Local Government Energy Audit:
Energy Audit Report

Delaware River Basin Commission Headquarters

25 State Police Drive

West Trenton, NJ 08628

February 28, 2017

Report by:

TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities associated with recommended upgrades to the facility's systems at this site. Approximate saving are included in this report to make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. It should be noted that detailed design efforts are required in order to implement several of the improvements evaluated as part of this energy analysis.

The energy conservation measures and estimates of energy consumption contained in this report have been reviewed for technical accuracy. However, all estimates contained herein of energy consumption at the site are not guaranteed, because energy consumption ultimately depends on behavioral factors, the weather, and many other uncontrollable variables. The energy assessor and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy consumption vary from the estimated consumption shown herein.

Estimated installation costs are based on a variety of sources, including our own experience at similar facilities, our own pricing research using local contractors and vendors, and cost estimating handbooks such as those provided by RS Means. The cost estimates represent our best judgment for the proposed action. The Owner is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for a particular installation, and for conditions which cannot be known prior to in-depth investigation and design, the energy assessor does not guarantee installed cost estimates and shall in no event be liable should actual installed costs vary from the estimated costs herein.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates and are based on program information available at the time this report is written. The NJBPU reserves the right to extend, modify, or terminate programs without prior or further notice, including incentive levels and eligibility requirements. The Owner should review available program incentives and requirements prior to selecting and/or installing any recommended measures.

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1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Delaware River Basin Commission Headquarters.

The goal of a LGEA is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and put you in a position to implement the ECMs. The LGEA also sets you on the path to receive financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing the ECMs.

This study was conducted by TRC Energy Services, as part of a comprehensive effort to assist New Jersey local government in controlling energy costs and protecting our environment by offering a full spectrum of energy management options.

1.1 Facility Summary

Delaware River Basin Commission Headquarters is a 27,055 square foot single floor building comprised of various space types. The Commission is an environmental agency whose missions includes water quality protection, water supply allocation, regulatory review, water conservation initiatives, watershed planning, drought management, flood loss reduction, and recreation.

Construction of the facility was completed in 1970. The facility includes office space, a conference room, a water quality laboratory, a small non-commercial kitchen and lunch room, and a penthouse mechanical space.

The building foundation consists of a conventional, reinforced concrete foundation. Exterior walls are finished with brick masonry.

Delaware River Basin Commission Headquarters lighting system consists mainly of T8 fluorescent lamps and fixtures with both electronic and magnetic ballasts. There are also incandescent fixtures and bulbs present in some spaces.

As part of a renovation, the Commission is currently replacing the conference room existing lighting system with a new LED system and also replacing the existing packaged HVAC roof top unit with a new energy efficient system.

The facility's HVAC system is original to the building and a mix of packaged and split direct expansion units (DX), and built up air handling units. The air handling units serve most of the facility and have both chilled and hot water coils. The air handling units are located in the penthouse with outside air intake on the roof top. The system consists of a boiler for heating and an air cooled chiller for cooling. The HVAC system is inefficient and should be to be replaced. We have provided two approaches to replacement of the existing HVAC system in this report. The first option is a comprehensive approach to existing equipment replacement detailed in ECM's 3, 4, 5, 6, 7, and 8. The second option is a systematic change as requested by the authority detailed in Appendix C.

A thorough description of the facility and our observations are located in Section 2, "Facility Information and Existing Conditions".

Energy Conservation Measures

TRC Energy Services evaluated 10 projects which represent an opportunity for Delaware River Basin Commission Headquarters to reduce annual energy costs by roughly $29,674.89 and annual greenhouse gas emissions by 259,841 lbs CO_2e. The measures would pay for themselves in roughly 5 years. The breakdown of existing and potential utility costs is illustrated in Figure 1 and Figure 2, respectively. These projects represent an opportunity to reduce Delaware River Basin Commission Headquarters' annual energy use by 36.7%.

Figure 1 – Previous 12 Month Utility Costs

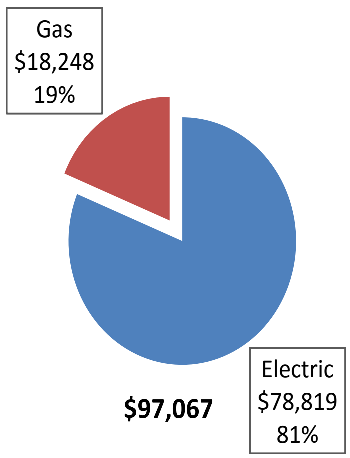
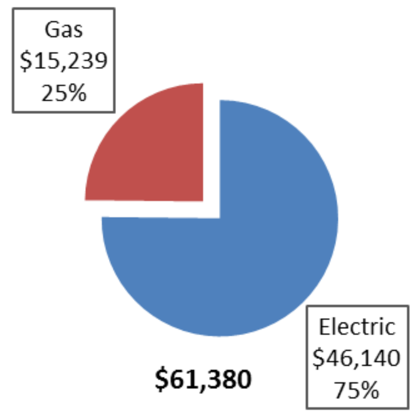


Figure 2 – Potential Post-Implementation Costs



A detailed description of Delaware River Basin Commission Headquarters' existing energy use can be found in Section 3 "Site Energy Use and Costs".

The evaluated measures have been listed and grouped into major categories as shown in Figure 3. Brief descriptions of the categories can be found below and descriptions of the individual opportunities can be found in Section 4, "Energy Conservation Measures". Measures without an "ECM #" in the table below have been evaluated, but are not recommended for implementation.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	*Annual Natural Gas Savings (MMBtu)*	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**46,254**	**15.1**	**0.0**	**0.0**	**$5,890.50**	**$41,837.04**	**$6,795.00**	**$35,042.04**	**5.95**	**46,577**
ECM 1	Install LED Fixtures	Yes	3,763	1.8	0.0	0.0	$479.18	$4,285.85	$1,705.00	$2,580.85	5.39	3,789
ECM 2	Retrofit Fixtures with LED Lamps	Yes	42,491	13.3	0.0	0.0	$5,411.32	$37,551.19	$5,090.00	$32,461.19	6.00	42,788
Motor Upgrades			**25,666**	**9.6**	**0.0**	**0.0**	**$3,268.57**	**$11,262.78**	**$0.00**	**$11,262.78**	**3.45**	**25,845**
ECM 3	Premium Efficiency Motors	Yes	25,666	9.6	0.0	0.0	$3,268.57	$11,262.78	$0.00	$11,262.78	3.45	25,845
Variable Frequency Drive (VFD) Measures			**76,851**	**19.7**	**0.0**	**0.0**	**$9,787.07**	**$22,252.05**	**$4,400.00**	**$17,852.05**	**1.82**	**77,388**
ECM 4	Install VFDs on Constant Volume (CV) HVAC	Yes	52,414	14.6	0.0	0.0	$6,675.07	$9,366.05	$3,200.00	$6,166.05	0.92	52,781
ECM 5	Install VFDs on Chilled Water Pumps	Yes	9,437	3.3	0.0	0.0	$1,201.80	$6,334.30	$1,200.00	$5,134.30	4.27	9,503
ECM 6	Install VFDs on Hot Water Pumps	Yes	14,999	1.9	0.0	0.0	$1,910.20	$6,551.70	$0.00	$6,551.70	3.43	15,104
Electric Chiller Replacement			**59,072**	**33.0**	**0.0**	**0.0**	**$7,522.92**	**$68,254.74**	**$7,200.00**	**$61,054.74**	**8.12**	**59,485**
ECM 7	Install High Efficiency Chillers	Yes	59,072	33.0	0.0	0.0	$7,522.92	$68,254.74	$7,200.00	$61,054.74	8.12	59,485
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**403.5**	**403.5**	**$2,901.68**	**$34,988.99**	**$2,940.00**	**$32,048.99**	**11.04**	**47,248**
ECM 8	Install High Efficiency Hot Water Boilers	Yes	0	0.0	403.5	403.5	$2,901.68	$34,988.99	$2,940.00	$32,048.99	11.04	47,248
Domestic Water Heating Upgrade			**0**	**0.0**	**14.8**	**14.8**	**$106.58**	**$57.36**	**$0.00**	**$57.36**	**0.54**	**1,735**
ECM 9	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	14.8	14.8	$106.58	$57.36	$0.00	$57.36	0.54	1,735
Plug Load Equipment Control - Vending Machine			**1,551**	**0.0**	**0.0**	**0.0**	**$197.57**	**$1,437.60**	**$0.00**	**$1,437.60**	**7.28**	**1,562**
ECM 10	Vending Machine Control	Yes	1,551	0.0	0.0	0.0	$197.57	$1,437.60	$0.00	$1,437.60	7.28	1,562
TOTALS			**209,394**	**77.4**	**418.4**	**418.4**	**$29,674.89**	**$180,090.56**	**$21,335.00**	**$158,755.56**	**5.35**	**259,841**

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

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

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

Motor Upgrades generally involve replacing old standard efficiency motors with motors of the current efficiency standard (EISA 2007). Motors will be replaced with the same size motors. This measure saves energy by reducing the power used by the motors due to improved electrical efficiency.

Variable Frequency Drives measures generally involve controlling the speed of a motor to achieve a flow or temperature rather than using a valve, damper, or no means at all. These measures save energy by slowing a motor which is an extremely efficient method of control.

Electric Chiller measures generally involve replacing old inefficient hydronic chillers with modern energy efficient systems. New chillers can provide cooling equivalent to older chillers, but use less energy. These measures save energy by reducing the power used by the chiller due to improved electrical and heat transfer efficiency.

