal halide fixtures or (70-Watt, 100-Watt or 150-Watt) high pressure sodium fixtures that are controlled using photocells. Exterior pole lights include 400-Watt high pressure sodium fixtures that are controlled by timeclock.

LED Screw-in

LED Linear tubes

High pressure sodium Wall Packs

8-foot T8 Tubes

2.5 Air Handling Systems

Packaged Units and Air Conditioners

Offices, lunch room, drivers' depot, warranty room, drivers' lounge, shop offices, etc. are cooled using packaged AC units with cooling capacities ranging from 3-tons to 28-tons, and spaces such as locker rooms are cooled using split AC units with cooling capacities ranging from 2-tons to 14-tons. While many of the units are within the useful life of the equipment, the older packaged units have been evaluated for replacement.

Some spaces are also cooled using window AC units ranging from 1.5-tons to 2-tons. Each of these units vary in efficiencies and terms of remaining useful life. Older units have been evaluated for replacement.

Space temperatures are controlled in the facility using the Building Management System. Operating schedules and setbacks are based on temperature setpoints.

Refer to Appendix A for detailed information about each unit.

Packaged Rooftop AC Unit

Packaged Rooftop AC Unit

Split AC Unit

Split AC Unit

2.6 Heating Hot Water Systems

There are four non-condensing hot water boilers (PK) in the facility. They have a heating capacity of 760 MBh and 900 MBh (two each) and a nominal efficiency of 75% serving the baseboard radiators and heating and ventilating units in the (19 HVUs) Ironbound and the (34 HVUs) Shop sections respectively. The supply and exhaust fans in these units range from 3 hp to 20 hp. The hot water produced by the boilers is circulated using constant speed hot water pumps to the various terminal units.

The boilers are configured in a lead-lag control scheme. All boilers are required under high load conditions in the respective sections. All of the boilers are past their useful life and have been evaluated for replacement.

The body shop, mechanical shop, record storage, central stores, haz-mat rooms, non-rev vehicles, bus barn areas, garage areas, brake shop, paint booth, fuel alleys, bus wash areas, and the warrantee room in the Iron Bound section; are all heated using gas-fired furnaces with capacities ranging from 1100 MBh to 2500 MBh. Shop area section of the facility also has 47 direct gas-fired furnaces with heating capacities ranging from 33 MBh to 2500 MBh.

Lube room, cyclone room, water reclaim room, and the bus barn entrance are heated using gas-fired, warm air unit heaters. Heating capacities of these units range from 150 MBh to 400 MBh. Steam rooms are also heated using gas-fired furnaces with heated capacities ranging from 30 MBh and 400 MBh.

Space temperatures are controlled in the facility using the Building Management System. Operating schedules and setbacks are based on temperature setpoints which is between 68°F and 72°F.

Hot Water Boilers

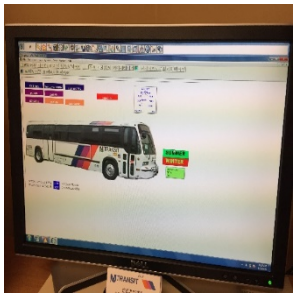
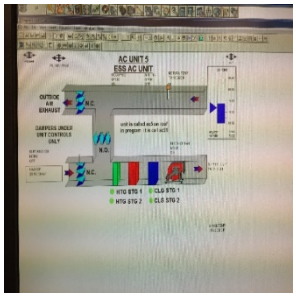
Heating Hot Water Pumps

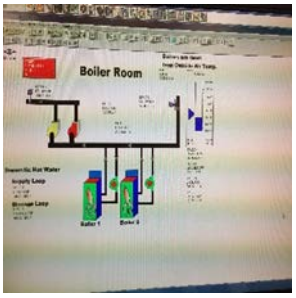
Heating and Ventilating Unit

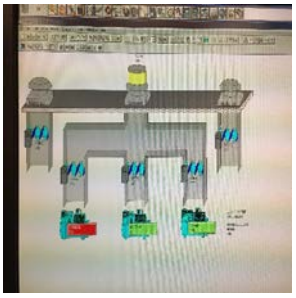
Heating and Ventilating Unit

2.7 Building Energy Management Systems (EMS)

A Siemens EMS controls the HVAC equipment, the boilers, furnaces, warm air unit heaters, the air handlers, and the package units. The EMS provides equipment scheduling, monitors and controls space temperatures, supply air temperatures, humidity, and heating water loop temperatures.





2.8 Domestic Hot Water

The facility has nine storage water heaters with varying tank capacity (65 gallons-119 gallons) and input heating capacities (199 MBh-500 MBh) with an average efficiency of 80%. Hot water is distributed to the end uses using fractional horsepower circulation pumps.

Most of the water heaters have past their useful life and have been evaluated for replacement.

DHW#1

Newer Rheem DHW#2

2.9 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume 0.32% percent of total building energy use. This is lower than a typical building.

You seem to already be doing a great job managing your electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are 67 computer work stations throughout the facility. Plug loads throughout the building include general café and office equipment.

2.10 Water-Using Systems

Faucet flow rates are at 2.2 gallons per minute (gpm) or higher. Toilets are rated at 1.6 gallons per flush (gpf) and urinals are rated at 1.0 gpf.

2.11 Process Equipment

The building has several large process equipment used for bus maintenance and repairs. This includes two, 60 hp; two, 125 hp; and one, 100 hp air compressors. The 60 hp air compressors is 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.

60 hp - Air Compressors

Dryer

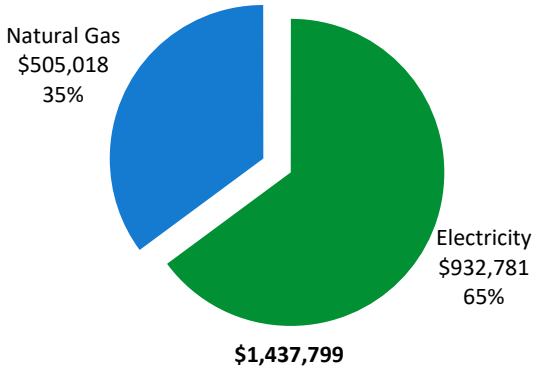
Bus Wash Area

Process Pump

3 Energy Use and Costs

Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

Utility Summary		
Fuel	**Usage**	**Cost**
Electricity	9,848,465 kWh	$932,781
Natural Gas	651,745 Therms	$505,018
Total		**$1,437,799**



An energy balance identifies and quantifies energy use in your various building systems. This can highlight areas with the most potential for improvement. This energy balance was developed using calculated energy use for each of the end uses noted in the figure.

The energy auditor collects information regarding equipment operating hours, capacity, efficiency, and other operational parameters from facility staff, drawings, and on-site observations. This information is used as the inputs to calculate the existing conditions energy use for the site. The calculated energy use is then compared to the historical energy use and the initial inputs are revised, as necessary, to balance the calculated energy use to the historical energy use.

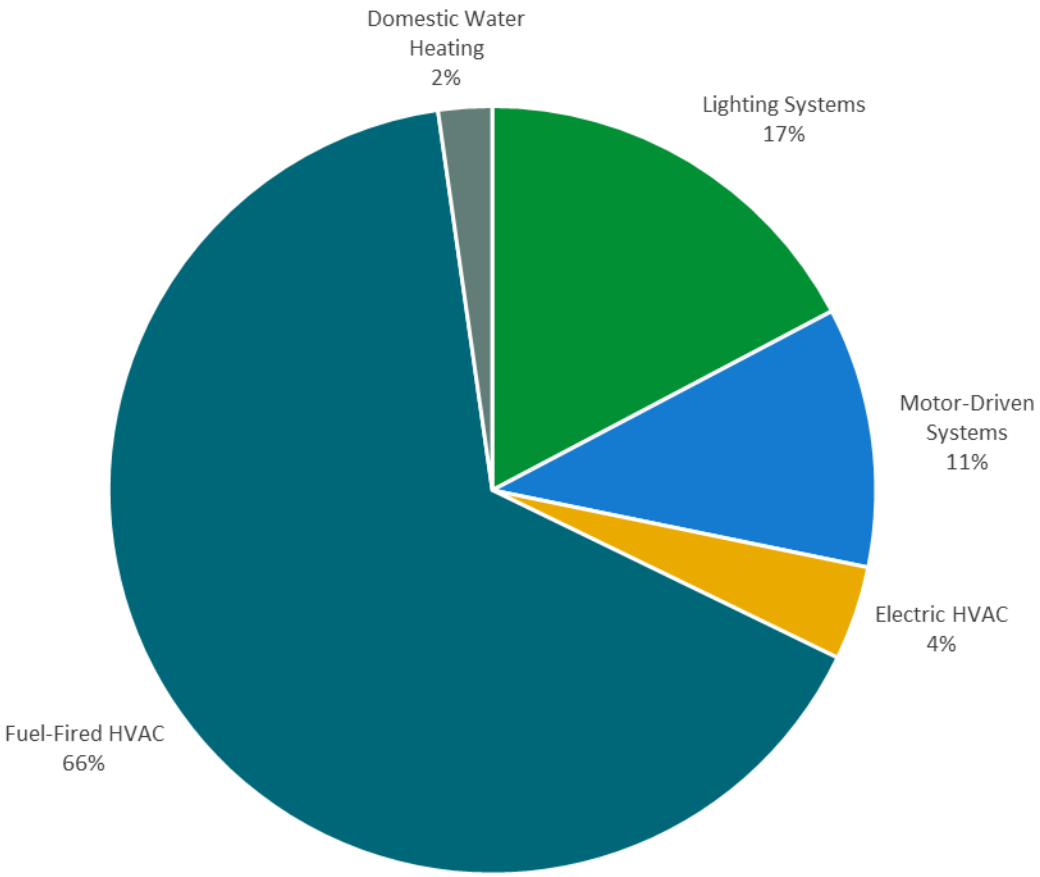
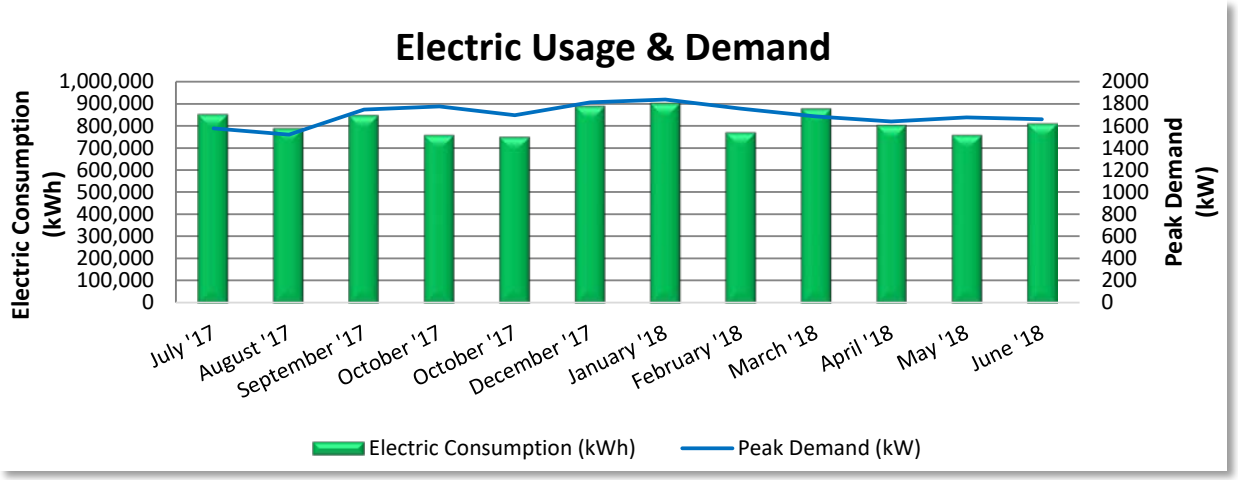


Figure 5 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class HTS, with electric production provided by Direct Energy Business, a third-party supplier.



