Local Government Energy Audit:
Energy Audit Report

Construction Center

10 South Boyd Street

Cape May Courthouse, New Jersey

08210

Middle Township

March 28, 2019

Final Report by:

TRC Energy Services

Disclaimer

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

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

TRC bases estimated installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. We encourage the owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual measures and conditions. TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

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

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

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1 EXECUTIVE SUMMARY

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

The goal of a LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

The Construction Center is a 9,114 square foot building that was formerly a fire station and now houses the Middle Township Construction and Zoning offices as well as police facilities. The fire truck bays are made of concrete block and brick veneer construction with a flat roof and are now used as storage for various specialty police vehicle and equipment. The rooms to the rear of the truck bays are also used by the police. Attached to the space is a stucco clad residential type building with a shingled, pitched roof, housing the construction and zoning offices. The heating system is primarily a boiler with baseboard radiators and how water fans coils, the building is cooled with split system air conditioning (AC) units and a number of ductless mini-split.

Lighting at the Construction Center consists of a variety of fluorescent fixtures. A detailed description of the building systems is in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated seven measures and recommends five measures which together represent an opportunity for Construction Center to reduce annual energy costs by roughly $2,840 and annual greenhouse gas emissions by 18,201 lbs. CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 4.1 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Construction Center's annual energy use by 14%.

Figure 1 – Previous 12 Month Utility Costs

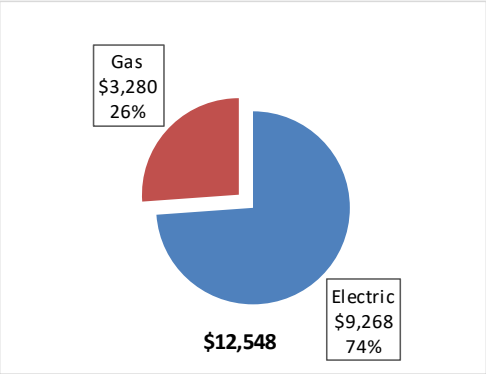
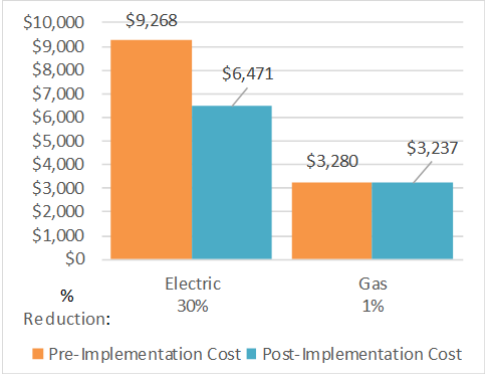


Figure 2 – Potential Post-Implementation Costs



A detailed description of the Construction Center's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**16,755**	**5.1**	**0.0**	**$2,655.28**	**$12,305.40**	**$1,391.00**	**$10,914.40**	**4.1**	**16,872**
ECM 1	Install LED Fixtures	Yes	8,457	1.6	0.0	$1,340.23	$5,562.84	$116.00	$5,446.84	4.1	8,516
ECM 2	Retrofit Fixtures with LED Lamps	Yes	7,724	3.5	0.0	$1,224.09	$6,163.23	$1,275.00	$4,888.23	4.0	7,778
ECM 3	Install LED Exit Signs	Yes	574	0.0	0.0	$90.96	$579.32	$0.00	$579.32	6.4	578
Lighting Control Measures			**895**	**0.3**	**0.0**	**$141.76**	**$850.00**	**$115.00**	**$735.00**	**5.2**	**901**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	895	0.3	0.0	$141.76	$850.00	$115.00	$735.00	5.2	901
Electric Unitary HVAC Measures			**2,090**	**1.5**	**0.0**	**$331.23**	**$18,491.58**	**$0.00**	**$18,491.58**	**55.8**	**2,105**
	Install High Efficiency Electric AC	No	2,090	1.5	0.0	$331.23	$18,491.58	$0.00	$18,491.58	55.8	2,105
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**25.9**	**$301.32**	**$27,891.98**	**$2,556.40**	**$25,335.58**	**84.1**	**3,029**
	Install High Efficiency Hot Water Boilers	No	0	0.0	25.9	$301.32	$27,891.98	$2,556.40	$25,335.58	84.1	3,029
Domestic Water Heating Upgrade			**0**	**0.0**	**3.7**	**$42.57**	**$21.51**	**$0.00**	**$21.51**	**0.5**	**428**
ECM 5	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	3.7	$42.57	$21.51	$0.00	$21.51	0.5	428
TOTALS FOR HIGH PRIORITY MEASURES			**17,650**	**5.4**	**3.7**	**$2,839.62**	**$13,176.91**	**$1,506.00**	**$11,670.91**	**4.1**	**18,201**
TOTALS FOR ALL EVALUATED MEASURES			**19,740**	**6.9**	**29.5**	**$3,472.18**	**$59,560.46**	**$4,062.40**	**$55,498.06**	**16.0**	**23,335**