Gas Heating (HVAC/Process) measures generally involve replacing old inefficient hydronic heating systems with modern energy efficient systems. Gas heating systems can provide heating equivalent to older systems, but use less energy. These measures save energy by reducing the fuel used by the heating due to improved combustion and heat transfer efficiency.

Domestic Water Heating upgrade measures generally involve replacing old inefficient domestic water heating systems with modern energy efficient systems. New domestic water heating systems can provide equivalent or greater capacity as older systems, but use less energy. These measures save energy by reducing the fuel used by the domestic water heating systems due to improved efficiency or the removal of standby losses.

Plug Load Equipment control measures generally involve installing automation that limits the power use or operation of equipment plugged into an electrical receptacle based on occupancy.

Energy Efficient Practices

TRC Energy Services also identified 18 no/low cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems. Through these practices equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. Opportunities identified at Delaware River Basin Commission Headquarters include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Assess Chillers & Request Tune-Ups
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls

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

Self-Generation Measures

TRC Energy Services evaluated the potential for installing self-generation sources for Delaware River Basin Commission Headquarters. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array. If the Commission is interested in exploring the installation of a photovoltaic (PV) array, reaching out to a qualified contractor would be a logical next step.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	140	kW DC STC
Electric Generation	166,792	kWh/yr
Displaced Cost	$14,510	/yr
Installed Cost	$364,000	

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

1.2 Implementation Planning

To realize the energy savings from the ECMs listed in this report, the equipment changes outlined for each ECM need to be selected and installed through project implementation. One of the first considerations is if there is capital available for project implementation. Another consideration is whether to pursue individual ECMs, a group of ECMs, or a comprehensive approach wherein all ECMs are pursued, potentially in conjunction with other facility projects or improvements.

Rebates, incentives, and financing are available from the NJBPU, NJCEP, as well as some of the state's investor-owned utilities, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any project, please review the appropriate incentive program guidelines before proceeding. This is important because in most cases you will need to submit an application for the incentives before purchasing materials and beginning installation.

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

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

For facilities with capital available for implementation of selected individual measures or phasing implementation of selected measures over multiple years, incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to design the ECM(s), select the equipment and apply for the incentive(s). Program pre-approval is required for some SS incentives, so only after receiving approval may the ECM(s) be installed. The incentive values listed above in Figure 3 represent the SS program and will be explained further in Section 8, as well as the other programs as mentioned below.

This facility also qualifies for the Direct Install program which, through an authorized network of participating contractors, can assist with the implementation of a group of measures versus installing individual measures or phasing implementation. This program is designed to be turnkey and will provide an incentive up to 70% of the cost of the project identified by the designated contractor.

For facilities with capital available and an interest in a comprehensive, holistic approach to energy conservation should consider participating in the P4P EB program. This program has minimum savings requirements and the incentives are based on actual measured performance savings. The application process is more involved, and requires working with an eligible contractor, but may result in more lucrative incentives up to 50% of total project cost.

For facilities without capital available to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with external project development, design, and implementation services as well as financing for implementing ECMs. This LGEA report is the first step for participating in ESIP and should help you determine next steps. Refer to Section 8.4 for additional information on the ESIP Program.

Additional descriptions of all relevant incentive programs are located in Section 8. You may also check the following website for further information on available rebates and incentives:

www.njcleanenergy.com/ci

To ensure projects are implemented such that maximum savings and incentives are achieved, bids and specifications should be reviewed by your procurement personnel and/or consultant(s) to ensure that selected equipment coincides with LGEA recommendations, as well as applicable incentive program guidelines and requirements.

2 Facility Information and Existing Conditions

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Richard C. Gore	Director ofFinance & Administration	richard.gore@drbc.nj.gov	609-883-9500 Ext.201
Designated Representative			
Richard C. Gore	Director of Finance & Administration	richard.gore@drbc.nj.gov	609-883.9500 Ext.201
TRC Energy Services			
Moussa Traore	Auditor	mtraore@trcsolutions.com	732-855-2879

2.2 General Site Information

On August 16, 2016, , TRC Energy Services performed an energy audit at Delaware River Basin Commission Headquarters located in West Trenton, NJ. The TRC Energy Services' Auditor met with the Director of Finance & Administration to review the facility operations and focus the investigation on specific energy-using systems.

Delaware River Basin Commission Headquarters is a 27,055 square foot single floor building comprised of various space types. The Commission is an environmental agency which missions include water quality protection, water supply allocation, regulatory review, water conservation initiatives, watershed planning, drought management, flood loss reduction, and recreation.

Construction of the facility was completed in 1970. The facility includes office space, a conference room, a water quality laboratory, a small non-commercial kitchen and lunch room, and a penthouse mechanical space.

The building foundation consists of a conventional, reinforced concrete foundation. Exterior walls are finished with brick masonry.

Delaware River Basin Commission Headquarters lighting system consists mainly of T8 fluorescent lamps and fixtures with both electronic and magnetic ballasts. There are also incandescent fixtures and some compact fluorescent fixtures and lamps present in some spaces.

The facility's HVAC system is original to the building and a mix of packaged and split direct expansion units (DX), and built up air handling units. The air handling units serve most of the facility and have both chilled and hot water coils. The air handling units are located in the penthouse with outside air intake on the roof top. The system consists of a boiler for heating and an air cooled chiller for cooling. The HVAC system is inefficient and should be replaced.

2.3 Building Occupancy

The building is open Monday through Friday. The typical schedule is presented in the table below. The entire facility is used year round.

Figure 6 - Building Schedule

Building Occupancy Schedule		
Building Name	**Weekday/Weekend**	**Operating Schedule**
Delaware River Basin Coomission	Weekday	7:30 AM 6:00 PM
Delaware River Basin Coomission	Weekend	N/A

2.4 Building Envelope

The foundation consists of a conventional, reinforced concrete foundation. Exterior walls are finished with brick masonry. Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall good condition with no signs of uncontrolled moisture, air-leakage and other energy-compromising issues.

The building has flat roof covered with a white membrane that is in good condition and contribute to cooling savings by reflecting heat.

The building has single pane windows which are in good condition and show no sign of outside air-infiltration.

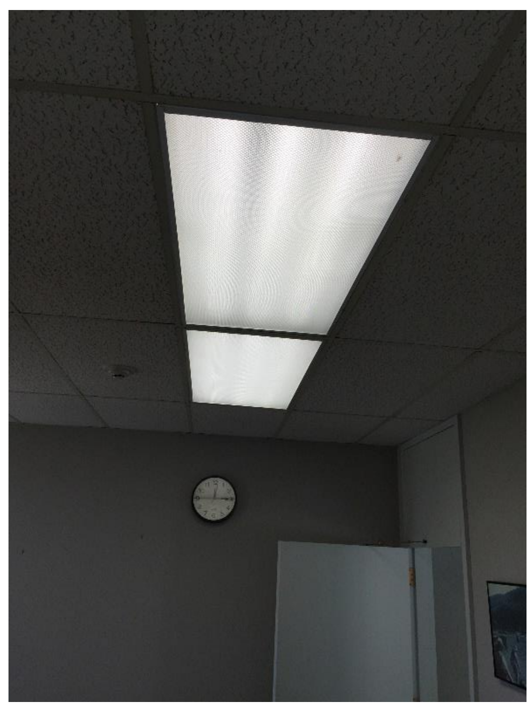
Exterior doors are constructed of aluminum. The door seals were found to be worn out and in poor condition. This increases the level of outside air-infiltration. We recommend the maintenance staff seal the doors. This will result in minimal energy savings, but should be part of the Commission's operation and maintenance plan.

2.5 On-site Generation

Delaware River Basin Commission Headquarters does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Lighting System



Lighting at the facility lighting system consists mainly of linear 32 Watt fluorescent T8 lamps with a mix of electronic and magnetic ballasts. Most of the building spaces use 2-lamp or 3-lamp, 4-foot troffers with diffusers lens. In some areas compact fluorescent (CFL) and incandescent lamps are providing space lighting.

The facility's front entrance and the reception area are lit with 32 Watt CFL lamps in recessed can with electronic ballasts. The lunch and conference rooms are lit with the new 40 Watts LED panel recessed and surfaced mounted fixtures. Offices and bathrooms are lit with fluorescent T8 lamps fixtures. Two by four 3 lamp (32 Watts each) fixtures are the predominant fluorescent fixtures throughout the rest of the facility.

Exit signs throughout the facility are LED types.

Lighting control in most spaces is provided by occupancy sensors and manual switches. The occupancy sensors are either wall or ceiling mounted depending on the space layout.

Chilled Water System

The Delaware River Basin Commission Headquarters is served by a single 77.7 ton air-cooled chiller located on the south wing of the roof top. The chiller has four (4) reciprocating compressors and was observe running at full load. The chiller feeds coils in buildup Air Handler Units (AHUs) that distribute condition air into the building spaces. The chilled water for the facility is pumped to the air-handling units' chilled water coils via four 15 horse power pumps located in the basement.

The chiller was put in service in 1992, and the AHUs were put in service more than forty five years (45) ago. The chiller plant is operating with minimal control, and the Commission staff indicated that the plant requires retro-commissioning in order to run the system as originally designed. However, based on review of the condition of the chiller, it has reached its useful life service and we are recommending its replacement with a more efficient chiller air cooled.