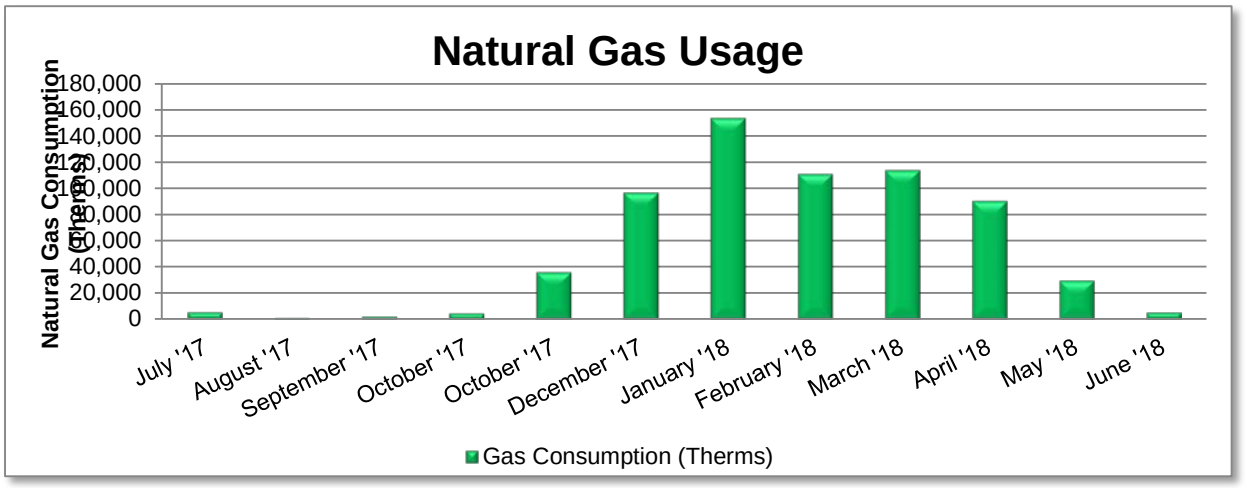
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
7/19/17	30	855,000	1,578		$83,156
8/17/17	29	792,436	1,521		$77,535
9/18/17	32	851,638	1,747		$82,543
10/17/17	29	761,932	1,776		$68,636
11/15/17	29	753,626	1,698		$67,769
12/18/17	33	892,429	1,814		$79,461
1/19/18	32	906,010	1,838		$80,434
2/16/18	28	773,334	1,757		$69,266
3/20/18	32	881,266	1,685		$78,366
4/19/18	30	805,926	1,642		$72,136
5/18/18	29	761,299	1,678		$95,155
6/19/18	32	813,569	1,660		$78,324
Totals	**365**	**9,848,465**	**1,838**	**$0**	**$932,781**
Annual	**365**	**9,848,465**	**1,838**	**$0**	**$932,781**

Notes:

- Peak demand of 1,838 kW occurred in January 2018.
- The average electric cost over the past 12 months was $0.095/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

PSE&G delivers natural gas under rate class LVG, with natural gas supply provided by Direct Energy Business, a third-party supplier.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
7/19/17	30	5,709	$3,186
8/17/17	29	1,320	$825
9/18/17	32	2,328	$1,370
10/17/17	29	4,879	$2,741
11/15/17	29	36,312	$40,450
12/18/17	33	96,929	$79,837
1/19/18	32	153,567	$120,506
2/16/18	28	110,989	$93,203
3/20/18	32	113,892	$95,039
4/19/18	30	90,544	$48,730
5/18/18	29	29,639	$15,998
6/19/18	32	5,639	$3,132
Totals	**365**	**651,745**	**$505,018**
Annual	**365**	**651,745**	**$505,018**

Notes:

- The average gas cost for the past 12 months is $0.775/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's (EPA) *Portfolio Manager®* software. Benchmarking compares your building's energy use to that of similar buildings across the county, while neutralizing variations due to location, occupancy and operating hours. Some building types can be scored with a 1-100 ranking of a building's energy performance relative to the national building market. A score of 50 represents the national average and a score of 100 is best.

This ENERGY STAR® benchmarking score provides a comprehensive snapshot of your building's energy performance. It assesses the building's physical assets, operations, and occupant behavior, which is compiled into a quick and easy-to-understand score.

Benchmarking Score	**N/A**

Due to its unique characteristics, this building type is not able to receive a benchmarking score. This report contains suggestions about how to improve building performance and reduce energy costs.

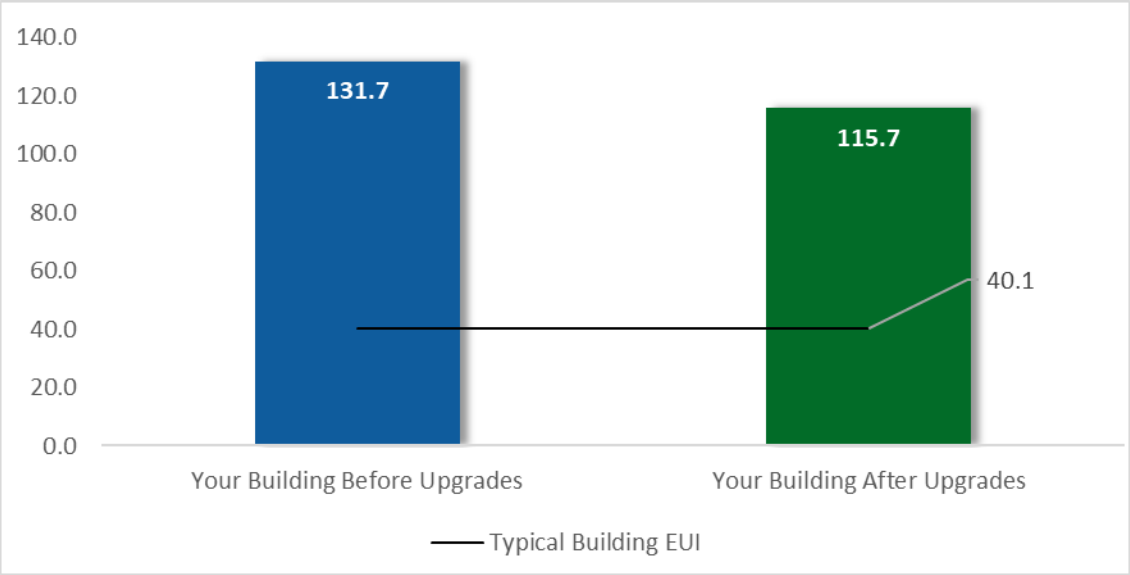


Figure 6 - Energy Use Intensity Comparison

Energy use intensity (EUI) measures energy consumption per square foot and is the standard metric for comparing buildings' energy performance. A lower EUI means better performance and less energy consumed. A number of factors can cause a building to vary from the "typical" energy usage. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and occupant behavior all contribute to a building's energy use and the benchmarking score.

Tracking Your Energy Performance

Keeping track of your energy use on a monthly basis is one of the best ways to keep energy costs in check. Update your utility information in Portfolio Manager® regularly, so that you can keep track of your building's performance.

We have created a Portfolio Manager® account for your facility and we have already entered the monthly utility data shown above for you. Account login information for your account will be sent via email.

Free online training is available to help you use ENERGY STAR® Portfolio Manager® to track your building's performance at: https://www.energystar.gov/buildings/training.

For more information on ENERGY STAR® and Portfolio Manager®, visit their website[3].

[3] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

4 ENERGY CONSERVATION MEASURES

The goal of this audit report is to identify and evaluate potential energy efficiency improvements, provide information about the cost effectiveness of those improvements, and recognize potential financial incentives from NJBPU. Most energy conservation measures have received preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is typically sufficient to demonstrate project cost-effectiveness and help prioritize energy measures.

Calculations of energy use and savings are based on the current version of the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the NJBPU. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances.

Operation and maintenance costs for the proposed new equipment will generally be lower than the current costs for the existing equipment—especially if the existing equipment is at or past its normal useful life. We have conservatively assumed there to be no impact on overall maintenance costs over the life of the equipment.

Financial incentives are based on the current NJCEP prescriptive SmartStart program. A higher level of investigation may be necessary to support any SmartStart Custom, Pay for Performance, or Direct Install incentive applications. Some measures and proposed upgrades may be eligible for higher incentives than those shown below through other NJCEP programs described in a following section of this report.

For a detailed list of the locations and recommended energy conservation measures for all inventoried equipment, see **Appendix A: Equipment Inventory & Recommendations.**

#	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		**3,251,706**	**352.0**	**-720**	**$302,400**	**$1,031,744**	**$194,042**	**$837,702**	**2.8**	**3,190,130**
ECM 1	Install LED Fixtures	3,241,921	350.9	-718	$301,491	$1,030,559	$193,800	$836,759	2.8	3,180,536
ECM 2	Retrofit Fixtures with LED Lamps	9,784	1.2	-2	$910	$1,185	$242	$943	1.0	9,594
Lighting Control Measures		**135,709**	**14.7**	**-31**	**$12,616**	**$103,476**	**$17,675**	**$85,801**	**6.8**	**133,075**
ECM 3	Install Occupancy Sensor Lighting Controls	134,828	14.6	-30	$12,534	$103,076	$17,675	$85,401	6.8	132,211
ECM 4	Install High/Low Lighting Controls	881	0.1	0	$82	$400	$0	$400	4.9	864
Motor Upgrades		**11,015**	**2.5**	**0**	**$1,043**	**$49,541**	**$0**	**$49,541**	**47.5**	**11,092**
	Premium Efficiency Motors	11,015	2.5	0	$1,043	$49,541	$0	$49,541	47.5	11,092
Variable Frequency Drive (VFD) Measures		**342,715**	**96.4**	**0**	**$32,460**	**$148,824**	**$26,920**	**$121,904**	**3.8**	**345,112**
ECM 5	Install VFDs on Constant Volume (CV) Fans	341,862	96.2	0	$32,379	$144,137	$26,920	$117,217	3.6	344,252
	Install VFDs on Heating Water Pumps	853	0.2	0	$81	$4,687	$0	$4,687	58.0	859
Electric Unitary HVAC Measures		**97,682**	**17.4**	**0**	**$9,252**	**$258,772**	**$12,469**	**$246,302**	**26.6**	**98,365**
	Install High Efficiency Air Conditioning Units	97,682	17.4	0	$9,252	$258,772	$12,469	$246,302	26.6	98,365
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**522**	**$4,045**	**$74,485**	**$5,810**	**$68,675**	**17.0**	**61,124**
	Install High Efficiency Hot Water Boilers	0	0.0	522	$4,045	$74,485	$5,810	$68,675	17.0	61,124
Domestic Water Heating Upgrade		**0**	**0.0**	**195**	**$1,508**	**$209,435**	**$7,311**	**$202,124**	**134.1**	**22,783**
	Install High Efficiency Gas-Fired Water Heater	0	0.0	195	$1,508	$209,435	$7,311	$202,124	134.1	22,783
Food Service & Refrigeration Measures		**12,895**	**1.5**	**0**	**$1,221**	**$1,840**	**$0**	**$1,840**	**1.5**	**12,985**
ECM 6	Vending Machine Control	12,895	1.5	0	$1,221	$1,840	$0	$1,840	1.5	12,985
TOTALS		**3,851,723**	**484.6**	**-34**	**$364,546**	**$1,878,116**	**$264,227**	**$1,613,889**	**4.4**	**3,874,667**

* - All incentives presented in this table are based on NJ SmartStart 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).