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

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

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

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

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

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

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

Energy Efficient Practices

TRC also identified eight low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at the Construction Center include:

- Reduce Air Leakage
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Perform Proper Boiler Maintenance
- Perform Proper Furnace Maintenance
- Perform Proper Water Heater Maintenance
- Water Conservation

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

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for the Construction Center. Based on the configuration of the site and its loads there is a **low** potential for installing any PV and combined heat and power self-generation measures.

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

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

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

- SmartStart
- Direct Install
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program, you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives than SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated Direct Install contractor and, in most cases, they will perform the installation work.

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

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

Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Elizabeth Terenik	Township Administrator	eterenik@middletownship.com	609-465-8732
Rob Flynn	Pulic Works Supervisor	rflynn@middletownship.com	609 602 1245
Designated Representative			
Tom Fairman	Techician		609 602 1245
TRC Energy Services			
Robert Grindrod	Auditor	rgrindrod@trcsolutions.com	518-416-7202

2.2 General Site Information

On September 18, 2018, TRC performed an energy audit at the Construction Center located in Cape May Courthouse, New Jersey. TRC's team met with Robert Flynn to review the facility operations and help focus our investigation on specific energy-using systems.

Constructed in 1926, the Construction Center is a 9,114 square foot facility that was formerly a fire station and now houses the Middle Township Construction and Zoning offices as well as police facilities. The fire truck bays are made of concrete block and brick veneer construction with a flat roof and are now use as storage for various specialty police vehicle and equipment. The rooms to the rear of the truck bays are also used by the police. Attached to the space is a stucco clad residential type building with a shingled, pitched roof, housing the construction and zoning offices. The heating system is primarily a boiler with baseboard radiators and how water fans coils, the building is cooled with split system AC units and a number of ductless mini-split

2.3 Building Occupancy

The police space may be accessed on any day at any time. The are no offices, only storage and regularly accessed rooms were patrol officer prepare to deploy. The Construction and Zoning offices are open Monday through Friday. The typical schedule is presented in the table below. During a typical day, the facility is occupied by approximately five staff.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Construction Office	Weekday	8:30 AM - 5:00 PM
Construction Office	Weekend	closed

2.4 Building Envelope

Given the age of the building, and the type of construction, it was likely built without insulation in the walls and minimal ceiling/roof insulation. The interior walls of the truck bay are painted concrete blocks. A suspended grid ceiling with drop-in panels was installed at some point. The walls extend up to a parapet surrounding the flat roof. The level of roof insulation is not known. The Construction and Zoning office is a concrete block building finished with stucco and brick exterior finish. The interior side of the walls are finished with drywall or wood veneer paneling. The attic joist spaces over a one-story extension were filled with fiberglass batt insulation. The double hung single glazed window were fitted with storm windows and were in good condition. The police storage garage has three 12-foot-high insulated overhead doors that are in good condition. The entry doors are good quality unglazed insulated steel doors.

Figure 6 - Construction/Zoning/ Police

Figure 7 - Police Storage Bay

2.5 On-Site Generation

Construction Center does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

Lighting System

Lighting at the facility is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL). Most of the fixtures are 2-lamp or 4-lamp, 4-foot long troffers with diffusers. The exterior photo cell controlled fixtures include 500-Watt (estimated) halogen floodlights, high pressure sodium wall packs and some compact fluorescent recessed fixtures in a soffit in the front of the building.