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

Hot Water Heating

The Delaware River Basin Commission Headquarters heating system consists of one Weil McLain 2000 MBH non-condensing gas- fired boiler located in the penthouse. The boiler is original to the building and has reached its useful life service. As a result our recommendation is to replace it with an energy efficient boiler which will result in energy savings. The heating hot water generated by the boiler is circulated to the air handling units and the variable air volume reheat coils by two (2) 5 horse power (hp) hot water pumps. The boiler operation is manually controlled by maintenance staff and building occupants. The name plate efficiency of the boiler is 85%, however based on standard degradation rates we estimate that the actual operating efficiency of the boiler to be closer to 75%. Through the replacement of the existing boiler the Commission would incur significant thermal energy savings, but the costs associated with a boiler replacement make the cost effectiveness of these projects challenging.

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

Air Distribution System

There are four (4) Trane indoor built up air-handling units located in the penthouse that supplied air registers by ducts concealed above the ceiling. Return air grilles are located in each space. These units contain hot and chilled water coils fed by the 77.7 ton air cooled chiller on the roof and the 2000 MBH Boiler located in the penthouse. Heated and cooled air is distributed through ducts to variable air volume (VAV) box hot water reheat coils concealed above the ceilings in each common area. The air handlers are original to the building and are in poor condition and contribute to the in efficiency of the HVAC system. It is important to note that the components of the air handlers contribute to the in efficiency rather than the actual air handler itself. The contributing components consist of fan motors, coils, and controls.

The air handlers' supply and return fans motors driving are operating at constant volume with no variable speed capability. The heating and cooling systems are controlled by local thermostats.

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

Air Conditioning (DX)

A 6 ton Carrier packaged gas heating/electric unit is used to condition the conference room. The unit is located on the roof. This is a brand new unit that was not operating during the site visit. There is also a small mini split system that services the data closet. This unit was found to be in reasonable condition and based on the size and efficiency rating of the unit we do not recommend replacement.

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

Building Energy Management System

The Delaware River Commission headquarters has no energy management system. The lighting is controlled by manual switches and occupancy sensors at the fixture or room level. The HVAC system is controlled by thermostats for each of the 6 air distribution systems. If the Commission decides to implement our recommendation to replace the HVAC equipment, we seriously encourage exploring the process of installing a new building energy management.

Domestic Hot Water

The domestic hot water system for the facility consists of one A.O. Smith gas fired non-condensing hot water heater with an input rating of 4,000 kBtu/hr and a nominal efficiency of 58%. The water heater has a 50 gallon storage tank. The domestic hot water distribution system needs to be inspected as we noticed a leak in the mechanical room.

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

Plug load & Vending Machines

There are roughly 35 computer work stations throughout the facility. The majority of the computers are desktop units with LCD monitors. There is no centralized PC power management software installed.

The facility has one non-refrigerated and one glass fronted refrigerated beverage vending machines located in the lunch room. There is also some residential cooking equipment located in the lunch room.

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

2.7 Water-Using Systems

There are 5 restrooms at this facility. A sampling of restrooms found that faucets are rated for 2 gpm or higher, the toilets are rated at 2.5 gallons per flush and the urinals are rated at 2 gallons per flush. The kitchen has a faucet that is rated at 2.5 gpm. We recommend the Commission install low flow devices on all water using systems.

3 Site Energy Use and Costs

Utility data for Electricity and Natural Gas was analyzed to identify opportunities for savings. In addition, data for Electricity and Natural Gas was evaluated to determine the annual energy performance metrics for the building in energy cost/ft^2 and energy use/ft^2. These energy use indices are indicative of the relative energy effectiveness of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy use for other facilities identified as: 0. Specific local climate conditions, daily occupancy hours of the facility, seasonal fluctuations in occupancy, daily operating hours of energy use systems, and the behavior of the occupants with regard to operating systems that impact energy use such as turning off appliances and leaving windows open. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

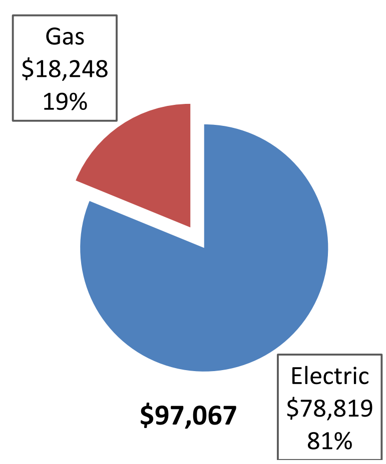
The following energy consumption and cost data is based on the last 12 month period of utility usage data that was provided for each utility. The annual consumption and cost was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Delaware River Basin Commission Headquarters		
Fuel	**Usage**	**Cost**
Electricity	568,969 kWh	$78,819
Natural Gas	25,377 Therms	$18,248
Total		**$97,067**

The current utility cost for this site is $97,067 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost (combined for commodity, transmission and distribution) for the past 12 months is $0.127/kWh, which is the blended rate used throughout the analyses in this report. The monthly electricity consumption and peak demand is represented graphically in the chart below.

Figure 9 - Graph of 12 Months Electric Usage & Demand

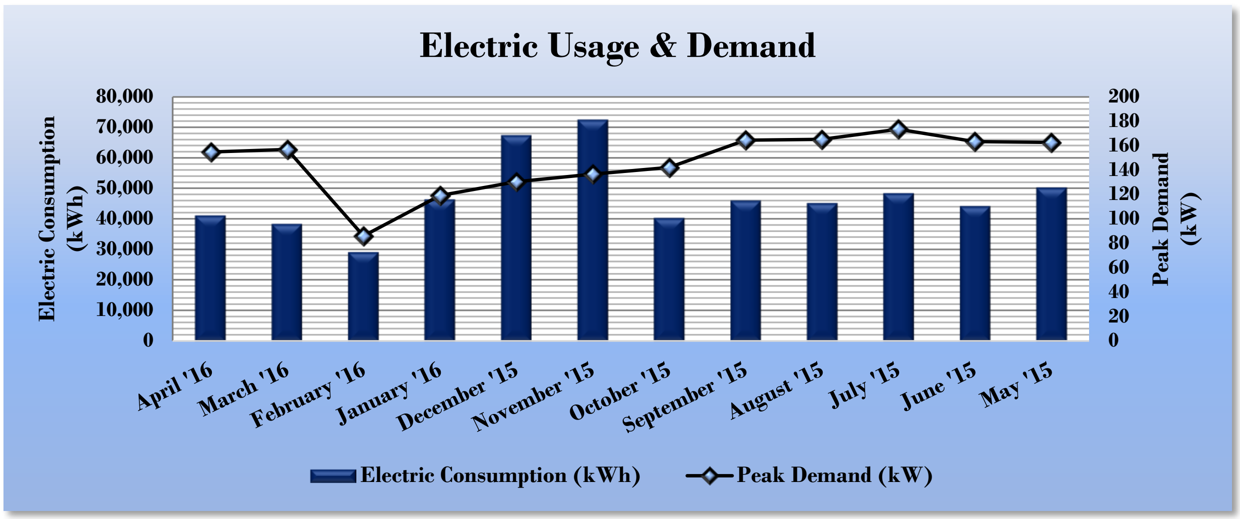


Figure 10 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for Delaware River Basin Commission Headquarters					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
5/3/16	30	41,147	155	$567	$5,069
4/2/16	32	38,313	157	$575	$4,792
3/3/16	29	29,161	86	$312	$3,611
2/2/16	32	46,316	119	$431	$5,556
1/1/16	29	67,303	131	$473	$7,861
12/2/15	31	72,420	137	$495	$8,926
11/1/15	31	40,288	142	$515	$5,380
10/1/15	30	45,986	165	$596	$7,565
9/1/15	31	45,182	165	$595	$7,466
8/1/15	30	48,418	173	$625	$8,119
7/2/15	30	44,184	163	$589	$7,559
6/3/15	30	50,251	163	$586	$6,914
Totals	**365**	**568,969**	**173.4**	**$6,360**	**$78,819**
Annual	**365**	**568,969**	**173.4**	**$6,360**	**$78,819**

3.3 Natural Gas Usage

Natural Gas is provided by PSE&G. The average gas cost for the past 12 months is $0.719/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is represented graphically in the chart below.

Figure 11 - Graph of 12 Months Natural Gas Usage

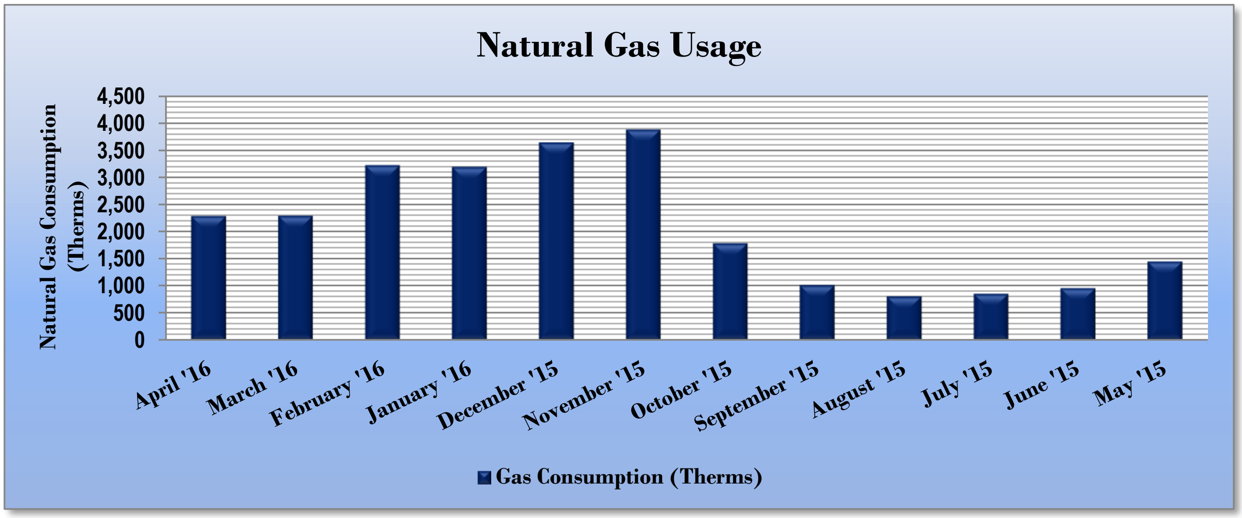


Figure 12 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Delaware River Basin Commission Headquarters			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
5/3/16	30	2,288	$1,381
4/2/16	32	2,292	$1,958
3/3/16	29	3,225	$2,523
2/2/16	32	3,194	$2,465
1/1/16	29	3,642	$2,748
12/2/15	31	3,880	$2,745
11/1/15	31	1,785	$1,041
10/1/15	30	1,012	$666
9/1/15	31	805	$573
8/1/15	30	850	$589
7/2/15	30	957	$654
6/3/15	30	1,446	$903
Totals	**365**	**25,377**	**$18,248**
Annual	**365**	**25,377**	**$18,248**