Figure 7 – All Evaluated 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		**3,251,706**	**352.0**	**-720**	**$302,400**	**$1,031,744**	**$194,042**	**$837,702**	**2.8**	**3,190,130**
ECM 1	Install LED Fixtures	3,241,921	350.9	-718	$301,491	$1,030,559	$193,800	$836,759	2.8	3,180,536
ECM 2	Retrofit Fixtures with LED Lamps	9,784	1.2	-2	$910	$1,185	$242	$943	1.0	9,594
Lighting Control Measures		**135,709**	**14.7**	**-31**	**$12,616**	**$103,476**	**$17,675**	**$85,801**	**6.8**	**133,075**
ECM 3	Install Occupancy Sensor Lighting Controls	134,828	14.6	-30	$12,534	$103,076	$17,675	$85,401	6.8	132,211
ECM 4	Install High/Low Lighting Controls	881	0.1	0	$82	$400	$0	$400	4.9	864
Variable Frequency Drive (VFD) Measures		**341,862**	**96.2**	**0**	**$32,379**	**$144,137**	**$26,920**	**$117,217**	**3.6**	**344,252**
ECM 5	Install VFDs on Constant Volume (CV) Fans	341,862	96.2	0	$32,379	$144,137	$26,920	$117,217	3.6	344,252
Food Service & Refrigeration Measures		**12,895**	**1.5**	**0**	**$1,221**	**$1,840**	**$0**	**$1,840**	**1.5**	**12,985**
ECM 6	Vending Machine Control	12,895	1.5	0	$1,221	$1,840	$0	$1,840	1.5	12,985
TOTALS		**3,742,172**	**464.4**	**-751**	**$348,617**	**$1,281,197**	**$238,637**	**$1,042,560**	**3.0**	**3,680,443**

* - All incentives presented in this table are based on NJ SmartStart 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).

Figure 8 – Cost Effective ECMs

4.1 Lighting

#	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		**3,251,706**	**352.0**	**-720**	**$302,400**	**$1,031,744**	**$194,042**	**$837,702**	**2.8**	**3,190,130**
ECM 1	Install LED Fixtures	3,241,921	350.9	-718	$301,491	$1,030,559	$193,800	$836,759	2.8	3,180,536
ECM 2	Retrofit Fixtures with LED Lamps	9,784	1.2	-2	$910	$1,185	$242	$943	1.0	9,594

When considering lighting upgrades, we suggest using a comprehensive design approach that simultaneously upgrades lighting fixtures and controls to maximize energy savings and improve occupant lighting. Comprehensive design will also consider appropriate lighting levels for different space types to make sure that the right amount of light is delivered where needed. If conversion to LED light sources are proposed, we suggest converting all of a specific lighting type (e.g., linear fluorescent) to LED lamps to minimize the number of lamp types in use at the facility, which should help reduce future maintenance costs.

ECM 1: Install LED Fixtures

Replace existing fixtures containing HID lamps with new LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

In some cases, HID fixtures can be retrofit with screw-based LED lamps. Replacing an existing HID fixture with a new LED fixture will generally provide better overall lighting optics; however, replacing the HID lamp with a LED screw-in lamp is typically a less expensive retrofit. We recommend you work with your lighting contractor to determine which retrofit solution is best suited to your needs and will be compatible with the existing fixture(s).

Maintenance savings may also be achieved since LED lamps last longer than other light sources and therefore do not need to be replaced as often.

Affected building areas: bus barns, other high ceiling areas, and exterior fixtures.

ECM 2: Retrofit Fixtures with LED Lamps

Replace fluorescent and incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps 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. Maintenance savings may also be available, as longer-lasting LEDs lamps will not need to be replaced as often as the existing lamps.

Affected building areas: all areas with fluorescent fixtures with T8 tubes and incandescent lamps.

4.2 Lighting Controls

#	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		**135,709**	**14.7**	**-31**	**$12,616**	**$103,476**	**$17,675**	**$85,801**	**6.8**	**133,075**
ECM 3	Install Occupancy Sensor Lighting Controls	134,828	14.6	-30	$12,534	$103,076	$17,675	$85,401	6.8	132,211
ECM 4	Install High/Low Lighting Controls	881	0.1	0	$82	$400	$0	$400	4.9	864

Lighting controls reduce energy use by turning off or lowering, lighting fixture power levels when not in use. A comprehensive approach to lighting design should upgrade the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 3: Install Occupancy Sensor Lighting Controls

Install occupancy sensors to control lighting fixtures in areas that are frequently unoccupied, even for short periods. For most spaces, we recommend lighting controls use dual technology sensors, which reduce the possibility of lights turning off unexpectedly.

Occupancy sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Most occupancy sensor lighting controls allow users to manually turn fixtures on/off, as needed. Some controls can also provide dimming options.

Occupancy sensors can be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are best suited to single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in large spaces, locations without local switching, and where wall switches are not in the line-of-sight of the main work area.

This measure provides energy savings by reducing the lighting operating hours.

Affected building areas: offices, conference rooms, restrooms, and storage rooms.

ECM 4: Install High/Low Lighting Controls

Install occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons.

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Fixtures automatically switch back to low level after a predefined period of vacancy. In parking lots and parking garages with significant ambient lighting, this control can sometimes be combined with photocell controls to turn the lights off when there is sufficient daylight.

This measure provides energy savings by reducing the light fixture power draw when reduced light output is appropriate.

Affected building areas: hallways.

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

4.3 Motors

#	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		**11,015**	**2.5**	**0**	**$1,043**	**$49,541**	**$0**	**$49,541**	**47.5**	**11,092**
	Premium Efficiency Motors	11,015	2.5	0	$1,043	$49,541	$0	$49,541	47.5	11,092

Premium Efficiency Motors

Replace standard efficiency motors with IHP 2014 efficiency motors. This evaluation assumes that existing motors will be replaced with motors of equivalent size and type. In some cases, additional savings may be possible by downsizing motors to better meet the motor's current load requirements.

Affected motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor
Shop area - HVU - 1	Body Shop	1	Supply Fan	15.0
Shop area - HVU - 2	Body Shop	1	Supply Fan	15.0
Shop area - HVU - 3	Body Shop	1	Supply Fan	20.0
Shop area - HVU - 4	Mech Shop	1	Supply Fan	15.0
Shop area - HVU - 5	Mech Shop	1	Supply Fan	15.0
Shop area - HVU - 6	Mech Shop	1	Supply Fan	15.0
Shop area - HVU - 7	Mech Shop	1	Supply Fan	20.0
Shop area - HVU - 8	Record Storage	1	Supply Fan	5.0
Shop area - HVU - 9	Central Stores	1	Supply Fan	15.0
Shop area - HVU - 10	Central Stores	1	Supply Fan	15.0
Shop area - HVU - 11	Central Stores	1	Supply Fan	15.0
Shop area - HVU - 12	Haz/Matl-Batt Ch Room	1	Supply Fan	3.0
Shop area - HVU - 13	NRVM Parts Store	1	Supply Fan	15.0
Shop area - HVU - 14	Non-Rev Vehicles	1	Supply Fan	15.0
Shop area - HVU - 15	Non-Rev Vehicles	1	Supply Fan	15.0
Shop area - HVU - 16	Non-Rev Vehicles	1	Supply Fan	5.0
Shop area - HVU - 17	Boody Rep/Parts Storage	1	Supply Fan	5.0
Shop area - HVU - 18	Body Rep/Parts Stor	1	Supply Fan	15.0
Shop area - HVU - 19	CFM area unit shop	1	Supply Fan	15.0

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor
Shop area - HVU - 20	CFM area unit shop	1	Supply Fan	7.5
Shop area - HVU - 21	Unit component clean	1	Supply Fan	5.0
Shop area - HVU - 22	Machine shop	1	Supply Fan	5.0
Shop area - HVU - 23	Steel metal shop	1	Supply Fan	3.0
Shop area - HVU - 24	Electric Shop	1	Supply Fan	15.0
Shop area - HVU - 25	Electrical substation	1	Supply Fan	7.5
Shop area - HVU - 26	Engine dyno	1	Supply Fan	15.0
Shop area - HVU - 27	Trans Dyno	1	Supply Fan	5.0
Shop area - HVU - 28	Chasis dynometer	1	Supply Fan	3.0
Shop area - HVU - 29	Steam clean room	1	Supply Fan	2.0
Shop area - HVU - 30	Pretreat Dyn Fac room	1	Supply Fan	5.0
Shop area - HVU - 31	Bus prep area	1	Supply Fan	1.5
Shop area - HVU - 32	Bus Spray paint room	1	Supply Fan	3.0
Shop area - HVU - 33	Paint Booth	1	Supply Fan	3.0
Shop area - HVU - 34	Paint Booth	1	Supply Fan	3.0

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor
Boiler room	DHW	2	Other	0.3

Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours. The base case motor energy consumption is estimated using the efficiencies found on nameplates or estimated based on the age of the motor and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the current *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*.

4.4 Variable Frequency Drives (VFD)

#	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		**342,715**	**96.4**	**0**	**$32,460**	**$148,824**	**$26,920**	**$121,904**	**3.8**	**345,112**
ECM 5	Install VFDs on Constant Volume (CV) Fans	341,862	96.2	0	$32,379	$144,137	$26,920	$117,217	3.6	344,252
	Install VFDs on Heating Water Pumps	853	0.2	0	$81	$4,687	$0	$4,687	58.0	859

Variable frequency drives control motors for fans, pumps, and process equipment based on the actual output required of the driven equipment. Energy savings result from more efficient control of motor energy usage when equipment operates at partial load. The magnitude of energy savings depends on the estimated amount of time that the motor would operate at partial load. For equipment with proposed VFDs, we have included replacing the controlled motor with a new motor —unless the existing motor meets or exceeds IHP 2014 standards—to conservatively account for the cost of an inverter duty rated motor. The savings and cost associated with the new motor are presented with the Premium Efficiency Motor measures. If the proposed VFD measure is not selected for implementation the motor replacement should be reevaluated.

ECM 5: Install VFDs on Constant Volume (CV) Fans

Install VFDs to control constant volume fan motor speeds. This converts 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 signal the VFD to adjust fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature.