Hot Water Heating System

The building has an older (estimated at 30 years) Weil McLain 1,162 mBh, non-condensing hot water boiler with a nominal efficiency of 80% which is in fair condition for its age. There are two heating hot water pumps, one 1/2 hp and one 1/10 hp. There are also thermostatically controlled zone valves serving radiators in various areas of the building and there is a hot water fan coil unit in the SWAT room. The police garage is heated with ceiling mounted hot water fan coil units.

Figure 8 - Weil McLain boiler

Figure 9 - Heating hot water circulator

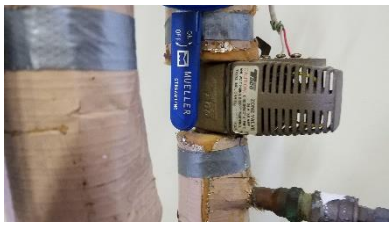


Figure 10 - Hot water zone valve

Figure 11 - SWAT room fan coil

Figure 12 - Old Honeywell thermostat

Figure 13 - Ceiling mounted fan coil unit in police garage

Direct Expansion Air Conditioning System (DX)

There are several mini-split air conditioners (AC) and heat pump serving various parts of the building. Cooling capacities for all units range from .75 to 2 tons and SEER ranges from 10 to 16. The one heat pump is a 1 ton unit with a SEER of 16 and a COP of 2.74. There is one 1.5 ton package terminal AC unit in the second floor IT closet with an estimated SEER of 10. There are two split system AC units. One is a 3.5 ton, 13 SEER unit serving the construction/zoning office and the other is an older unit with no nameplate info, estimated to be a 1.5 ton unit and 10 SEER. There are 2 roll-around, .83 ton portable window AC units, with integral thermostats, one serving the second floor archive room and the other serving the Swat room. These are SEER 10 units.

Most of the units are ground mounted but given the number and style of indoor evaporator units, we assumed there are condensers located on the flat roof over the police garage.

Figure 14 - Ground mounted condensers

Figure 15 - Ground mounted condenser

Figure 16 - Mini-split heat pump

Figure 17 - Minisplit indoor unit (condenser on the roof)

Figure 18 - Indoor unit in plan room

Figure 19 - PTAC in IT room.

Fuel Fired HVAC Equipment

The offices are heated with a condensing furnace that was not accessible at the time of the audit. The capacity was estimated at 80 mBh and efficiency a 90%.

Figure 20 - Condensing furnace intake and exhaust piping

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists one Ruud 40 gallon, 40 mBh natural gas hot water heater.

Building Plug Load

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

Other plug loads include refrigerators, printers (including a wide format printer), a water cooler, a large screen TV and an ice machine in the police department area.

2.7 Water-Using Systems

There are three restrooms at this facility. The faucets are rated for 2.0 gpm or higher, the toilets are rated at 1.6 gallons per flush (gpf).

3 SITE ENERGY USE AND COSTS

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

3.1 Total Cost of Energy

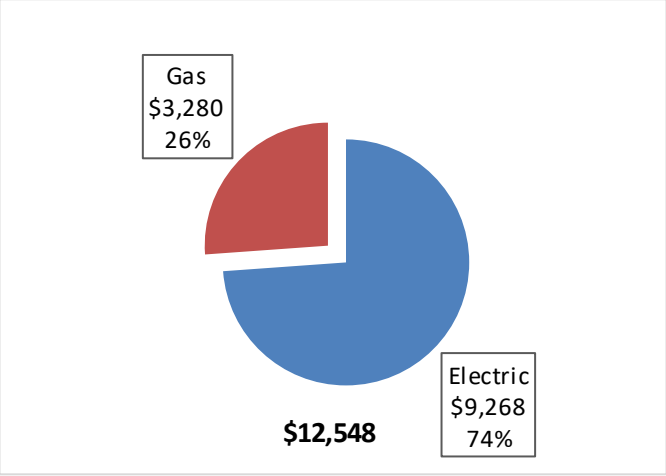
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 21 - Utility Summary

Utility Summary for Construction Center		
Fuel	**Usage**	**Cost**
Electricity	58,480 kWh	$9,268
Natural Gas	2,816 Therms	$3,280
Total		**$12,548**

The current annual energy cost for this facility is $12,548 as shown in the chart below.