3.4 Benchmarking

This facility was benchmarked through Portfolio Manager, an online tool created and managed by the United State Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and compares its performance against a yearly baseline, national medians, or similar buildings in your portfolio. Metrics used in this comparison are the energy use intensity (EUI) and ENERGY STAR® Score.

Energy use intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more energy than similar buildings on a square foot basis or if that building performs better than the median. EUI is presented in both 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 is the raw fuel consumed to generate the energy consumed at the site, factoring in energy production and distribution losses.

Figure 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Delaware River Basin Commission Headquarters	National Median Building Type: Other - General
Source Energy Use Intensity (kBtu/ft^2)	323.8	123.1
Site Energy Use Intensity (kBtu/ft^2)	165.6	78.8

By implementing all recommended measures covered in this reporting, the Project's estimated post-implementation EUI improves as shown in the Table below:

Figure 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Delaware River Basin Commission Headquarters	National Median Building Type: Other - General
Source Energy Use Intensity (kBtu/ft^2)	224.6	123.1
Site Energy Use Intensity (kBtu/ft^2)	123.7	78.8

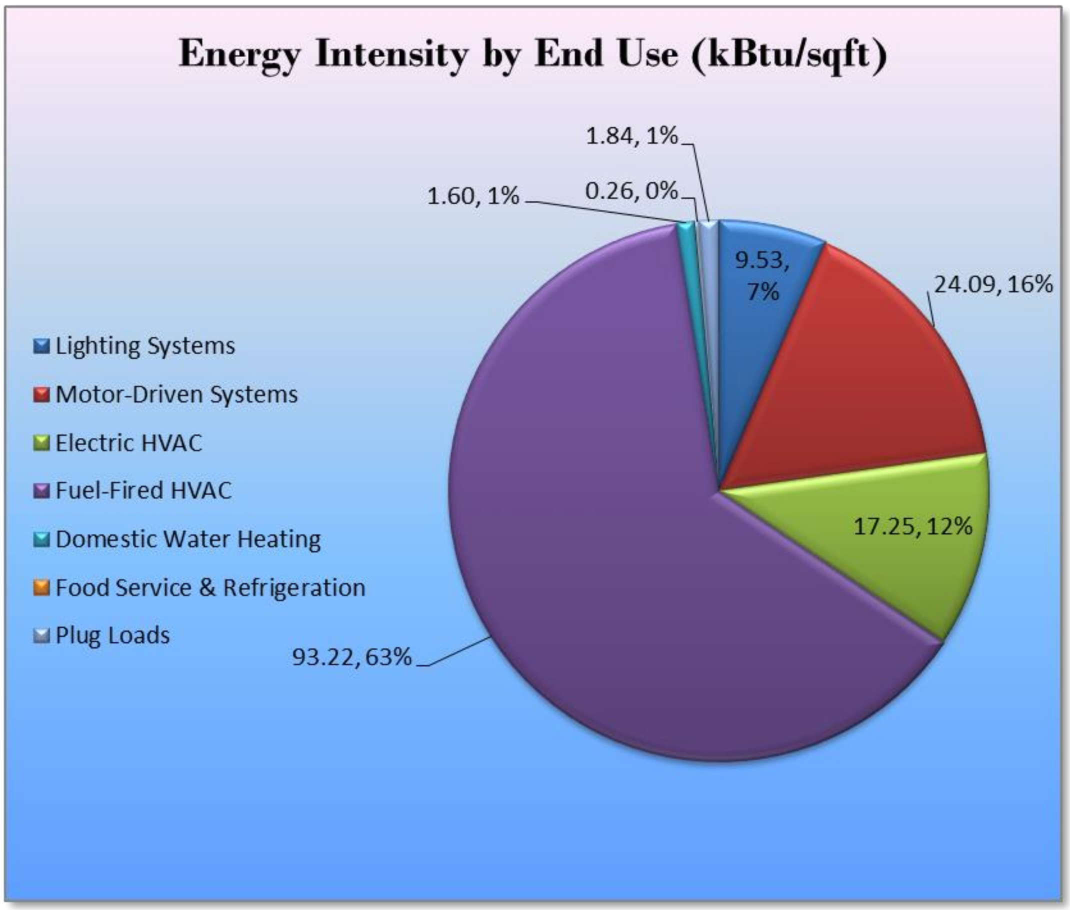
Many buildings can also receive a 1 – 100 ENERGY STAR® score. This score compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide — and may be eligible for ENERGY STAR® certification. This facility has a current score of 3

The Portfolio Manager, Statement of Energy Performance can be found in Appendix B: EPA Statement of Energy Performance.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building and determine their proportional contribution to overall building energy usage. This visual representation of energy end uses highlights systems that may benefit most from energy efficiency projects.

Figure 15 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy projects, help prioritize specific measures for implementation, and set Delaware River Basin Commission Headquarters on the path to receive financial incentives. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is considered sufficient to make "Go/No-Go" decisions and to prioritize energy projects. Savings are based on the New Jersey Board of Public Utilities New Jersey Clean Energy Program Protocols to Measure Resource Savings dated March 17, 2014. Further analysis or investigation may be required to calculate more accurate savings to support any custom SmartStart, Pay for Performance, or Large Energy Users incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJ prescriptive SmartStart program. Depending on your implementation strategy, the project may be eligible for more lucrative incentives through other programs as identified in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 16 – Summary of Recommended ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	*Annual Natural Gas Savings (MMBtu)*	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**46,254**	**15.1**	**0.0**	**0.0**	**$5,890.50**	**$41,837.04**	**$6,795.00**	**$35,042.04**	**5.95**	**46,577**
ECM 1	Install LED Fixtures	Yes	3,763	1.8	0.0	0.0	$479.18	$4,285.85	$1,705.00	$2,580.85	5.39	3,789
ECM 2	Retrofit Fixtures with LED Lamps	Yes	42,491	13.3	0.0	0.0	$5,411.32	$37,551.19	$5,090.00	$32,461.19	6.00	42,788
Motor Upgrades			**25,666**	**9.6**	**0.0**	**0.0**	**$3,268.57**	**$11,262.78**	**$0.00**	**$11,262.78**	**3.45**	**25,845**
ECM 3	Premium Efficiency Motors	Yes	25,666	9.6	0.0	0.0	$3,268.57	$11,262.78	$0.00	$11,262.78	3.45	25,845
Variable Frequency Drive (VFD) Measures			**76,851**	**19.7**	**0.0**	**0.0**	**$9,787.07**	**$22,252.05**	**$4,400.00**	**$17,852.05**	**1.82**	**77,388**
ECM 4	Install VFDs on Constant Volume (CV) HVAC	Yes	52,414	14.6	0.0	0.0	$6,675.07	$9,366.05	$3,200.00	$6,166.05	0.92	52,781
ECM 5	Install VFDs on Chilled Water Pumps	Yes	9,437	3.3	0.0	0.0	$1,201.80	$6,334.30	$1,200.00	$5,134.30	4.27	9,503
ECM 6	Install VFDs on Hot Water Pumps	Yes	14,999	1.9	0.0	0.0	$1,910.20	$6,551.70	$0.00	$6,551.70	3.43	15,104
Electric Chiller Replacement			**59,072**	**33.0**	**0.0**	**0.0**	**$7,522.92**	**$68,254.74**	**$7,200.00**	**$61,054.74**	**8.12**	**59,485**
ECM 7	Install High Efficiency Chillers	Yes	59,072	33.0	0.0	0.0	$7,522.92	$68,254.74	$7,200.00	$61,054.74	8.12	59,485
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**403.5**	**403.5**	**$2,901.68**	**$34,988.99**	**$2,940.00**	**$32,048.99**	**11.04**	**47,248**
ECM 8	Install High Efficiency Hot Water Boilers	Yes	0	0.0	403.5	403.5	$2,901.68	$34,988.99	$2,940.00	$32,048.99	11.04	47,248
Domestic Water Heating Upgrade			**0**	**0.0**	**14.8**	**14.8**	**$106.58**	**$57.36**	**$0.00**	**$57.36**	**0.54**	**1,735**
ECM 9	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	14.8	14.8	$106.58	$57.36	$0.00	$57.36	0.54	1,735
Plug Load Equipment Control - Vending Machine			**1,551**	**0.0**	**0.0**	**0.0**	**$197.57**	**$1,437.60**	**$0.00**	**$1,437.60**	**7.28**	**1,562**
ECM 10	Vending Machine Control	Yes	1,551	0.0	0.0	0.0	$197.57	$1,437.60	$0.00	$1,437.60	7.28	1,562
TOTALS			**209,394**	**77.4**	**418.4**	**418.4**	**$29,674.89**	**$180,090.56**	**$21,335.00**	**$158,755.56**	**5.35**	**259,841**

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

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

4.1.1 Lighting Upgrades

Lighting Upgrades include several "submeasures" as outlined in Figure 17 below.