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

Energy savings result from reducing the fan speed (and power) when conditions allow for reduced air flow.

Affected units: 34 HV units in the shop area.

Install VFDs on Heating Water Pumps

Install variable frequency drives (VFD) to control heating water pumps. Two-way valves must serve the hot water coils and the hot water loop must have a differential pressure sensor installed. If three-way valves or a bypass leg are used in the hot water distribution they will need to be modified when this measure is implemented. As the hot water valves close, the differential pressure increases and the VFD modulates the pump speed to maintain a differential pressure setpoint.

Energy savings result from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

Affected pumps: two, 3 hp heating hot water pumps.

4.5 Electric Unitary HVAC

#	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		**99,396**	**17.4**	**0**	**$9,414**	**$258,772**	**$12,469**	**$246,302**	**26.2**	**100,091**
	Install High Efficiency Air Conditioning Units	99,396	17.4	0	$9,414	$258,772	$12,469	$246,302	26.2	100,091

Replacing the unitary HVAC units has a long payback period and may not be justifiable based simply on energy considerations. However, most of the units at this facility are nearing or have reached the end of their normal useful life. Typically, the marginal cost of purchasing a high efficiency unit can be justified by the marginal savings from the improved efficiency. When the AC units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

Install High Efficiency Air Conditioning Units

Replace standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. 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.

4.6 Gas-Fired Heating

#	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**	**522**	**$4,045**	**$74,485**	**$5,810**	**$68,675**	**17.0**	**61,124**
	Install High Efficiency Hot Water Boilers	0	0.0	522	$4,045	$74,485	$5,810	$68,675	17.0	61,124

Install High Efficiency Hot Water Boilers

Replace older inefficient hot water boilers with high efficiency hot water boilers. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

The most notable efficiency improvement is condensing hydronic boilers which can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130°F. Therefore, condensing hydronic boilers are evaluated when the return water temperature is less than 130°F during most of the operating hours.

For the purposes of this analysis, we evaluated the replacement of boilers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load at this facility. In many cases installing multiple modular boilers rather than one or two large boilers will result in higher overall plant efficiency while providing additional system redundancy.

Replacing the boilers has a long payback and may not be justifiable based simply on energy considerations. However, the boilers [are nearing, have reached] the end of their normal useful life. Typically, the marginal cost of purchasing high efficiency boilers can be justified by the marginal savings from the improved efficiency. When the boiler is eventually replaced, consider purchasing boilers that exceed the minimum efficiency required by building codes. We also recommend working with your mechanical design team to determine whether the heating system can operate with return water temperatures below 130°F, which would allow the use of condensing boilers.

4.7 Domestic Water Heating

#	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**	**195**	**$1,508**	**$209,435**	**$7,311**	**$202,124**	**134.1**	**22,783**
	Install High Efficiency Gas-Fired Water Heater	0	0.0	195	$1,508	$209,435	$7,311	$202,124	134.1	22,783

Install High Efficiency Gas-Fired Water Heater

Replace the existing tank water heater with a high efficiency tank water heater. Energy savings result from the increased efficiency of the unit, which uses less gas to heat water, and fewer operating hours to maintain the tank water temperature.

4.8 Food Service & Refrigeration Measures

#	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)
Food Service & Refrigeration Measures		**12,895**	**1.5**	**0**	**$1,221**	**$1,840**	**$0**	**$1,840**	**1.5**	**12,985**
ECM 6	Vending Machine Control	12,895	1.5	0	$1,221	$1,840	$0	$1,840	1.5	12,985

ECM 6: Vending Machine Control

Vending machines operate continuously, even during unoccupied hours. Install occupancy sensor controls to reduce energy use. These controls power down vending machines when the vending machine area has been vacant for some time, and, they power up the machines at necessary regular intervals or when the surrounding area is occupied. Energy savings are dependent on the vending machine and activity level in the area surrounding the machines.

5 ENERGY EFFICIENT BEST PRACTICES

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs. You may already be doing some of these things— see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

Energy Tracking with ENERGY STAR® Portfolio Manager®

You've heard it before - you can't manage what you don't measure. ENERGY STAR® Portfolio Manager® is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions[4]. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Lighting Controls

As part of a lighting maintenance schedule, test lighting controls to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight and photocell sensors, maintenance involves cleaning sensor lenses and confirming that setpoints and sensitivity are configured properly.

Motor Maintenance

Motors have many moving parts. As these parts degrade over time, the efficiency of the motor is reduced. Routine maintenance prevents damage to motor components. Routine maintenance should include 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.

Destratification Fans

For areas with high ceilings, destratification fans f air balance the air temperature from floor to ceiling. They help reduce the recovery time needed to warm the space after nightly temperature setbacks and will increase occupants' the comfort level.

Areas with high ceilings require the heating system to heat a larger volume of space than that which is occupied. As the warm air rises, the warmest space is at the ceiling level, rather than floor level. Higher temperatures at the ceiling accelerate heat loss through the roof, which requires additional energy consumption by the heating equipment to compensate for this accelerated heat transfer.

[4] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager

Thermostat Schedules and Temperature Resets

Use thermostat setback temperatures and schedules to reduce heating and cooling energy use during periods of low or no occupancy. Thermostats should be programmed for a setback of 5°F-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced 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.

AC System Evaporator/Condenser Coil Cleaning

Dirty evaporator and condenser coils restrict air flow and restrict heat transfer. This increases the loads on the evaporator and condenser fan, and decreases overall cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

HVAC Filter Cleaning and Replacement

Air filters should be checked regularly (often monthly) and cleaned or replaced when appropriate. Air filters reduce indoor air pollution, increase occupant comfort, and help keep equipment operating efficiently. If the building has a building management system, consider installing a differential pressure switch across filters to send an alarm about premature fouling or overdue filter replacement. Over time, filters become less and less effective as particulate buildup increases. Dirty filters also restrict air flow through the air conditioning or heat pump system, which increases the load on the distribution fans.

Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Boilers should be cleaned according to the manufacturer's instructions to remove soot and scale from the water side or fire side of the boiler.

Furnace Maintenance

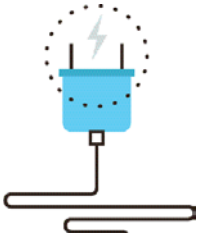
Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should: check for gas/carbon monoxide leaks; change the air and fuel filters; check components for cracks, corrosion, dirt, or debris build-up; ensure the ignition system is working properly; test and adjust operation and safety controls; inspect electrical connections; and lubricate motors and bearings.

Water Heater Maintenance

Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. At least once a year, follow manufacturer instructions to 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. Annual checks should include checks for:

- Leaks or heavy corrosion on the pipes and valves.
- 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 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 more than three years old, have a technician inspect the sacrificial anode annually.

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips[5]. Your local utility may offer incentives or rebates for this equipment.

Water Conservation

Installing dual flush or low-flow toilets and low-flow/waterless urinals are ways to reduce water use. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and for flush valve toilets is 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

For more information regarding water conservation go to the EPA's WaterSense™ website[6] or download a copy of EPA's "WaterSense™ at Work: Best Management Practices for Commercial and Institutional Facilities"[7] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

[5] For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices

[6] https://www.epa.gov/watersense

[7] https://www.epa.gov/watersense/watersense-work-0

Water conservation devices that do not reduce hot water consumption will not provide energy savings at the site level, but they may significantly affect your water and sewer usage costs. 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.

If the facility has detached buildings with a master water meter for the entire campus, check for unnatural wet areas in the lawn or water seeping in the foundation at water pipe penetrations through the foundation. Periodically check overnight meter readings when the facility is unoccupied, and there is no other scheduled water usage.

Manage irrigation systems to use water more effectively outside the building. Adjust spray patterns so that water lands on intended lawns and plantings and not on pavement and walls. Consider installing an evapotranspiration irrigation controller that will prevent over-watering.

Procurement Strategies

Purchasing efficient products reduces energy costs without compromising quality. Consider modifying your procurement policies and language to require ENERGY STAR® or WaterSense™ products where available.

6 On-site Generation

You don't have to look far in New Jersey to see one of the thousands of solar electric systems providing clean power to homes, businesses, schools, and government buildings. On-site generation includes both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) technologies that generate power to meet all or a portion of the facility's electric energy needs. Also referred to as distributed generation, these systems contribute to greenhouse gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases reduction, which results in improved electric grid reliability through better use of transmission and distribution systems.

Preliminary screenings were performed to determine if an on-site generation measure could be a cost-effective solution for your facility. Before deciding to install an on-site generation system, we recommend conducting a feasibility study to analyze 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 Solar Photovoltaic

Photovoltaic (PV) panels convert sunlight into electricity. Individual panels are combined into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is then connected to the building's electrical distribution system.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential. A PV array located on the roof may be feasible. If you are interested in pursuing the installation of PV, we recommend conducting a full feasibility study.

The graphic below displays the results of the PV potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.

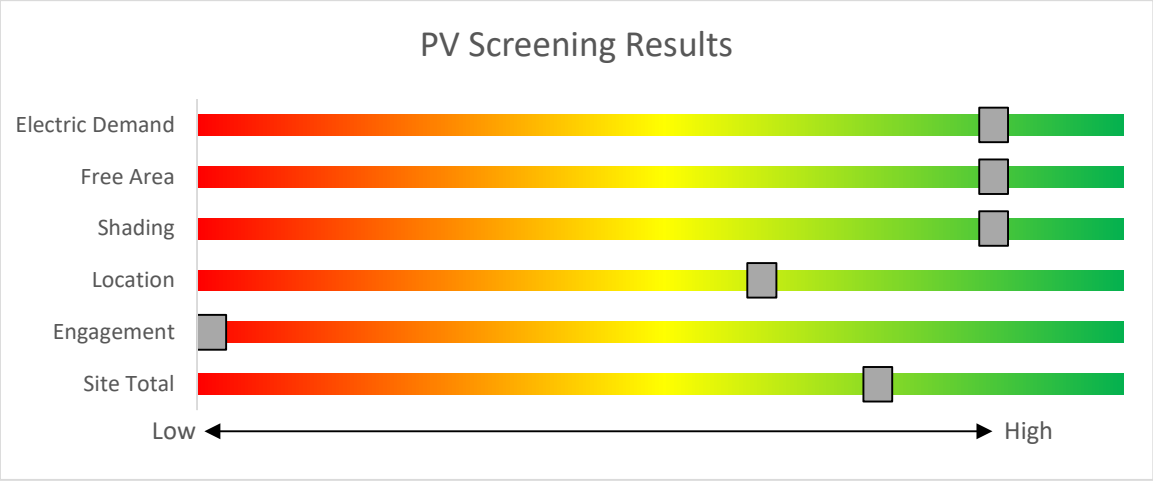


Figure 9 - Photovoltaic Screening

Solar Renewable Energy Certificate (SREC) Registration Program (SRP)

Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SREC Registration Program before starting construction. Once your PV system is up and running, you periodically earn credits, which can then be sold on the open market for up to 15 years.

If you are considering installing solar photovoltaics on your building, visit www.njcleanenergy.com/srec for more information about the SREC Registration Program.