Figure 22 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by Atlantic City Electric. The average electric cost over the past 12 months was $0.158/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The usage pattern is normal for a facility with constant occupancy, and a winter electric heat load resulting from electric heating load (heat pumps), hot water heating circulating pumps and hot water fan coil fan energy. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 23 - Electric Usage & Demand

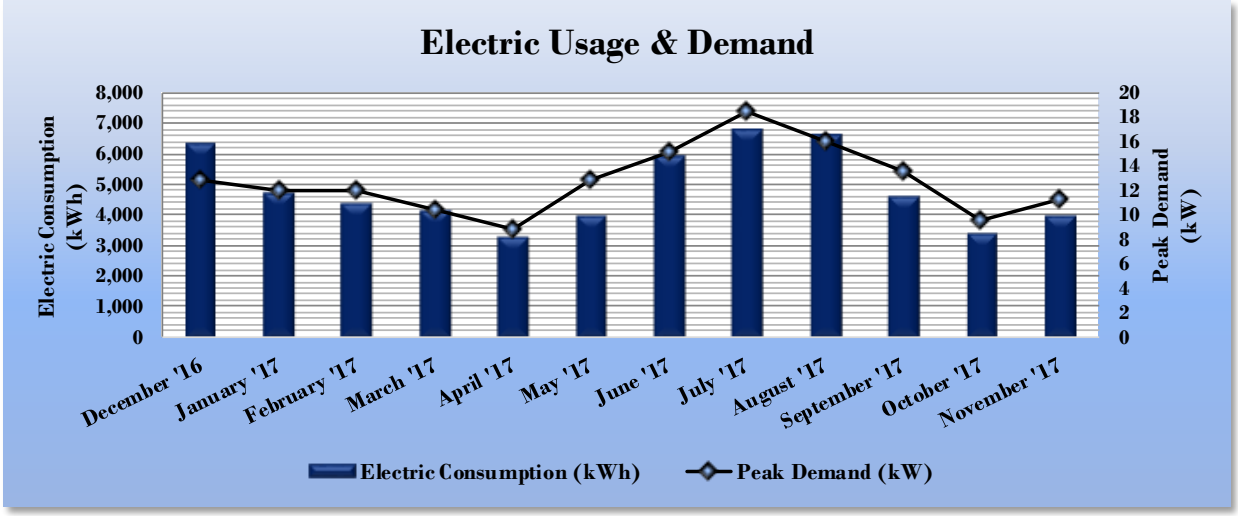


Figure 24 - Electric Usage & Demand

Electric Billing Data for Construction Center					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
1/12/17	30	6,320	13	$22	$994
2/9/17	33	4,720	12	$17	$760
3/10/17	28	4,400	12	$18	$713
4/11/17	29	4,160	10	$17	$678
5/11/17	32	3,280	9	$14	$540
6/12/17	30	4,000	13	$10	$661
7/12/17	32	5,920	15	$29	$936
8/10/17	30	6,800	18	$34	$1,075
9/13/17	29	6,640	16	$34	$1,066
10/11/17	34	4,640	14	$23	$709
11/9/17	28	3,440	10	$16	$513
12/11/17	29	4,000	11	$21	$598
Totals	**364**	**58,320**	**18.4**	**$256**	**$9,242**
Annual	**365**	**58,480**	**18.4**	**$257**	**$9,268**

3.3 Natural Gas Usage

Natural gas is provided by South Jersey Gas. The average gas cost for the past 12 months is $1.165/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. The energy use profile for natural gas is typical for a gas heated building with a small service water load in a temperate climate.