Figure 17 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Natural Gas Savings (MMBtu)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			46,254	15.1	0.0	0.0	$5,890.50	$41,837.04	$6,795.00	$35,042.04	5.95	46,577
ECM 1	Install LED Fixtures	Yes	3,763	1.8	0.0	0.0	$479.18	$4,285.85	$1,705.00	$2,580.85	5.39	3,789
ECM 2	Retrofit Fixtures with LED Lamps	Yes	42,491	13.3	0.0	0.0	$5,411.32	$37,551.19	$5,090.00	$32,461.19	6.00	42,788

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	160	0.0	0.0	$20.34	$35.85	$5.00	$30.85	1.52	161
Exterior	3,603	1.8	0.0	$458.84	$4,250.00	$1,700.00	$2,550.00	5.56	3,628

Measure Description

This measure evaluates replacing linear fluorescent lamps, ballasts, and reflectors with LED tube lamps, reflectors, and drivers specifically designed for existing linear fluorescent fixtures. The retrofit uses the existing fixture housing but replaces the rest of the components with an efficient source and reflectors designed for LEDs. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output and efficiently projects the light into the space.

Maintenance savings are anticipated since LED sources have burn hours which are more than twice that of a fluorescent source. Maintenance savings may be partially offset by the higher material costs associated with LED sources.

During retrofit planning and design, we recommend a holistic approach that considers both the technology of the lighting sources and how they are controlled.

Please refer to Appendix A: Equipment Inventory & Recommendations for a detailed list of the locations and light fixtures affected by this measure.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	42,116	13.1	0.0	$5,363.52	$37,300.24	$5,055.00	$32,245.24	6.01	42,410
Exterior	375	0.2	0.0	$47.80	$250.95	$35.00	$215.95	4.52	378

Measure Description

This measure evaluates replacing linear fluorescent lamps with LED tube lamps and replacing incandescent and halogen screw-in/plug-in based lamps with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed although there is a fluorescent fixture ballast in place. Other tube lamps require that fluorescent fixture ballasts be removed or replaced with LED drivers. Screw-in/plug-in LED lamps can be used as a direct replacement for most other screw-in/plug-in lamps. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

Maintenance savings are anticipated since LED sources have burn hours which are more than twice that of a fluorescent source and more than 10 times incandescent sources. LED lamps that use the existing fluorescent fixture ballast will be constrained by the remaining hours of the ballast. Maintenance savings may be partially offset by the higher material costs associated with LED sources.

During retrofit planning and design, we recommend a holistic approach that considers both the technology of the lighting sources and how they are controlled.

Please refer to Appendix A: Equipment Inventory & Recommendations for a detailed list of the locations and light fixtures affected by this measure.

4.1.2 Motor Upgrades

ECM 3: Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
25,666	9.6	0.0	$3,268.57	$11,262.78	$0.00	$11,262.78	3.45	25,845

Measure Description

This measure evaluates replacing standard efficiency motors with EISA 2007 efficiency motors. The evaluation assumes existing motors will be replaced with the same size motors. It is important that the speed of each new motor match the speed of the motor it replaces as closely as possible. The base case motor efficiencies are obtained from nameplate information. Proposed case premium motor efficiencies are obtained from the New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2012). Savings are based on the difference between baseline and proposed efficiencies and the annual operating hours.

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

4.1.3 Variable Frequency Drive Measures

Variable frequency drive (VFD) measures include several "submeasures" as outlined in Figure 18 below.

Figure 18 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**76,851**	**19.7**	**0.0**	**$9,787.07**	**$22,252.05**	**$4,400.00**	**$17,852.05**	**1.82**	**77,388**
ECM 4	Install VFDs on Constant Volume (CV) HVAC	52,414	14.6	0.0	$6,675.07	$9,366.05	$3,200.00	$6,166.05	0.92	52,781
ECM 5	Install VFDs on Chilled Water Pumps	9,437	3.3	0.0	$1,201.80	$6,334.30	$1,200.00	$5,134.30	4.27	9,503
ECM 6	Install VFDs on Hot Water Pumps	14,999	1.9	0.0	$1,910.20	$6,551.70	$0.00	$6,551.70	3.43	15,104

ECM 4: Install VFDs on CV HVAC

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
52,414	14.6	0.0	$6,675.07	$9,366.05	$3,200.00	$6,166.05	0.92	52,781

Measure Description

This measure evaluates installing a variable frequency drive (VFD) to control supply fan motor speed and converting the constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is required to control the return fan motor or dedicated exhaust fan motor if the air handler has one. The zone thermostats will modulate the VFD speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature. Energy savings result from reducing fan speed (and power) when there is a reduced load in the zone. The magnitude of energy savings is based on the amount of time at reduced loads.

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

ECM 5: Install VFDs on Chilled Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
9,437	3.3	0.0	$1,201.80	$6,334.30	$1,200.00	$5,134.30	4.27	9,503

Measure Description

This measure evaluates installing a variable frequency drive (VFD) to control a chilled water pump. This measure requires that a majority of the chilled water coils be served by 2-way valves and that a differential pressure sensor is installed in the chilled water loop. As the chilled water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings result from reducing pump motor speed (and power) as chilled water valves close. The magnitude of energy savings is based on the amount of time at reduced loads.

For system with variable chilled water flow through the chiller, the minimum flow to prevent the chiller from tripping will have to be determined during the final project design. The control system should be programmed to maintain the minimum flow through the chiller and to prevent pump cavitation.

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

ECM 6: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
14,999	1.9	0.0	$1,910.20	$6,551.70	$0.00	$6,551.70	3.43	15,104

Measure Description

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

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

4.1.4 Electric Chiller Replacement

ECM 7: Install High Efficiency Chillers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
59,072	33.0	0.0	$7,522.92	$68,254.74	$7,200.00	$61,054.74	8.12	59,485

Measure Description

This measure evaluates replacing old inefficient electric chillers with new high efficiency chillers. The type of chiller to be installed depends on the magnitude of the cooling load and variability of the cooling load profile. Positive displacement chillers are usually under 600 tons of cooling capacity and centrifugal chillers generally start at 150 tons of cooling capacity. Constant speed chillers should be used to meet cooling loads with little or no variation while variable speed chillers are more efficient for variable cooling load profiles. Water cooled chillers are more efficient than air cooled chillers but require cooling towers and additional pumps to circulate the cooling water. In any given size range variable speed chillers tend to have better part load efficiency but worse full load efficiency than constant speed chillers.

The savings result from the improvement in chiller efficiency and matching the right type of chiller to the cooling load. The energy savings associated with this measure are based on the cooling capacity of the new chiller, the improvement in efficiency compared with the base case equipment, the cooling load profile, and the annual operating hours of the chiller. Energy savings are maximized by proper selection of new equipment based on the load profile.

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

4.1.5 Gas Heating (HVAC/Process) Replacement

Gas heating replacement measures include several "submeasures" as outlined in Figure 19 below.

Figure 19 - Summary of Gas Heating Replacement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**93.0**	**$668.55**	**$34,988.99**	**$2,940.00**	**$32,048.99**	**47.94**	**10,886**
ECM 8	Install High Efficiency Hot Water Boilers	0	0.0	93.0	$668.55	$34,988.99	$2,940.00	$32,048.99	47.94	10,886

ECM 8: Install High Efficiency Hot Water Boilers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	93.0	$668.55	$34,988.99	$2,940.00	$32,048.99	47.94	10,886

Measure Description

This measure evaluates replacing old inefficient hot water boilers with high efficiency hot water boilers. Significant improvements have been made in combustion technology resulting in increases in overall boiler efficiency. Savings result from improved combustion efficiency and reduced standby losses at low loads.

The most notable efficiency improvement is condensing hydronic boilers that 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 were only evaluated when the return water temperature is less than 130 °F during most of the operating hours. As a result condensing hydronic boilers are not recommended for this site. It should be noted that condensing boilers produce acidic condensate that needs to be drained.

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

4.1.6 Domestic Water Heating Upgrade

Domestic water heating measures include several "submeasures" as outlined in Figure 20 below.

Figure 20 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**14.8**	**$106.58**	**$57.36**	**$0.00**	**$57.36**	**0.54**	**1,735**
ECM 9	Install Low-Flow Domestic Hot Water Devices	0	0.0	14.8	$106.58	$57.36	$0.00	$57.36	0.54	1,735

ECM 9: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	14.8	$106.58	$57.36	$0.00	$57.36	0.54	1,735

Measure Description

This measure evaluates the savings from installing low flow domestic water devices to reduce overall water flow in general and hot water flow in particular. Low flow showerheads and faucet aerators reduce the water flow, relative to standard showerheads and aerators, from the fixture. Pre-rinse spray valves—often used in commercial and institutional kitchens—are designed to remove food waste from dishes prior to dishwashing. Replacing standard pre-rinse spray valves with low flow valves will reduce water use.