Get more information about solar power in New Jersey or find a qualified solar installer who can help you decide if solar is right for your building:

- **Basic Info on Solar PV in NJ**: www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: 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) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for space cooling.

The key criteria used for screening is the amount of time that the CHP system would operate at full load and the facility's ability to use the recovered heat. Facilities with a continuous need 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 no potential for installing a cost-effective CHP system.

Based on a preliminary analysis, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation. The lack of gas service, low or infrequent thermal load, and lack of space for siting the equipment are the most significant factors contributing to the lack of CHP potential.

The graphic below displays the results of the CHP potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.

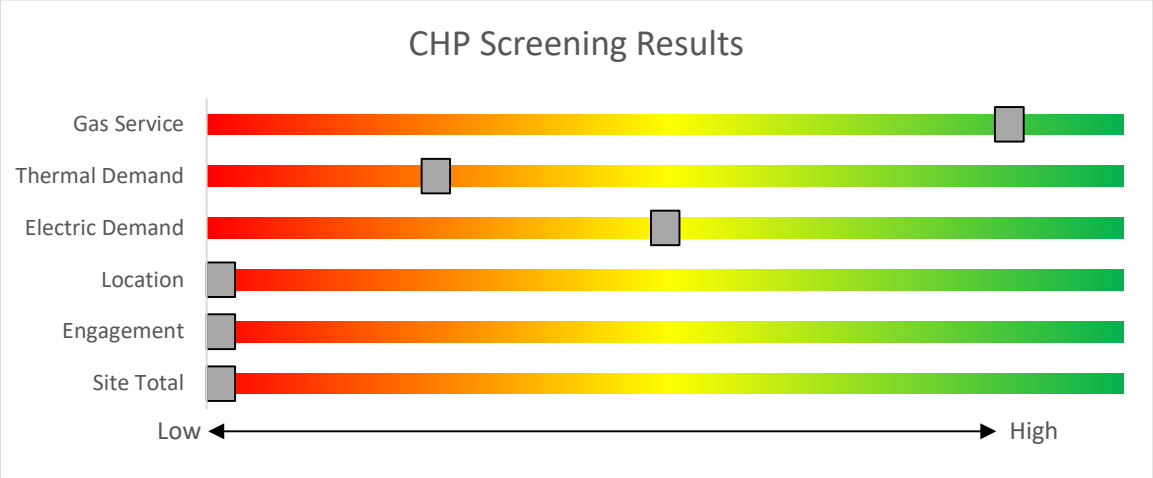


Figure 10 - Combined Heat and Power Screening

Find a qualified firm that specializes in commercial CHP cost assessment and installation: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.

7 PROJECT FUNDING AND INCENTIVES

Ready to improve your building's performance? Pick the program that works best for you. Incentive programs that may apply to this facility are identified in the Executive Summary. This section provides an overview of currently available from New Jersey's Clean Energy Programs.

	SmartStart *Flexibility to install at your own pace*	**Direct Install** *Turnkey installation*	**Pay for Performance** *Whole building upgrades*
Who should use it?	Buildings installing individual measures or small group of measures.	Small to mid-size facilities that can bundle multiple measures together. Average peak demand should be below 200 kW. Not suitable for significant building shell issues.	Mid to large size facilities looking to implement as many measures as possible at one time. Peak demand should be over 200 kW.
How does it work?	Use in-house staff or your preferred contractor.	Pre-approved contractors pass savings along to you via reduced material and labor costs.	Whole-building approach to energy upgrades designed to reduce energy use by at least 15%. The more you save, the higher the incentives.
What are the Incentives?	Fixed incentives for specific energy efficiency measures.	Incentives pay up to 70% of eligible costs, up to $125,000 per project. You pay the remaining 30% directly to the contractor.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
How do I participate?	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified Partner to develop your Energy Reduction Plan and set your energy savings targets.
Take the next step by visiting **www.njcleanenergy.com** for program details, applications, and to contact a qualified contractor.			

7.1 SmartStart

SmartStart offers incentives for installing prescriptive and custom energy efficiency measures at your facility. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades. This program serves most common equipment types and sizes.

SmartStart routinely adds, removes, or modifies incentives from year-to-year for various energy-efficient 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

Incentives

The SmartStart Prescriptive program provides fixed incentives for specific energy efficiency measures. Prescriptive incentives vary by equipment type.

SmartStart Custom provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentives. Custom incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings. Incentives are 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

Submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. You can work with your preferred contractor or use internal staff to install measures.

Visit www.njcleanenergy.com/SSB for a detailed program description, instructions for applying, and applications.

7.2 Pay for Performance - Existing Buildings

Pay for Performance works for larger customers with a peak demand over 200 kW. The minimum installed scope of work must include at least two unique measures that results in at least 15% source energy savings, and 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 to achieve deep energy savings. This program has an added benefit of addressing measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program loan also use this program.

The scope of work presented in this audit report does not quite meet the requirements of the current P4P program. However, due to the size of the facility and existing conditions, should additional measures be identified at a later point in time, for example through further evaluation or the Energy Savings Improvement Program process, this facility could potentially meet the requirements necessary to participate in the P4P program.

Incentives

Incentives are 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

Contact one of the pre-approved consultants and contractors (“Partners”). Under direct contract to you, they will help further evaluate the measures identified in this report through development of the energy reduction plan), assist you in implementing selected measures, and verify actual savings one year after the installation. Your Partner will also help you apply for incentives.

Approval of the final scope of work is required by the program prior to installation. Installation can be done by the contractor of your choice (some P4P Partners are also contractors) or by internal staff, but the Partner remains involved throughout construction to ensure compliance with the program requirements.

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

7.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. An ESIP is a type of performance contract, whereby school districts, counties, municipalities, housing authorities and other public and state entities enter into contracts to help finance building energy upgrades. Annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive for the life of the contract.

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 described above can also be used to help further reduce the total project cost of eligible measures.

How to Participate

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 used 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. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program description and application can be found at: www.njcleanenergy.com/ESIP.

ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you can use NJCEP incentive programs to help further reduce costs when developing the energy savings plan. Refer to the ESIP guidelines at the link above for further information and guidance on next steps.

7.4 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 prior to the start of construction to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

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

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

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar Renewable Portfolio Standard. Purchasing SRECs can help them meet those requirements. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period fluctuates depending on supply and demand.

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

8 Energy Purchasing and Procurement Strategies

8.1 Retail Electric Supply Options

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 already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party electric suppliers is available at the NJBPU website[8].

8.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate monthly. 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 typically depends on whether a customer prefers 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 does not already purchase natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility already purchases natural gas from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party natural gas suppliers is available at the NJBPU website[9].

[8] www.state.nj.us/bpu/commercial/shopping.html.

[9] 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	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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
Mechanical room	17	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	6,916		None	No	17	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	6,916	0.0	0	0	$0	$0	$0	0.0
Computer room	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.0	381	0	$35	$270	$35	6.6
Computer room shop	3	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	3	LED - Fixtures: High-Bay	Wall Switch	120	6,916	0.9	7,153	-2	$665	$2,325	$450	2.8
Central stores*	28	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1, 3	Fixture Replacement	Yes	28	LED - Fixtures: High-Bay	Occupancy Sensor	120	4,772	9.0	74,110	-17	$6,890	$22,297	$4,800	2.5
Central stores	91	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	91	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.7	5,771	-1	$537	$2,160	$280	3.5
Central stores	3	Exit Signs: LED - 2 W Lamp	None		60	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	60	8,760	0.0	0	0	$0	$0	$0	0.0
Central stores*	104	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1, 3	Fixture Replacement	Yes	104	LED - Fixtures: High-Bay	Occupancy Sensor	120	4,772	33.3	275,265	-62	$25,590	$80,588	$15,600	2.5
Central stores*	216	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	6,916	3	None	Yes	216	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	4,772	0.8	6,849	-2	$637	$47,520	$7,560	62.8
Central stores	81	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	81	LED - Fixtures: High-Bay	Wall Switch	120	6,916	23.4	193,133	-44	$17,955	$62,765	$12,150	2.8
Jim Gomes office	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.1	507	0	$47	$270	$35	5.0
Storage	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916		None	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,916	0.0	0	0	$0	$0	$0	0.0
Storage	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	6,916		None	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	6,916	0.0	0	0	$0	$0	$0	0.0
Non-revenue vehicles	94	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	94	LED - Fixtures: High-Bay	Wall Switch	120	6,916	27.1	224,130	-51	$20,836	$72,839	$14,100	2.8
Offices	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.0	254	0	$24	$270	$35	10.0
Offices	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	6,916	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	6,916	0.0	205	0	$19	$72	$10	3.3
Offices	2	LED - Fixtures: Ambient - 2' - Indirect Fixture	Wall Switch	S	36	6,916		None	No	2	LED - Fixtures: Ambient - 2' - Indirect Fixture	Wall Switch	36	6,916	0.0	0	0	$0	$0	$0	0.0
Offices	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	6,916	3	None	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,772	0.1	1,015	0	$94	$270	$35	2.5
Machine shop	81	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	81	LED - Fixtures: High-Bay	Wall Switch	120	6,916	23.4	193,133	-44	$17,955	$62,765	$12,150	2.8
Machine shop - transmission	4	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	4	LED - Fixtures: High-Bay	Wall Switch	120	6,916	1.2	9,537	-2	$887	$3,100	$600	2.8
Dyno room	1	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	1	LED - Fixtures: High-Bay	Wall Switch	120	6,916	0.3	2,384	-1	$222	$775	$150	2.8
Lounge	4	LED - Fixtures: Ambient - 2' - Indirect Fixture	Wall Switch	S	36	6,916	3	None	Yes	4	LED - Fixtures: Ambient - 2' - Indirect Fixture	Occupancy Sensor	36	4,772	0.0	315	0	$29	$116	$20	3.3
Restroom - Men	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.1	507	0	$47	$270	$35	5.0
Restroom - shower	2	Incandescent: Screw-in 1 lamp	Wall Switch	S	60	6,916	2	Relamp	No	2	LED Screw-In Lamps: Screw-in 1 lamp	Wall Switch	9	6,916	0.1	720	0	$67	$34	$2	0.5
Restroom - Women	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.1	507	0	$47	$270	$35	5.0
Restroom - shower	2	Incandescent: Screw-in 1 lamp	Wall Switch	S	60	6,916	2	Relamp	No	2	LED Screw-In Lamps: Screw-in 1 lamp	Wall Switch	9	6,916	0.1	720	0	$67	$34	$2	0.5