Figure 25 - Natural Gas Usage

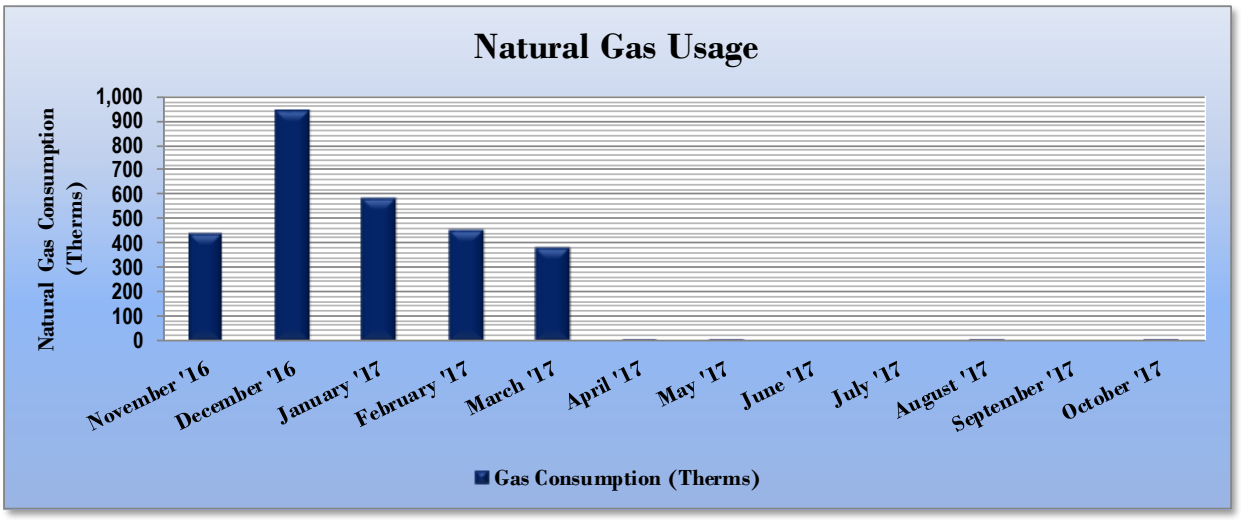


Figure 26 - Natural Gas Usage

Gas Billing Data for Construction Center			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
12/10/16	30	440	$507
1/12/17	30	944	$1,136
2/9/17	33	582	$639
3/10/17	28	453	$372
4/11/17	29	385	$408
5/11/17	32	4	$33
6/12/17	30	1	$32
7/12/17	32	0	$29
8/10/17	30	0	$28
9/13/17	29	1	$34
10/11/17	34	0	$27
11/9/17	28	5	$35
Totals	**365**	**2,816**	**$3,280**
Annual	**365**	**2,816**	**$3,280**

3.4 Benchmarking

This facility was benchmarked using Portfolio Manager®, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager® analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

The EUI is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy." Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 27 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Construction Center	National Median Building Type: Office
Source Energy Use Intensity (kBtu/ft^2)	101.2	148.1
Site Energy Use Intensity (kBtu/ft^2)	52.8	67.3

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

Figure 28 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Construction Center	National Median Building Type: Office
Source Energy Use Intensity (kBtu/ft^2)	79.6	148.1
Site Energy Use Intensity (kBtu/ft^2)	45.6	67.3

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of **34**. The low score may be due, in part, to air leakage primarily from the ceiling planes of the wood frame building. Of note is the lookout tower and where the southern addition meets the main house. These and likely other hidden thermal bypasses that allow warm air to pass from the conditioned space into the unheated attic space or the tower. See Section 5 for more information.