All of the low flow devices reduce the overall water flow from the fixture which generally reduces the amount of hot water used resulting in energy and water savings.

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

4.1.7 Plug Load Equipment Control - Vending Machine

ECM 10: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,551	0.0	0.0	$197.57	$1,437.60	$0.00	$1,437.60	7.28	1,562

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor based controls to reduce the energy use. These controls power down the machine when the surrounding area is vacant, then monitor the surrounding temperature and power up the cooling system at regular intervals to keep the product cool. Savings are a function of the activity level around the vending machine.

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

5 Energy Efficient Practices

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

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Close Doors and Windows

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

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Perform Proper Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20% - 60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6 – 12 months.

Develop a Lighting Maintenance Schedule

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

Ensure Lighting Controls Are Operating Properly

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

Perform Routine Motor Maintenance

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

Use Fans to Reduce Cooling Load

Utilizing ceiling fans to supplement cooling is a low cost strategy to reduce cooling load considerably. Thermostat settings can be increased by 4°F with no change in overall occupant comfort when the wind chill effect of moving air is employed for cooling.

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Assess Chillers & Request Tune-Ups

Chillers are responsible for a substantial portion of a commercial building's overall energy usage. When components of a chiller are not optimized, this can quickly result in a noticeable increase in energy bills. Chiller diagnostics can produce a 5% to 10% cost avoidance potential from discovery and implementation of low/no cost optimization strategies.

Clean Evaporator/Condenser Coils on AC Systems

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

Clean and/or Replace HVAC Filters

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

Check for and Seal Duct Leakage

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

Perform Proper Boiler Maintenance

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

Perform Proper Water Heater Maintenance

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

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "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

Replace Computer Monitors

Replacing old computer monitors or displays with efficient monitors will reduce energy use. ENERGY STAR® rated monitors have specific requirements for on mode power consumption as well as idle and sleep mode power. According to the ENERGY STAR® website monitors that have earned the ENERGY STAR® label are 25% more efficient than standard monitors.

Water Conservation

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

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

Refer to Section 4.1.6 for any low-flow ECM recommendations.

6 Self-Generation Measures

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

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

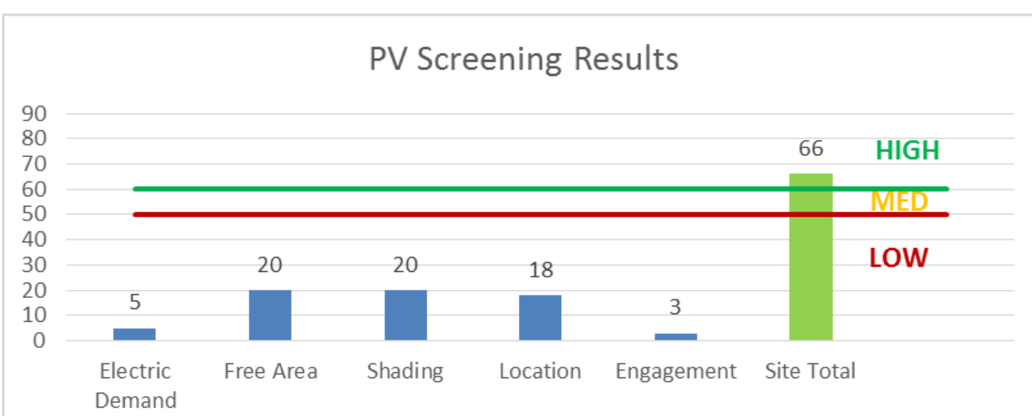
Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection,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

6.1 Photovoltaic

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

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

Figure 21 - Photovoltaic Screening



Potential	High	
System Potential	140	kW DC STC
Electric Generation	166,792	kWh/yr
Displaced Cost	$14,510	/yr
Installed Cost	$364,000	

Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing. Refer to Section 8.6 for additional information.

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

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

6.2 Combined Heat and Power

In non-industrial settings, combined heat and power (CHP) is the on-site generation of electricity and recovery of heat which is put to beneficial use. Common prime movers in CHP applications include reciprocating engines, microturbines, fuel cells, and (at large facilities) gas turbines. Electricity is typically interconnected to the sites local distribution system. Heat is recovered from the exhaust stream and the ancillary cooling system and interconnected to the existing hot water (or steam) distribution system.

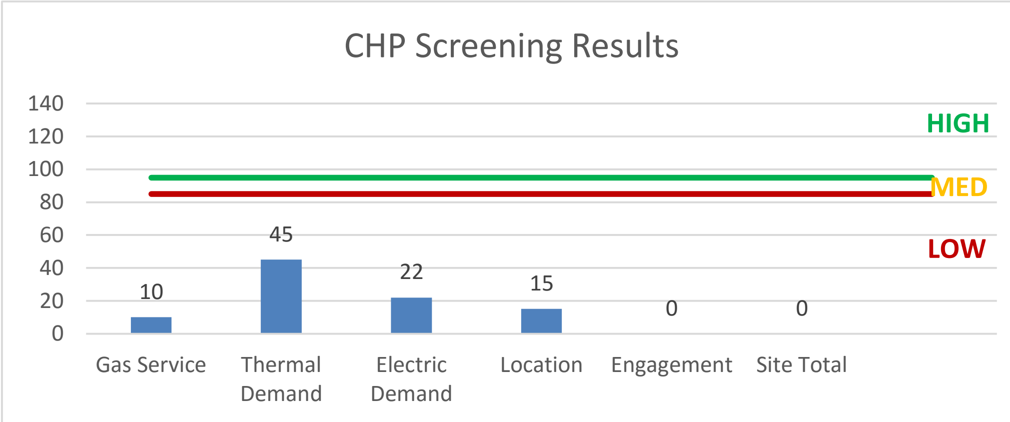
CHP systems are typically used to produce a portion of the electricity needed by a facility, with the balance of electric needs satisfied by purchase from the grid. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste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

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

Low or infrequent thermal load, and lack of space near the existing thermal generation are the most significant factors contributing to the low potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in NJ specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

Figure 22 - Combined Heat and Power Screening


CHP Screening Results
140
120
100
80
60
40
20
0
HIGH
MED
LOW
10
45
22
15
0
0
Gas Service
Thermal Demand
Electric Demand
Location
Engagement
Site Total

7 Demand Response

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

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

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

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

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

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

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and others, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's 1999 Electricity Restructuring Law which requires all customers of investor-owned electric and gas utilities to pay this charge on their monthly energy bills. As a contributor to the fund you were able to participate in the LGEA program and are also eligible to utilize the equipment incentive programs. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 23 for a list of the eligible programs identified for each recommended ECM.

Figure 23 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install
ECM 1	Install LED Fixtures	x		x
ECM 2	Retrofit Fixtures with LED Lamps	x		x
ECM 3	Premium Efficiency Motors			x
ECM 4	Install VFDs on Constant Volume (CV) HVAC	x		x
ECM 5	Install VFDs on Chilled Water Pumps	x		x
ECM 6	Install VFDs on Hot Water Pumps			x
ECM 7	Install High Efficiency Chillers	x		x
ECM 8	Install High Efficiency Hot Water Boilers	x		x
ECM 9	Install Low-Flow Domestic Hot Water Devices			x
ECM 10	Vending Machine Control			x

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

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent comparison of available incentives.

Brief descriptions of all relevant alternative financing and incentive programs are located in the sections below. You may also check the following website for further information, including most current program availability, requirements, and incentive levels: www.njcleanenergy.com/ci

8.1 SmartStart

Overview

The SmartStart (SS) program is comprised of New Construction and Retrofit components that offer incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives for various energy efficiency equipment based on national/market trends, new technologies or changes in efficiency baselines.

Prescriptive Equipment Incentives 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

All customer sizes and types may be served by this program. This program provides an effective mechanism for securing incentives for individual projects that may be completed at once or over several years.

Incentives

The prescriptive path provides fixed incentives for specific energy efficiency measures whereas the custom measure path provides incentives for unique or specialized technologies that are not addressed through prescriptive offerings.

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

How to Participate

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

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

8.2 Direct Install

Overview

Direct Install (DI) is a turnkey program available to existing small to mid-sized facilities with a peak electric demand that did not exceed 200 kW in any of the preceding 12 months. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and install those measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the DI program you will need to contact the participating contractor assigned to the county where your facility is located; a complete list is provided on the DI website identified below. The contractor will be paid the program incentive directly which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps mentioned above, and the remaining 30% of the cost is your responsibility to the contractor.