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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
Engine dyno - room #1	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916		None	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,916	0.0	0	0	$0	$0	$0	0.0
Engine dyno - room #1	1	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	1	LED - Fixtures: High-Bay	Wall Switch	120	6,916	0.3	2,384	-1	$222	$775	$150	2.8
Engine dyno - room #1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,916	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,916	0.0	233	0	$22	$37	$10	1.2
Test control room #2	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	6,916	3	None	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,772	0.0	381	0	$35	$116	$20	2.7
Paint room	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	6,916	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,772	0.3	2,370	-1	$220	$335	$80	1.2
Wash room (parts)	7	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	7	LED - Fixtures: High-Bay	Wall Switch	120	6,916	2.0	16,691	-4	$1,552	$5,424	$1,050	2.8
Sand blasting	2	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	2	LED - Fixtures: High-Bay	Wall Switch	120	6,916	0.6	4,769	-1	$443	$1,550	$300	2.8
Shop office	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.0	381	0	$35	$116	$20	2.7
Shop office	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	6,916	3	None	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,772	0.1	507	0	$47	$116	$20	2.0
Shop office	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.0	190	0	$18	$348	$60	16.3
Parts room	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,916	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.3	2,666	-1	$248	$599	$125	1.9
Electrical department	24	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	24	LED - Fixtures: High-Bay	Wall Switch	120	6,916	6.9	57,225	-13	$5,320	$18,597	$3,600	2.8
Electrical department	2	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	6,916	2	Relamp	No	2	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	6,916	0.1	536	0	$50	$177	$40	2.7
Metal shop	45	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	45	LED - Fixtures: High-Bay	Wall Switch	120	6,916	13.0	107,296	-24	$9,975	$34,870	$6,750	2.8
Electrical foreman office	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.0	254	0	$24	$116	$20	4.1
Break room	41	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	41	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.3	2,600	-1	$242	$1,080	$140	3.9
Conference room	8	Incandescent: Screw-in 1 lamp	Wall Switch	S	60	6,916	2, 3	Relamp	Yes	8	LED Screw-In Lamps: Screw-in 1 lamp	Occupancy Sensor	9	4,772	0.4	3,036	-1	$282	$408	$43	1.3
Conference room	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.0	317	0	$29	$0	$0	0.0
Exit	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Restroom - Male	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.1	571	0	$53	$270	$35	4.4
Exit	3	Exit Signs: LED - 2 W Lamp	None		60	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	60	8,760	0.0	0	0	$0	$0	$0	0.0
Central parts office	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.0	317	0	$29	$116	$20	3.3
Central parts office - hall	2	LED - Fixtures: Ambient - 2' - Indirect Fixture	Wall Switch	S	36	6,916		None	No	2	LED - Fixtures: Ambient - 2' - Indirect Fixture	Wall Switch	36	6,916	0.0	0	0	$0	$0	$0	0.0
Restroom	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,916	0.0	0	0	$0	$0	$0	0.0
Break room	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916		None	No	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,916	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Break room	1	LED - Fixtures: Ambient - 2' - Indirect Fixture	Wall Switch	S	36	6,916		None	No	1	LED - Fixtures: Ambient - 2' - Indirect Fixture	Wall Switch	36	6,916	0.0	0	0	$0	$0	$0	0.0
2nd floor office	23	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.2	1,459	0	$136	$540	$70	3.5
Restroom	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,916	0.0	0	0	$0	$0	$0	0.0
Exit	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Closet	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	6,916	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	4,772	0.1	553	0	$51	$261	$20	4.7
Battery storage	4	LED - Fixtures: Ambient - 2' - Indirect Fixture	Occupancy Sensor	S	36	6,916		None	No	4	LED - Fixtures: Ambient - 2' - Indirect Fixture	Occupancy Sensor	36	6,916	0.0	0	0	$0	$0	$0	0.0
Hazmat room	21	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	21	LED - Fixtures: High-Bay	Wall Switch	120	6,916	6.1	50,072	-11	$4,655	$16,273	$3,150	2.8
Iron bound bus barn*	63	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	8,760	1, 3	Fixture Replacement	Yes	63	LED - Fixtures: High-Bay	Occupancy Sensor	120	6,044	20.2	211,207	-48	$19,635	$62,678	$11,655	2.6
Iron bound bus barn*	92	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	8,760	1, 3	Fixture Replacement	Yes	92	LED - Fixtures: High-Bay	Occupancy Sensor	120	6,044	29.5	308,429	-70	$28,673	$91,529	$17,020	2.6
Bus paint area	123	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,760		None	No	123	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,760	0.0	0	0	$0	$0	$0	0.0
Bus paint area	11	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	8,760	1	Fixture Replacement	No	11	LED - Fixtures: High-Bay	Wall Switch	120	8,760	3.2	33,221	-7	$3,088	$8,524	$1,650	2.2
Paint room	52	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,760		None	No	52	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,760	0.0	0	0	$0	$0	$0	0.0
Paint room	52	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,760		None	No	52	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,760	0.0	0	0	$0	$0	$0	0.0
Paint room	30	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,760		None	No	30	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,760	0.0	0	0	$0	$0	$0	0.0
Fuel Isle	43	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,760		None	No	43	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	8,760	0.0	0	0	$0	$0	$0	0.0
Fuel Isle	30	Metal Halide: (1) 250W Lamp	Wall Switch	S	295	8,760	1	Fixture Replacement	No	30	LED - Fixtures: High-Bay	Wall Switch	80	8,760	5.5	57,632	-13	$5,358	$23,246	$4,500	3.5
Lube room	14	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	8,760	3	None	Yes	14	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	6,044	0.1	562	0	$52	$270	$35	4.5
Bus Wash area	36	Metal Halide: (1) 250W Lamp	Wall Switch	S	295	8,760	1	Fixture Replacement	No	36	LED - Fixtures: High-Bay	Wall Switch	80	8,760	6.6	69,158	-16	$6,429	$27,896	$5,400	3.5
Bus Wash area	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,760		None	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,760	0.0	0	0	$0	$0	$0	0.0
Bus Wash area	3	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	8,760	1	Fixture Replacement	No	3	LED - Fixtures: High-Bay	Wall Switch	120	8,760	0.9	9,060	-2	$842	$2,325	$450	2.2
Exterior - Poles	7	High-Pressure Sodium: (1) 400W Lamp	Timeclock		465	4,380	1	Fixture Replacement	No	7	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	140	4,380	1.6	9,980	0	$945	$6,514	$700	6.2
Exterior - Wallpack	20	High-Pressure Sodium: (1) 150W Lamp	Photocell		175	4,380	1	Fixture Replacement	No	20	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	53	4,380	1.7	10,731	0	$1,016	$19,319	$2,000	17.0
Exterior - Wallpack	20	High-Pressure Sodium: (1) 100W Lamp	Photocell		138	4,380	1	Fixture Replacement	No	20	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	41	4,380	1.4	8,462	0	$801	$19,319	$2,000	21.6
Exterior - Wallpack	19	High-Pressure Sodium: (1) 70W Lamp	Photocell		75	4,380	1	Fixture Replacement	No	19	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	23	4,380	0.7	4,369	0	$414	$18,353	$1,900	39.8

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Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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
Exterior - Wallpack	20	Metal Halide: (1) 250W Lamp	Photocell		295	4,380	1	Fixture Replacement	No	20	LED - Fixtures: High-Bay	Photocell	80	4,380	3.0	18,834	0	$1,784	$15,498	$3,000	7.0
Exterior - Wallpack	2	Metal Halide: (1) 1000W Lamp	Photocell		1,080	4,380	1	Fixture Replacement	No	2	LED - Fixtures: High-Bay	Photocell	400	4,380	1.0	5,957	0	$564	$1,550	$300	2.2
Body Shop	10	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	10	LED - Fixtures: High-Bay	Wall Switch	120	6,916	2.9	23,844	-5	$2,217	$7,749	$1,500	2.8
Paint room	46	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	6,916		None	No	46	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	6,916	0.0	0	0	$0	$0	$0	0.0
Paint room	10	Exit Signs: LED - 2 W Lamp	None		6	6,916		None	No	10	Exit Signs: LED - 2 W Lamp	None	6	6,916	0.0	0	0	$0	$0	$0	0.0
Body Shop	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916		None	No	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,916	0.0	0	0	$0	$0	$0	0.0
Tire room*	38	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	38	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.3	2,410	-1	$224	$800	$800	0.0
Main lobby*	26	High-Pressure Sodium: (1) 100W Lamp	Wall Switch	S	138	6,916	1, 3	Fixture Replacement	Yes	26	LED - Fixtures: High-Bay	Occupancy Sensor	41	4,772	2.4	20,072	-5	$1,866	$25,867	$4,810	11.3
IB Maintenance shop*	32	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	6,916	3	None	Yes	32	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	4,772	0.1	1,015	0	$94	$600	$600	0.0
IB Maintenance shop*	1	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1, 3	Fixture Replacement	Yes	1	LED - Fixtures: High-Bay	Occupancy Sensor	120	4,772	0.3	2,647	-1	$246	$775	$150	2.5
IB Maintenance shop*	4	Exit Signs: LED - 2 W Lamp	None		6	6,916		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	6,916	0.0	0	0	$0	$0	$0	0.0
Steam room	44	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916		None	No	44	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,916	0.0	0	0	$0	$0	$0	0.0
IB Shop	94	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	6,916	1	Fixture Replacement	No	94	LED - Fixtures: High-Bay	Wall Switch	120	6,916	27.1	224,130	-51	$20,836	$72,839	$14,100	2.8
IB Shop	87	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916		None	No	87	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,916	0.0	0	0	$0	$0	$0	0.0
IB Offices	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.0	381	0	$35	$270	$35	6.6
IB Offices	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,916	3	None	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,772	0.1	1,142	0	$106	$540	$70	4.4
IB Offices	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	6,916	3	None	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,772	0.0	254	0	$24	$116	$0	4.9
IB Offices	4	LED Screw-In Lamps: Screw-in 1 lamp	Wall Switch	S	10	6,916	3	None	Yes	4	LED Screw-In Lamps: Screw-in 1 lamp	Occupancy Sensor	10	4,772	0.0	87	0	$8	$270	$35	28.9
Locekr room	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.1	1,282	0	$119	$270	$35	2.0
Bathroom	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.0	481	0	$45	$270	$35	5.3
Bathroom	6	LED Screw-In Lamps: Screw-in 1 lamp	Wall Switch	S	10	8,736	3	None	Yes	6	LED Screw-In Lamps: Screw-in 1 lamp	Occupancy Sensor	10	6,028	0.0	166	0	$15	$270	$35	15.3
Quality assurance	11	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.1	881	0	$82	$270	$35	2.9
Restroom - Male	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.1	961	0	$89	$270	$35	2.6
IB lobby	11	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	4	None	Yes	11	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	6,028	0.1	881	0	$82	$400	$0	4.9
Storage	14	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	8,736	3	None	Yes	14	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	6,028	0.1	561	0	$52	$116	$0	2.2