Figure 29 - Lookout tower

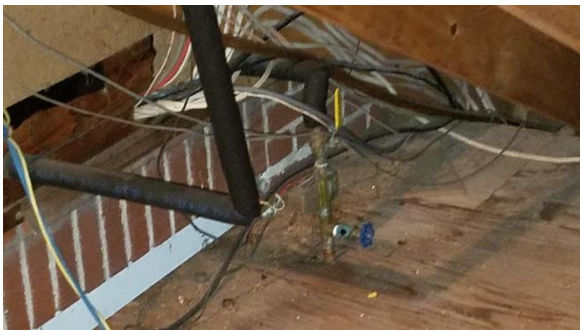


Figure 30 - Thermal bypasses - mechanical and electrical penetrations

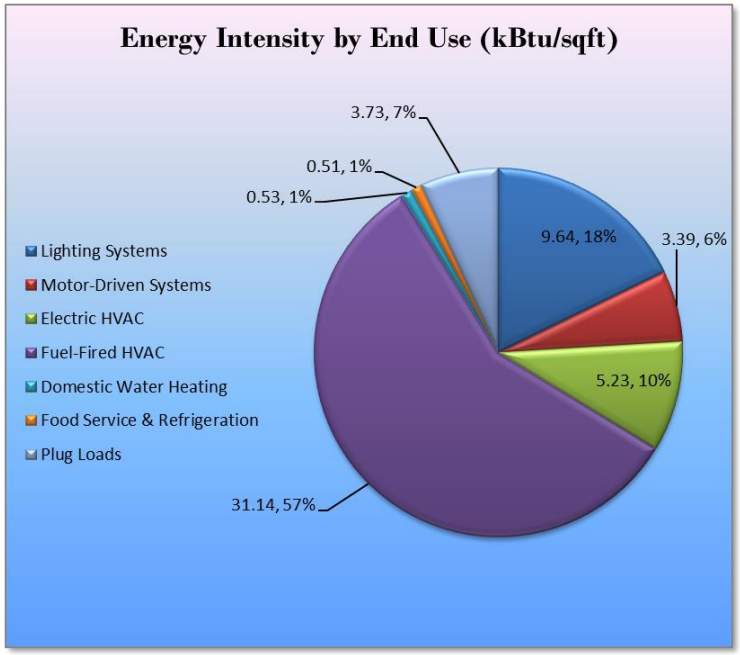
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager® account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager® regularly, so that you can keep track of your building's performance. Free online training is available to help you use ENERGY STAR® Portfolio Manager® to track your building's performance at: https://www.energystar.gov/buildings/training.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 31 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Construction Center regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 32 – Summary of Recommended ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**16,755**	**5.1**	**0.0**	**$2,655.28**	**$12,305.40**	**$1,391.00**	**$10,914.40**	**4.1**	**16,872**
ECM 1	Install LED Fixtures	Yes	8,457	1.6	0.0	$1,340.23	$5,562.84	$116.00	$5,446.84	4.1	8,516
ECM 2	Retrofit Fixtures with LED Lamps	Yes	7,724	3.5	0.0	$1,224.09	$6,163.23	$1,275.00	$4,888.23	4.0	7,778
ECM 3	Install LED Exit Signs	Yes	574	0.0	0.0	$90.96	$579.32	$0.00	$579.32	6.4	578
Lighting Control Measures			**895**	**0.3**	**0.0**	**$141.76**	**$850.00**	**$115.00**	**$735.00**	**5.2**	**901**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	895	0.3	0.0	$141.76	$850.00	$115.00	$735.00	5.2	901
Electric Unitary HVAC Measures			**2,090**	**1.5**	**0.0**	**$331.23**	**$18,491.58**	**$0.00**	**$18,491.58**	**55.8**	**2,105**
	Install High Efficiency Electric AC	No	2,090	1.5	0.0	$331.23	$18,491.58	$0.00	$18,491.58	55.8	2,105
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**25.9**	**$301.32**	**$27,891.98**	**$2,556.40**	**$25,335.58**	**84.1**	**3,029**
	Install High Efficiency Hot Water Boilers	No	0	0.0	25.9	$301.32	$27,891.98	$2,556.40	$25,335.58	84.1	3,029
Domestic Water Heating Upgrade			**0**	**0.0**	**3.7**	**$42.57**	**$21.51**	**$0.00**	**$21.51**	**0.5**	**428**
ECM 5	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	3.7	$42.57	$21.51	$0.00	$21.51	0.5	428
TOTALS FOR HIGH PRIORITY MEASURES			**17,650**	**5.4**	**3.7**	**$2,839.62**	**$13,176.91**	**$1,506.00**	**$11,670.91**	**4.1**	**18,201**
TOTALS FOR ALL EVALUATED MEASURES			**19,740**	**6.9**	**29.5**	**$3,472.18**	**$59,560.46**	**$4,062.40**	**$55,498.06**	**16.0**	**23,335**

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

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

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 33 below.