Since DI offers a free assessment, LGEA applicants that do not meet the audit program eligibility requirements, but do meet the DI requirements, may be moved directly into this program.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI

8.3 SREC Registration Program

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

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

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

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

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

8.4 Energy Savings Improvement Program

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

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

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

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

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

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

9 Energy Purchasing and Procurement Strategies

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	0.26	803	0.0	$102.27	$834.30	$100.00	7.18
Entrance Hallway	1	Incandescent: A Lamp 65W	Wall Switch	65	2,080	Fixture Replacement	No	1	LED - Fixtures: Downlight Recessed	Wall Switch	15	2,080	0.04	122	0.0	$15.50	$35.85	$5.00	1.99
Entrance Hallway	1	Halogen Incandescent: PAR 38 90W	Wall Switch	90	2,080	Relamp	No	1	LED Screw-In Lamps: 15W LED A20	Wall Switch	15	2,080	0.06	183	0.0	$23.24	$35.85	$5.00	1.33
Hallway	62	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	62	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	1.63	4,979	0.0	$634.10	$5,172.66	$620.00	7.18
Hallway	8	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	8	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Reception Area	22	Compact Fluorescent: Recessed CFL 32W	Occupancy Sensor	32	1,456	Relamp	No	22	LED Screw-In Lamps: 15W LED A19	Occupancy Sensor	15	1,456	0.30	637	0.0	$81.14	$788.70	$110.00	8.36
Front Entrance-Exterior	4	Compact Fluorescent: Recessed CFL 32W	Daylight Dimming	32	1,040	Relamp	No	4	LED Screw-In Lamps: 15W LED A19	Daylight Dimming	15	1,040	0.05	83	0.0	$10.54	$143.40	$20.00	11.71
Front Entrance-Exterior	1	Compact Fluorescent: Recessed CFL 32W	Daylight Dimming	32	1,040	Relamp	No	1	LED Screw-In Lamps: 15W LED A19	Daylight Dimming	15	1,040	0.01	21	0.0	$2.63	$35.85	$5.00	11.71
Waiting Room Area	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,080	Relamp	No	7	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,080	0.04	122	0.0	$15.50	$966.00	$140.00	53.30
Conference Room	1	Compact Fluorescent: Recessed CFL 32W	Occupancy Sensor	32	1,456	Relamp	No	1	LED Screw-In Lamps: 15W LED A19	Occupancy Sensor	15	1,456	0.01	29	0.0	$3.69	$69.79	$5.00	17.57
Conference Room	1	LED Screw-In Lamps: Recessed LED 12W	Occupancy Sensor	12	1,456	None	No	1	LED Screw-In Lamps: Recessed LED 12W	Occupancy Sensor	12	1,456	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Conference Room	18	LED - Fixtures: Downlight Surface Mount	Occupancy Sensor	40	1,456	None	No	18	LED - Fixtures: Downlight Surface Mount	Occupancy Sensor	40	1,456	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room1	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.12	253	0.0	$32.22	$313.05	$45.00	8.32
Tortoriello Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Katharine E. Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Room2	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.12	253	0.0	$32.22	$313.05	$45.00	8.32
Clark D. Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Room3	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.24	506	0.0	$64.43	$626.10	$90.00	8.32
Room4	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.16	337	0.0	$42.96	$417.40	$60.00	8.32
Pamela M. Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Room5	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.12	253	0.0	$32.22	$313.05	$45.00	8.32
Steve T. Room1	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Steve T. Room2	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,080	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,080	0.32	964	0.0	$122.73	$834.80	$120.00	5.82
Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	1,456	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,456	0.01	30	0.0	$3.80	$62.52	$5.00	15.15
Bathroom	1	Incandescent: A Lamp 60W	Occupancy Sensor	60	1,456	Relamp	No	1	LED Screw-In Lamps: 15W LED PAR38	Occupancy Sensor	15	1,456	0.04	77	0.0	$9.76	$38.85	$0.00	3.98

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Meeting Room1	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.16	337	0.0	$42.96	$417.40	$60.00	8.32
Denis Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Richard Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.24	506	0.0	$64.43	$626.10	$90.00	8.32
General Council Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.12	253	0.0	$32.22	$313.05	$45.00	8.32
Carol A. Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Jerrel Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.39	843	0.0	$107.39	$1,043.50	$150.00	8.32
Storage Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,456	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.05	112	0.0	$14.32	$166.86	$20.00	10.26
Joseph Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Electrical Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	0.05	161	0.0	$20.45	$166.86	$20.00	7.18
Storage Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	0.21	642	0.0	$81.82	$667.44	$80.00	7.18
Aquatic Lab Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,080	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,080	0.24	723	0.0	$92.05	$626.10	$90.00	5.82
Water Quality Lab Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.47	1,012	0.0	$128.87	$1,252.20	$180.00	8.32
Storage Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,080	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,080	0.01	43	0.0	$5.42	$62.52	$5.00	10.61
Intern Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,080	Relamp	No	10	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,080	0.39	1,205	0.0	$153.41	$1,043.50	$150.00	5.82
Chap Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.12	253	0.0	$32.22	$313.05	$45.00	8.32
Jessica R. Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Rich Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.12	253	0.0	$32.22	$313.05	$45.00	8.32
Kenneth F. Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.32	675	0.0	$85.91	$834.80	$120.00	8.32
Karl S. Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.32	675	0.0	$85.91	$834.80	$120.00	8.32
Namsoo Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.12	253	0.0	$32.22	$313.05	$45.00	8.32
Recycling Room	1	Compact Fluorescent: 32W CFL Ceiling Mounted	Wall Switch	32	2,080	Relamp	No	1	LED Screw-In Lamps: Downlight Recessed	Wall Switch	15	2,080	0.01	41	0.0	$5.27	$35.85	$5.00	5.86
Men's Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,456	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.03	56	0.0	$7.16	$83.43	$10.00	10.26
Men's Bathroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	1,456	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,456	0.06	119	0.0	$15.19	$250.08	$20.00	15.15
LiBrary Room	33	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	33	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	0.87	2,650	0.0	$337.51	$2,753.19	$330.00	7.18
Lunch Room	10	LED - Fixtures: Downlight Surface Mount	Occupancy Sensor	40	1,456	None	No	10	LED - Fixtures: Downlight Surface Mount	Occupancy Sensor	40	1,456	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Storage Room	1	Compact Fluorescent: Recessed CFL 32W	Wall Switch	32	2,080	Relamp	No	1	LED Screw-In Lamps: 15W LED PAR38	Wall Switch	15	2,080	0.01	41	0.0	$5.27	$35.85	$5.00	5.86
Women's Bathroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.08	169	0.0	$21.48	$208.70	$30.00	8.32
Women's Bathroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	1,456	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,456	0.04	89	0.0	$11.39	$187.56	$15.00	15.15
Meeting Room2	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.24	506	0.0	$64.43	$626.10	$90.00	8.32
Thomas J. Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Meeting Room3	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
John R. Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.12	253	0.0	$32.22	$313.05	$45.00	8.32
Pamela Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Robert L. Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Gregory J. Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Eric Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Amy Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Gail R. Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Hernan Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Shane M. Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Bob Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Bill Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.20	422	0.0	$53.69	$521.75	$75.00	8.32
Judy Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.12	253	0.0	$32.22	$313.05	$45.00	8.32
David Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,456	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,456	0.24	506	0.0	$64.43	$626.10	$90.00	8.32
Fire Control Room	1	Compact Fluorescent: Receesed CFL 32W	Wall Switch	32	2,080	Relamp	No	1	LED Screw-In Lamps: 15W LED PAR38	Wall Switch	15	2,080	0.01	41	0.0	$5.27	$35.85	$5.00	5.86
Reception Bathroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	33	1,456	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.00	7	0.0	$0.87	$83.43	$0.00	96.14
Reception Bathroom	1	Compact Fluorescent: Recessed CFL 26W	Occupancy Sensor	26	1,456	Relamp	No	1	LED Screw-In Lamps: 15W LED PAR38	Occupancy Sensor	15	1,456	0.01	19	0.0	$2.39	$35.85	$0.00	15.02
Storage Room	1	Compact Fluorescent: Recessed CFL 32W	Occupancy Sensor	32	1,456	Relamp	No	1	LED Screw-In Lamps: 15W LED PAR38	Occupancy Sensor	15	1,456	0.01	29	0.0	$3.69	$35.85	$0.00	9.72
Parking Lot	10	Metal Halide: (1) 150W Lamp	Daylight Dimming	190	1,040	Fixture Replacement	No	10	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	40	1,040	1.19	1,825	0.0	$232.44	$1,544.30	$0.00	6.64
Parking Lot	7	Metal Halide: (1) 100W Lamp	Daylight Dimming	128	1,040	Fixture Replacement	No	7	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	20	1,040	0.60	920	0.0	$117.15	$250.95	$0.00	2.14

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
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Parking Lot	2	Halogen Incandescent: PAR38 90W	Daylight Dimming	90	1,365	Relamp	No	2	LED Screw-In Lamps: 15W LED	Daylight Dimming	15	1,365	0.12	240	0.0	$30.51	$71.70	$10.00	2.02
Back Enrance- Exterior	2	LED Screw-In Lamps: Recessed LED 14W	Daylight Dimming	14	1,365	None	No	2	LED Screw-In Lamps: Recessed LED 14W	Daylight Dimming	14	1,365	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Basement Storage	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,730	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,730	0.24	949	0.0	$120.81	$626.10	$90.00	4.44
Stairway	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,730	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,730	0.12	474	0.0	$60.41	$313.05	$45.00	4.44

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof Top	Kitchen	1	Exhaust Fan	0.8	62.0%	No	2,745	No	62.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Basement	Basement	1	Air Compressor	1.0	68.0%	No	4,957	No	68.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Basement	Boiler Hot water loop	1	Heating Hot Water Pump	5.0	89.5%	No	2,745	No	89.5%	Yes	1	0.84	6,635	0.0	$845.01	$3,275.85	$0.00	3.88
Basement	Boiler Hot water loop	1	Heating Hot Water Pump	5.0	71.0%	No	2,745	No	71.0%	Yes	1	1.06	8,364	0.0	$1,065.19	$3,275.85	$0.00	3.08
Basement	DHW Pump Motor	1	Water Supply Pump	3.0	54.0%	No	2,745	No	54.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Basement	CHW	2	Chilled Water Pump	10.0	75.0%	No	1,000	Yes	91.7%	Yes	1	5.68	11,882	0.0	$1,513.23	$9,021.40	$1,200.00	5.17
Basement	Airside System	4	Supply Fan	10.0	75.0%	No	3,391	Yes	91.7%	Yes	1	19.40	68,999	0.0	$8,787.20	$14,740.25	$3,200.00	1.31
Basement	Airside System	4	Return Fan	5.0	75.0%	No	2,745	Yes	89.5%	No		2.38	6,635	0.0	$845.01	$3,201.48	$0.00	3.79