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Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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
IB break room	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.1	1,442	0	$134	$540	$70	3.5
Electrical	41	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	8,736		None	No	41	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	8,736	0.0	0	0	$0	$0	$0	0.0
Electrical	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Phone room	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736		None	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.0	0	0	$0	$0	$0	0.0
2nd floor: Archives	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736		None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.0	0	0	$0	$0	$0	0.0
2nd floor: ESS offices	53	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736		None	No	53	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.0	0	0	$0	$0	$0	0.0
2nd floor: Telephone room	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.0	160	0	$15	$116	$20	6.4
2nd floor: Operating training	16	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,736	3	None	Yes	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	6,028	0.2	2,563	-1	$238	$270	$35	1.0
2nd floor: Storage parts	18	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	8,736	3	None	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	6,028	0.2	2,163	0	$201	$540	$70	2.3
2nd Floor : Storage parts	6	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,736	3	None	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	6,028	0.1	961	0	$89	$270	$35	2.6
Pool room	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736		None	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.0	0	0	$0	$0	$0	0.0
Quiet room	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736		None	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.0	0	0	$0	$0	$0	0.0
Union office	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,736		None	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	8,736	0.0	0	0	$0	$0	$0	0.0
Drivers lounge	54	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,736		None	No	54	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	8,736	0.0	0	0	$0	$0	$0	0.0
Hallway	12	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,736		None	No	12	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	8,736	0.0	0	0	$0	$0	$0	0.0
Restroom - Men	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.0	320	0	$30	$270	$35	7.9
Restroom - Women	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.0	401	0	$37	$270	$35	6.3
Restroom - Women	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.0	80	0	$7	$0	$0	0.0
Depot Master: Open office	12	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,736		None	No	12	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	8,736	0.0	0	0	$0	$0	$0	0.0
Depot Master: Private office	12	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,736	3	None	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	6,028	0.2	1,923	0	$179	$270	$35	1.3
Depot Master: Storage	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736		None	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.0	0	0	$0	$0	$0	0.0
Depot Master: Restroom	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.0	0	0	$0	$0	$0	0.0
Depot Master: Kitchen	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736		None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.0	0	0	$0	$0	$0	0.0
Depot Master:Warranty office	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736		None	No	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.0	0	0	$0	$0	$0	0.0
Depot Master: Conference room	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736		None	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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
Depot Master: Electronics office	20	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,736		None	No	20	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	8,736	0.0	0	0	$0	$0	$0	0.0
Depot Master: Electronics office	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,736		None	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	8,736	0.0	0	0	$0	$0	$0	0.0
Depot Master: Principal's office	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,736		None	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	8,736	0.0	0	0	$0	$0	$0	0.0
Depot Master: Conference room	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,736		None	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	8,736	0.0	0	0	$0	$0	$0	0.0
Depot Master: Testing	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	8,736		None	No	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	8,736	0.0	0	0	$0	$0	$0	0.0
Depot Master: Heavy Mech/Body shop	360	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	8,736	1	Fixture Replacement	No	360	LED - Fixtures: High-Bay	Wall Switch	120	8,736	103.9	1,084,256	-244	$100,799	$278,958	$54,000	2.2
Depot Master: Maintenance office	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.1	561	0	$52	$270	$35	4.5
Depot Master: Fore center	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.0	160	0	$15	$116	$0	7.8
Depot Master: CMF offices	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.0	481	0	$45	$270	$35	5.3
Depot Master: CMF offices	17	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736		None	No	17	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,736	0.0	0	0	$0	$0	$0	0.0
Depot Master: (Foreman's mech)	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	8,736	3	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,028	0.0	320	0	$30	$116	$20	3.2
Engine dyno - room #2	4	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	8,736	1	Fixture Replacement	No	4	LED - Fixtures: High-Bay	Wall Switch	137	8,736	1.1	11,427	-3	$1,062	$3,100	$600	2.4

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?	Remaining Useful Life	Annual Operating Hours	ECM #	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
Ironbound area	Bus equipment	2	Air Compressor	60.0	95.0%	Yes	W	6,978		No	95.0%	No		0.0	0	0	$0	$0	$0	0.0
Shop compressor room	Shop compressor room	2	Air Compressor	125.0	95.4%	No	W	6,978		No	95.4%	No		0.0	0	0	$0	$0	$0	0.0
Shop compressor room	Shop compressor room	1	Air Compressor	100.0	95.4%	No	W	6,978		No	95.4%	No		0.0	0	0	$0	$0	$0	0.0
Shop compressor room	Shop compressor room	1	Other	0.3	60.0%	No	W	2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Shop compressor room	Shop compressor room	1	Other	0.8	60.0%	No		2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Parts wash room	Vehicles	10	Other	9.4	91.7%	No		3,391		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Parts wash room	Vehicles	2	Other	2.3	86.5%	No		2,745		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Parts wash room	Vehicles	2	Other	4.7	89.5%	No		2,745		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Bus wash equipment	Vehicles	2	Process Pump	1.5	85.5%	No		2,745		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Bus wash equipment	Vehicles	2	Process Pump	7.5	91.7%	No		3,391		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Bus wash equipment	Vehicles	2	Process Pump	7.5	91.7%	No		3,391		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Bus wash equipment	Vehicles	2	Process Pump	20.0	93.0%	No		3,391		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Parts wash room	Barn	8	Other	1.5	82.5%	No		2,745		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler room	Boiler room	1	Process Blower	0.3	60.0%	No		2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
AHU	AHU	1	Supply Fan	5.0	89.5%	No		2,745		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler room	Boiler	2	Heating Hot Water Pump	3.0	89.5%	No	N	2,745		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler room	DHW	2	Other	0.3	60.0%	No	W	2,745	NR, NR	Yes	73.4%	Yes	2	0.2	1,134	0	$107	$5,598	$0	52.1
Newak bus facility/shop roof	AC 7	1	Supply Fan	7.5	91.7%	0	W	3,391		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Newak bus facility/shop roof	AC 2	1	Supply Fan	2.0	84.0%	No	W	2,745		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Newak bus facility/shop roof	AC 3	1	Supply Fan	3.0	89.5%	No	W	2,745		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0

		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?	Remaining Useful Life	Annual Operating Hours	ECM #	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
Newak bus facility/shop roof	AC 1	1	Supply Fan	2.0	84.0%	No	W	2,745		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 1	Body Shop	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 2	Body Shop	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 3	Body Shop	1	Supply Fan	20.0	91.0%	No	B	3,391	NR, 5	Yes	93.0%	Yes	1	5.9	21,656	0	$2,051	$8,850	$1,600	3.5
Shop area - HVU - 4	Mech Shop	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 5	Mech Shop	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 6	Mech Shop	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 7	Mech Shop	1	Supply Fan	20.0	91.0%	No	B	3,391	NR, 5	Yes	93.0%	Yes	1	5.9	21,656	0	$2,051	$8,850	$1,600	3.5
Shop area - HVU - 8	Record Storage	1	Supply Fan	5.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	1.5	4,565	0	$432	$4,197	$400	8.8
Shop area - HVU - 9	Central Stores	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 10	Central Stores	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 11	Central Stores	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 12	Haz/Matl-Batt Ch Room	1	Supply Fan	3.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	0.9	2,739	0	$259	$3,812	$240	13.8
Shop area - HVU - 13	NRVM Parts Store	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 14	Non-Rev Vehicles	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 15	Non-Rev Vehicles	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 16	Non-Rev Vehicles	1	Supply Fan	5.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	1.5	4,565	0	$432	$4,197	$400	8.8
Shop area - HVU - 17	Boody Rep/Parts Storage	1	Supply Fan	5.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	1.5	4,565	0	$432	$4,197	$400	8.8
Shop area - HVU - 18	Body Rep/Parts Stor	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 19	CFM area unit shop	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9

		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?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Shop area - HVU - 20	CFM area unit shop	1	Supply Fan	7.5	89.5%	No	B	3,391	NR, 5	Yes	91.7%	Yes	1	2.2	8,293	0	$785	$4,761	$600	5.3
Shop area - HVU - 21	Unit component clean	1	Supply Fan	5.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	1.5	4,565	0	$432	$4,197	$400	8.8
Shop area - HVU - 22	Machine shop	1	Supply Fan	5.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	1.5	4,565	0	$432	$4,197	$400	8.8
Shop area - HVU - 23	Steel metal shop	1	Supply Fan	3.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	0.9	2,739	0	$259	$3,812	$240	13.8
Shop area - HVU - 24	Electric Shop	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 25	Electrical substation	1	Supply Fan	7.5	89.5%	No	B	3,391	NR, 5	Yes	91.7%	Yes	1	2.2	8,293	0	$785	$4,761	$600	5.3
Shop area - HVU - 26	Engine dyno	1	Supply Fan	15.0	91.0%	No	B	3,391	NR, 5	Yes	92.4%	Yes	1	4.4	16,063	0	$1,521	$7,086	$1,200	3.9
Shop area - HVU - 27	Trans Dyno	1	Supply Fan	5.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	1.5	4,565	0	$432	$4,197	$400	8.8
Shop area - HVU - 28	Chasis dynometer	1	Supply Fan	3.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	0.9	2,739	0	$259	$3,812	$240	13.8
Shop area - HVU - 29	Steam clean room	1	Supply Fan	2.0	84.0%	No	B	2,745	NR, 5	Yes	86.5%	Yes	1	0.6	1,923	0	$182	$3,623	$160	19.0
Shop area - HVU - 30	Pretreat Dyn Fac room	1	Supply Fan	5.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	1.5	4,565	0	$432	$4,197	$400	8.8
Shop area - HVU - 31	Bus prep area	1	Supply Fan	1.5	84.0%	No	B	2,745	NR, 5	Yes	86.5%	Yes	1	0.4	1,443	0	$137	$3,380	$120	23.9
Shop area - HVU - 32	Bus Spray paint room	1	Supply Fan	3.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	0.9	2,739	0	$259	$3,812	$240	13.8
Shop area - HVU - 33	Paint Booth	1	Supply Fan	3.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	0.9	2,739	0	$259	$3,812	$240	13.8
Shop area - HVU - 34	Paint Booth	1	Supply Fan	3.0	87.5%	No	B	2,745	NR, 5	Yes	89.5%	Yes	1	0.9	2,739	0	$259	$3,812	$240	13.8
ACU 1	Women's Locker Room	1	Supply Fan	1.0	82.5%	No		2,745		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
ACU 2	Electronic Shop	1	Supply Fan	2.0	84.0%	No		2,745		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
ACU 3	Misc Offices	1	Supply Fan	3.0	87.5%	No		2,745		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
ACU 4	CS Main Office	1	Supply Fan	1.0	82.5%	No		2,745		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
ACU 5	Shop Offices	1	Supply Fan	0.8	60.0%	No		2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0

		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?	Remaining Useful Life	Annual Operating Hours	ECM #	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
ACU 6	Lunch Room 129	1	Supply Fan	1.0	82.5%	No		2,745		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
ACU 7	Lunch Room 141	1	Supply Fan	3.0	87.5%	No		2,745		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
ACU 8	Receive office 126	1	Supply Fan	0.3	60.0%	No		2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
ACU 9	NRV Foreman's office	1	Supply Fan	0.3	60.0%	No		2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
ACU 10	Locker Rooms Foremans office	1	Supply Fan	5.0	87.5%	No		2,745		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
ACU 10	Locker Rooms Foremans office	1	Supply Fan	5.0	87.5%	No		2,745		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0