Figure 33 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**16,755**	**5.1**	**0.0**	**$2,655.28**	**$12,305.40**	**$1,391.00**	**$10,914.40**	**4.1**	**16,872**
ECM 1	Install LED Fixtures	8,457	1.6	0.0	$1,340.23	$5,562.84	$116.00	$5,446.84	4.1	8,516
ECM 2	Retrofit Fixtures with LED Lamps	7,724	3.5	0.0	$1,224.09	$6,163.23	$1,275.00	$4,888.23	4.0	7,778
ECM 3	Install LED Exit Signs	574	0.0	0.0	$90.96	$579.32	$0.00	$579.32	6.4	578

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

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	681	0.3	0.0	$107.94	$566.00	$116.00	$450.00	4.2	686
Exterior	7,855	1.3	0.0	$1,244.83	$4,996.84	$0.00	$4,996.84	4.0	7,910

Measure Description

We recommend replacing existing fixtures containing fluorescent or HID lamps with new high performance LED light fixtures. This includes the exterior fixtures and older 8-foot T12 fluorescent fixtures in the boiler room and storage areas. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have a service life which is more than twice that of fluorescent and HID lamps.

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	7,333	3.4	0.0	$1,162.04	$5,969.23	$1,245.00	$4,724.23	4.1	7,384
Exterior	392	0.1	0.0	$62.05	$194.00	$30.00	$164.00	2.6	394

Measure Description

We recommend retrofitting all of the T8 32-Watt fluorescent lamps in the facility with LED lamps. These lamps are located in the offices, police storage garage and the BPA meeting space upstairs. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent tubes.

ECM 3: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	574	0.0	0.0	$90.96	$579.32	$0.00	$579.32	6.4	578
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

4.1.2 Lighting Control Measures

Our recommendations for upgrades to existing lighting control measures are summarized in Figure 34 below.

Figure 34 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**895**	**0.3**	**0.0**	**$141.76**	**$850.00**	**$115.00**	**$735.00**	**5.2**	**901**
ECM 4	Install Occupancy Sensor Lighting Controls	895	0.3	0.0	$141.76	$850.00	$115.00	$735.00	5.2	901

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

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
895	0.3	0.0	$141.76	$850.00	$115.00	$735.00	5.2	901

Measure Description

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

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

4.1.3 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 35 below.

Figure 35 - 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**	**3.7**	**$42.57**	**$21.51**	**$0.00**	**$21.51**	**0.5**	**428**
ECM 5	Install Low-Flow Domestic Hot Water Devices	0	0.0	3.7	$42.57	$21.51	$0.00	$21.51	0.5	428

ECM 5: 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	3.7	$42.57	$21.51	$0.00	$21.51	0.5	428

Measure Description

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

Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.2 ECMs Evaluated but Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 36 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures	**2,090**	**1.5**	**0.0**	**$331.23**	**$18,491.58**	**$0.00**	**$18,491.58**	**55.8**	**2,105**
Install High Efficiency Electric AC	2,090	1.5	0.0	$331.23	$18,491.58	$0.00	$18,491.58	55.8	2,105
Gas Heating (HVAC/Process) Replacement	**0**	**0.0**	**25.9**	**$301.32**	**$27,891.98**	**$2,556.40**	**$25,335.58**	**84.1**	**3,029**
Install High Efficiency Hot Water Boilers	0	0.0	25.9	$301.32	$27,891.98	$2,556.40	$25,335.58	84.1	3,029

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
2,090	1.5	0.0	$331.23	$18,491.58	$0.00	$18,491.58	55.8	2,105

Measure Description

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

Reasons for not Recommending

Due to a longer simple payback for this measure the replacement would not be cost effective based on energy savings alone. The facility may choose to upgrade for other reasons such as a compressive facility-wide retrofit or if additional O&M savings are identified which may make the payback more attractive.

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	25.9	$301.32	$27,891.98	$2,556.40	$25,335.58	84.1	3,029

Measure Description

We evaluated replacing older inefficient hot water boilers with high efficiency hot water boilers. Significant improvements have been made in combustion technology resulting in increased overall boiler efficiency. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

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.

Reasons for not Recommending

Due to a longer simple payback for this measure the replacement would not be cost effective based on energy savings alone. The facility may choose to upgrade for other reasons such as a compressive facility-wide retrofit or if additional O&M savings are identified which may make the payback more attractive.