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof Top	Data Room	1	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Building	1	Packaged AC	6.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric Chiller Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	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 Top	Building	1	Air-Cooled Reciprocating Chiller	77.70	Yes	1	Air-Cooled Centrifugal Chiller	Variable	80.00	1.24	0.74	32.98	59,072	0.0	$7,522.92	$68,254.74	$7,200.00	8.12

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Basement	Building	1	Non-Condensing Hot Water Boiler	1,960.00	Yes	1	Non-Condensing Hot Water Boiler	1,960.00	85.00%	Et	0.00	0	93.0	$668.55	$34,988.99	$2,940.00	47.94

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Basement	Building	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Steve Room2	1	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	2.0	$14.60	$7.17	$0.00	0.49
Women's Bathroom	3	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	6.1	$43.80	$21.51	$0.00	0.49
Men,s Bathroom	3	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	6.1	$43.80	$21.51	$0.00	0.49
Lunch Room	1	Faucet Aerator (Kitchen)	2.50	2.20	0.00	0	0.6	$4.38	$7.17	$0.00	1.64

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	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
Aquatic Laboratory	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Lunch Room	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Building	35	Desktop Computer	110.0	Yes
katharine E. Room	1	Small Printer	20.0	Yes
Pamela M. Room	1	Small Printer	20.0	Yes
Steve Tambini Room1	1	Small Printer	20.0	Yes
Carol A. Room	1	Small Printer	20.0	Yes
Jerrel Room	1	Multifunction Printer	760.0	Yes
Jerrel Room	1	Multifunction Printer	760.0	Yes
Joseph Room	1	Small Printer	35.0	Yes
Intern Room	1	Small Printer	35.0	Yes
Intern Room	1	Multifunction Printer	450.0	No
Kenneth F. Room	1	Printer	45.0	Yes
Kenneth F. Room	1	Printer	550.0	Yes
Lunch Room	1	Microwave	1,000.0	No
Lunch Room	1	Microwave	1,000.0	No
Lunch Room	2	Toater	800.0	No
Eric Room	1	Small Printer	25.0	Yes
Amy Room	1	Printer	45.0	Yes
Judy Room	1	Printer	45.0	Yes

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lunch Room	1	Non-Refrigerated	Yes	0.00	343	0.0	$43.62	$718.80	$0.00	16.48
Lunch Room	1	Glass Fronted Refrigerated	Yes	0.00	1,209	0.0	$153.95	$718.80	$0.00	4.67

Appendix B: EPA Statement of Energy Performance

Need to include SEP report at minimum. Recommend also include Data Verification Checklist and Score Card (if applicable). These are all easily generated by Portfolio Manager

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

3

ENERGY STAR® Score[1]

Delaware River Bassin Commission

Primary Property Type: Office
Gross Floor Area (ft²): 27,055
Built: 1970

For Year Ending: March 31, 2016
Date Generated: November 03, 2016

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
Delaware River Bassin Commission 25 State Police Drive West Trenton, New Jersey 08628	______________ , (___)___-_____	___ ______ , (___)___-_____ ______________

Property ID: 5086545

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
163.8 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	1,938,361 (44%)
Natural Gas (kBtu)	2,494,116 (56%)

Source EUI
321.8 kBtu/ft²

National Median Comparison

National Median Site EUI (kBtu/ft²)	79
National Median Source EUI (kBtu/ft²)	155.1
% Diff from National Median Source EUI	107%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	355

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: Option B HVAC System

Measure Description

The existing HVAC system built up major mechanical system comprised of a chiller, a boiler, pumps, fans, and air handlers equipped with heating and cooling coils. The system is antiquated and inefficient and requires replacement. The report addresses the replacement of the equipment with new high efficiency equipment. We have included that analysis below as a package calling it Option One.

The Commission requested an analysis to replace the existing system with a new system rather than simply replacing the existing equipment. The below calculation evaluates the replacement of the built up mechanical system currently in operation with packaged heating and cooling rooftop units called Option Two. The units were sized using the design/as-built capacity of the existing system. The analysis does not include cost for decommissioning and removal of old equipment. The recommended next step is for the Commission to engage a mechanical contractor to further evaluate the project. This measure will be discussed in detail during the debrief call.

Existing Condition:

Existing Conditions							
Description	One Split-System AC (2-Tons; 12 SEER) One Packaged AC (6-Tons, 12.5 EER) One Constant Speed Air-Cooled Reciprocating Chiller (77.7 Tons; 1.4 kW/Ton) One Non-Condensing Gas-Fired Hot Water Boiler (1,960 MBH Output, 65% Et) Ancillary Equipment (Chilled Water Pumps, Boiler Hot Water Pumps, AHU Supply Fans, AHU Return Fans)						
System Quantity	**System Type**	**Cooling Capacity per Unit (Tons)**	**Output Heating Capacity per Unit (MBh)**	**Total kW**	**Total Annual kWh**	**Total Annual MMBtu**	**Annual Energy Cost**
1	Split-System AC	2.00	0	2.00	1,600	0.0	$203.76
1	Packaged AC	6.00	0	5.76	4,608	0.0	$586.84
1	Air-Cooled Reciprocating Chiller	77.70	0	108.78	130,536	0.0	$16,623.99
1	Non-Condensing Hot Water Boiler	0.00	1,960	0.00	0	2,522.1	$18,135.47
Ancillary Equipment (Chilled Water Pumps, Boiler Pumps, AHU Supply/Return Air Fans)				*88.99*	*176,459*	*0.0*	*$22,472.31*
Totals				**205.53**	**313,203**	**2,522.1**	**$58,022.38**

analysis continued on next page

Option 1- Replace Existing Equipment (Included as ECM's in Energy Audit)

Proposed Conditions (Option #1)							
Description	**No Change**: One Split-System AC (2-Tons; 12 SEER) **No Change:** One Packaged AC (6-Tons, 12.5 EER) **Replace Existing Chiller:** One Variable Speed Air-Cooled Centrifugal Chiller (80.0 Tons; 0.74 kW/Ton) **Replace Existing Boiler:** One Non-Condensing Gas-Fired Hot Water Boiler (1,960 MBH Output, 85% Et) **No Change:** Ancillary Equipment (Chilled Water Pumps, Boiler Hot Water Pumps, AHU Supply Fans, AHU Return Fans)						
System Quantity	**System Type**	**Cooling Capacity per Unit (Tons)**	**Output Heating Capacity per Unit (MBh)**	**Total kW**	**Total Annual kWh**	**Total Annual MMBtu**	**Annual Energy Cost**
1	Split-System AC	2.00	0	2.00	1,600	0.0	$203.76
1	Packaged AC	6.00	0	5.76	4,608	0.0	$586.84
1	Air-Cooled Centrifugal Chiller	80.00	0	75.80	71,464	0.0	$9,101.07
1	Non-Condensing Hot Water Boiler	0.00	1,960	0.00	0	2,118.5	$15,233.79
Ancillary Equipment (Chilled Water Pumps, Boiler Pumps, AHU Supply/Return Air Fans)				*88.99*	*176,459*	*0.0*	*$22,472.31*
				172.55	**254,131**	**2,118.5**	**$47,597.78**

Option 2- Replace Existing Equipment with Packaged RTU's

Proposed Conditions (Option #2)							
Description	**No Change**: One Split-System AC (2-Tons; 12 SEER) **No Change:** One Packaged AC (6-Tons, 12.5 EER) **Replace Existing Chiller and Boiler with RTUs w/ Gas Heating:** Four Packaged RTUs w/ Gas Heating (20 Tons each; 12 EER; 410 MBH Output each; 82% Et) **Remove CHW Pumps, Boiler Water Pumps, AHU Fans:** Ancillary Equipment (RTU Fans)						
System Quantity	**System Type**	**Cooling Capacity per Unit (Tons)**	**Output Heating Capacity per Unit (MBh)**	**Total kW**	**Total Annual kWh**	**Total Annual MMBtu**	**Annual Energy Cost**
1	Split-System AC	2.00	0	2.00	1,600	0.0	$203.76
1	Packaged AC	6.00	0	5.76	4,608	0.0	$586.84
4	Packaged AC (w/ Gas Heating)	20.00	0	80.00	96,000	0.0	$12,225.77
4	Furnace (RTU Heating)	0.00	410	0.00	0	2,196.0	$15,791.13
Ancillary Equipment (RTU Fans)				*59.68*	*142,143*	*0.0*	*$18,102.14*
				147.44	**244,351**	**2,196.0**	**$46,909.64**

Side by Side Comparison

Comparative Analysis (Option 1 vs. Option 2)		
	Option 1	**Option 2**
kW Demand Savings	32.98	58.09
Annual kWh Savings	59,072	68,852
Annual MMBtu Savings	403.5	326.0
Annual Energy Cost Savings	$10,424.60	$11,112.73
Implementation Cost (does not include existing equipment removal)	$103,243.73	$151,936.40
NJOCE SmartStart Incentives	$10,140.00	$6,320.00
Net Implementation Cost	$93,103.73	$145,616.40
Simple Payback in Years (after Incentives)	8.9	13.1

RSMeans Cost Data		
Equipment Type	Cost (M+L+O&P)	
20-Ton Single-Zone RTU with Gas Heat	$37,984.10	Trenton Cost Region