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 (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	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 office	4	Split-System AC	3.00		B	NR	Yes	4	Split-System AC	3.00		14.00		1.5	8,533	0	$808	$17,955	$1,104	20.8
Newak bus facility/shop roof	AC 7	1	Packaged AC	28.00		W		No							0.0	0	0	$0	$0	$0	0.0
Newak bus facility/shop roof	AC 2	1	Packaged AC	8.00		W		No							0.0	0	0	$0	$0	$0	0.0
Newak bus facility/shop roof	AC 3	1	Packaged AC	11.00		W		No							0.0	0	0	$0	$0	$0	0.0
Newak bus facility/shop roof	AC 1	1	Packaged AC	7.00		W		No							0.0	0	0	$0	$0	$0	0.0
Newak bus facility/shop roof	ACC 3	1	Split-System AC	14.00		B		No							0.0	0	0	$0	$0	$0	0.0
Roof	A1 - Metal off/Women Locker	1	Split-System AC	1.50		W	NR	Yes	1	Packaged AC	14.00		11.50		-6.5	-36,238	0	-$3,432	$19,514	$1,106	-5.4
Roof	A2 - Metal shop locker room	1	Split-System AC	1.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A3 - Maintenance office	1	Packaged AC	8.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A4 - Main Office	1	Packaged AC	7.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A5 - CSD Receiving office	1	Packaged AC	7.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A6 - CSD Main Office	1	Packaged AC	7.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A7 - CSD lunch room	1	Packaged AC	7.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A8 - CSD locker room	1	Split-System AC	4.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A9 - CM lunch room	1	Packaged AC	6.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A10 - Unit Dept Office	1	Packaged AC	6.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A-11 Trans Dyno (Window)	1	Window AC	1.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A12 - Eng. Dyno Control Room	1	Window AC	1.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A13 - NRV locker room	1	Split-System AC	3.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A14 - NRV supers office	1	Window AC	1.00		W		No							0.0	0	0	$0	$0	$0	0.0

		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)	Remaining Useful Life	ECM #	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)	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	A15 - BRV office	1	Window AC	1.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A16 - Radio room (window)	1	Window AC	1.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A17 - BS office/locker room	1	Window AC	1.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A18 - Drivers depot	1	Packaged AC	6.00				No							0.0	0	0	$0	$0	$0	0.0
Roof	A19 - Seat room	1	Packaged AC	5.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A 20 - Warantee room	1	Packaged AC	5.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	A21 - Drivers lounge	1	Packaged AC	20.00		B	NR	Yes	1	Packaged AC	20.00		10.50		1.9	11,429	0	$1,082	$33,748	$1,580	29.7
Roof	A22 - Electronics	1	Packaged AC	25.00		B	NR	Yes	1	Packaged AC	25.00		10.50		2.4	14,286	0	$1,353	$42,185	$1,975	29.7
Roof	A23 IB lunch room	1	Split-System AC	2.00		B	NR	Yes	1	Split-System AC	2.00		14.00		0.3	1,422	0	$135	$2,992	$184	20.8
Roof	A24 - Phone room	1	Window AC	1.50		B		No							0.0	0	0	$0	$0	$0	0.0
Roof	A25 - Phone room (window)	1	Window AC	1.50		B		No							0.0	0	0	$0	$0	$0	0.0
Roof	A26 - Water storage room	1	Window AC	1.50		B		No							0.0	0	0	$0	$0	$0	0.0
Roof	A27 - Superintendent office	1	Window AC	1.50		B		No							0.0	0	0	$0	$0	$0	0.0
Roof	A28 - Veeder root room	1	Packaged AC	3.00		W		No							0.0	0	0	$0	$0	$0	0.0
ACU 1	Women's Locker Room	1	Packaged AC	6.25		B	NR	Yes	1	Packaged AC	6.25		11.50		1.3	7,040	0	$667	$11,138	$456	16.0
ACU 2	Electronic Shop	1	Packaged AC	7.50			NR	Yes	1	Packaged AC	7.50		11.50		1.3	7,389	0	$700	$13,366	$548	18.3
ACU 3	Misc Offices	1	Packaged AC	10.00			NR	Yes	1	Packaged AC	10.00		11.50		2.1	11,758	0	$1,114	$17,821	$730	15.3
ACU 4	CS Main Office	1	Packaged AC	6.25			NR	Yes	1	Packaged AC	6.25		11.50		1.3	7,040	0	$667	$11,138	$456	16.0
ACU 5	Shop Offices	1	Packaged AC	5.00			NR	Yes	1	Packaged AC	5.00		14.00		1.4	7,882	0	$746	$11,345	$460	14.6
ACU 6	Lunch Room 129	1	Packaged AC	6.25			NR	Yes	1	Packaged AC	6.25		11.50		1.3	7,040	0	$667	$11,138	$456	16.0

		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)	Remaining Useful Life	ECM #	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)	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
ACU 7	Lunch Room 141	1	Packaged AC	15.98			NR	Yes	1	Packaged AC	15.98		11.50		3.3	18,634	0	$1,765	$22,278	$1,263	11.9
ACU 8	Receive office 126	1	Packaged AC	6.00			NR	Yes	1	Packaged AC	6.00		11.50		1.2	6,759	0	$640	$10,693	$438	16.0
ACU 9	NRV Foreman's office	1	Packaged AC	5.00			NR	Yes	1	Packaged AC	5.00		14.00		1.4	7,765	0	$735	$11,345	$460	14.8
ACU 10	Locker Rooms Foremans office	1	Packaged AC	15.87			NR	Yes	1	Packaged AC	15.87		11.50		3.3	18,656	0	$1,767	$22,116	$1,253	11.8

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)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Baseboard radiators and AHU	2	Non-Condensing Hot Water Boiler	760.00	B	NR	Yes	2	Non-Condensing Hot Water Boiler	760.00	85.00%	Et	0.0	0	262	$2,032	$34,102	$2,660	15.5
Newak bus facility/shop roof	AC 7	1	Furnace	251.00	W		No						0.0	0	0	$0	$0	$0	0.0
Newak bus facility/shop roof	AC 2	1	Furnace	251.00	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 1	Body Shop	1	Furnace	914.40	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 2	Body Shop	1	Furnace	914.40	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 3	Body Shop	1	Furnace	993.60	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 4	Mech Shop	1	Furnace	892.00	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 5	Mech Shop	1	Furnace	892.00	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 6	Mech Shop	1	Furnace	892.00	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 7	Mech Shop	1	Furnace	929.60	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 8	Record Storage	1	Furnace	75.36	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 9	Central Stores	1	Furnace	240.64	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 10	Central Stores	1	Furnace	267.68	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 11	Central Stores	1	Furnace	242.24	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 12	Haz/Matl-Batt Ch Room	1	Furnace	622.00	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 13	NRVM Parts Store	1	Furnace	168.80	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 14	Non-Rev Vehicles	1	Furnace	874.40	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 15	Non-Rev Vehicles	1	Furnace	874.40	W		No						0.0	0	0	$0	$0	$0	0.0
Shop area - HVU - 16	Non-Rev Vehicles	1	Furnace	874.40	W		No						0.0	0	0	$0	$0	$0	0.0

DHW Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Restrooms	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0
Body shop locker room	Body shop locker room	1	Storage Tank Water Heater (> 50 Gal)	B	NR	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	93.00%	Et	0.0	0	24	$188	$25,055	$875	128.3
Body shop locker room	Body shop locker room	1	Storage Tank Water Heater (> 50 Gal)	B	NR	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	93.00%	Et	0.0	0	24	$188	$25,055	$875	128.3
Sheet metal dpt	Sheet metal dpt	1	Storage Tank Water Heater (> 50 Gal)	B	NR	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	93.00%	Et	0.0	0	24	$188	$32,572	$1,138	166.8
Sheet metal dpt	Sheet metal dpt	1	Storage Tank Water Heater (> 50 Gal)	B	NR	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	93.00%	Et	0.0	0	24	$188	$32,572	$1,138	166.8
Sheet metal dpt	Sheet metal dpt	1	Storage Tank Water Heater (> 50 Gal)	B	NR	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	93.00%	Et	0.0	0	24	$188	$32,572	$1,138	166.8
CSD	CSD	1	Storage Tank Water Heater (> 50 Gal)	B	NR	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	93.00%	Et	0.0	0	24	$188	$25,055	$875	128.3
Machine shop	Machine shop	1	Storage Tank Water Heater (> 50 Gal)	B	NR	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	93.00%	Et	0.0	0	24	$188	$25,055	$875	128.3
Pretreatment plant	Pretreatment plant	1	Storage Tank Water Heater (> 50 Gal)	B	NR	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	93.00%	Et	0.0	0	24	$188	$11,500	$398	58.9

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Newark bus facility	67	Desktops	145.0	Yes
Newark bus facility	20	Printer - Small	60.0	Yes
Newark bus facility	22	Printer - Medium	100.0	Yes
Newark bus facility	11	Printer - Large	200.0	Yes
Newark bus facility	4	TV - 55"	120.0	Yes
Newark bus facility	10	Refrigerator	220.0	Yes
Newark bus facility	25	Microwave	900.0	Yes
Newark bus facility	6	Toaster	1,200.0	Yes
Newark bus facility	9	Mini fridge	60.0	Yes
Newark bus facility	5	TV - 40"	100.0	Yes
Newark bus facility	3	Coffee	300.0	Yes

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	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
Bus facility	8	Refrigerated	7	Yes	1.5	12,895	0	$1,221	$1,840	$0	1.5

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

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.

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ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

Newark Bus Complex

Primary Property Type: Repair Services (Vehicle, Shoe, Locksmith, etc.)
Gross Floor Area (ft²): 750,000
Built: 1970

For Year Ending: May 31, 2018
Date Generated: March 26, 2019

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Newark Bus Complex 601 Doremus Avenue Newark, New Jersey 07105	NJ Transit 1 Penn Plaza Newark, NJ 07015 (____)____-_____	Steve Jenks 1 Penn Plaza Newark, NJ 07015 9734918589 pdubuc@chacompanies.com

Property ID: 6725702

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
131.7 kBtu/ft²

Source EUI
216.8 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	33,631,983 (34%)
Natural Gas (kBtu)	65,171,229 (66%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	58.9
National Median Source EUI (kBtu/ft²)	96.9
% Diff from National Median Source EUI	124%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	6,869

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

____ _____
,
(____)____-_____
_____

Professional Engineer Stamp (if applicable)

APPENDIX C: GLOSSARY

TERM	DEFINITION
Blended Rate	Used to calculate financial savings. The blended rate is calculated by dividing the amount of your bill by the total energy use. For example, if your bill is $22,217.22, and you used 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
BTU	A British thermal unit is the amount of heat required to increase the temperature of one pound water by one-degree Fahrenheit. Commonly used to measure natural gas consumption.
Demand Response	Demand response reduces or shifts electricity usage at or among participating buildings/sites during peak energy use periods in response to time-based rates or other forms of financial incentives.
Energy Efficiency	Reducing the amount of energy necessary to provide comfort and service to a building/area. Achieved through the installation of new equipment and/or optimizing energy management systems.
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
HVAC	Heating, ventilation, and air conditioning.
kW	Kilowatt. Equal to 1,000 Watts.
Load	The total amount of power used by a building system at any given time.
Measure	A single activity, or installation of a single type of equipment, that is implemented in a building system to reduce total energy consumption.
MMBtu	One million British thermal units.
psig	Pounds per square inch.
Plug Load	Refers to the amount of energy used in a space by products that are powered by means of an ordinary AC plug.
Simple Payback	The amount of time needed to recoup the funds expended in an investment, or to reach the break-even point.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
Turnkey	Provision of a complete product or service that is ready for immediate use
Watt (W)	Unit of power commonly used to measure electricity use.