5 ENERGY EFFICIENT PRACTICES

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

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 and sealing the pressure plane between the conditioned space and the unheated attic crawlspace. Though the ceiling may be well insulated, fibrous insulation is not an air barrier. There may be thermal bypasses in the form of unsealed electrical, plumbing (I.e. openings at the top of a wet wall), and mechanical penetrations (i.e. gap between the chimney and the chimney chase) allowing warm air (stack effect) to pass. Sealing the ceiling from the attic, will increase comfort levels on the lower levels and save energy and allows for better control of indoor air quality through controlled ventilation.

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Clean Evaporator/Condenser Coils on AC Systems

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

Clean and/or Replace HVAC Filters

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

Perform Proper Boiler Maintenance

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

Perform Proper Furnace Maintenance

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

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.

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 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 4.1.3 for any low-flow ECM recommendations.

6 On-Site Generation Measures

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

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

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

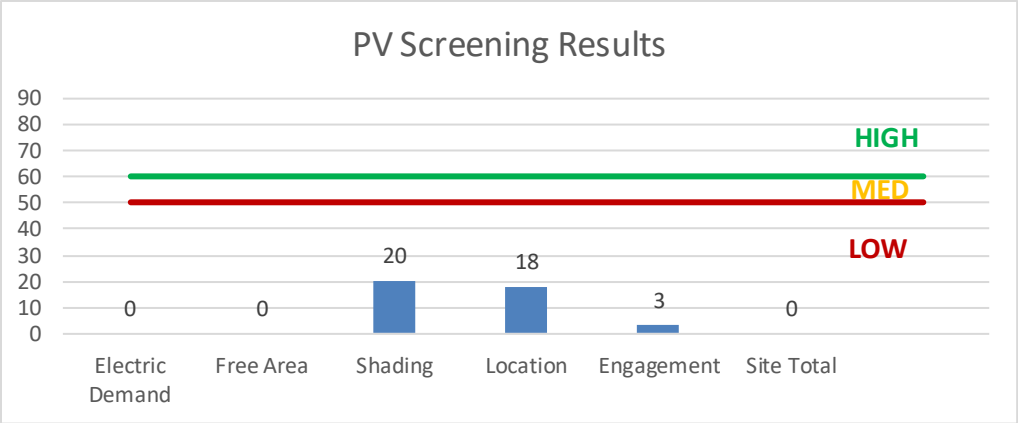
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC 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 **low** potential for installing a PV array.

In order to be cost-effective, a solar PV array needs certain minimum criteria, such as flat or south-facing rooftop or other unshaded space on which to place the PV panels. In our opinion, the facility does not appear not meet these minimum criteria for cost-effective PV installation.

Figure 37 - Photovoltaic Screening



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

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

6.2 Combined Heat and Power

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

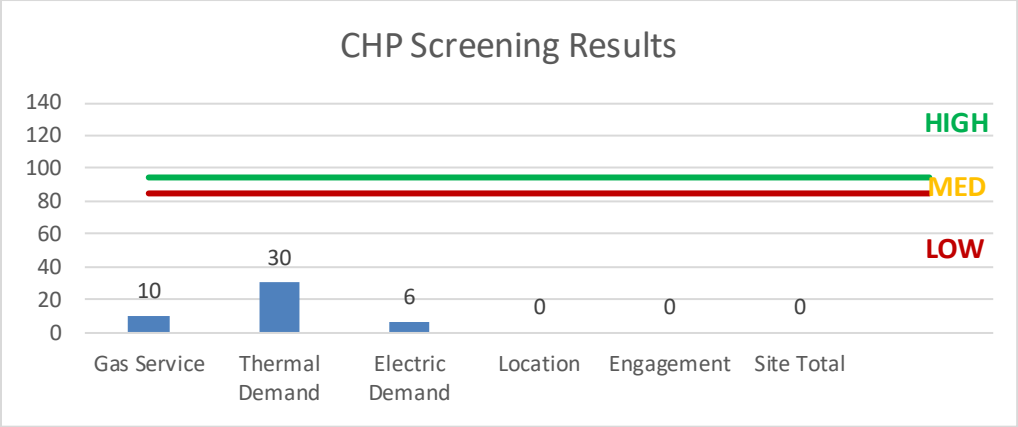
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste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

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

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the 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 New Jersey 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 38 - Combined Heat and Power Screening



7 DEMAND RESPONSE

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

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

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

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

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

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

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

High demand is the most significant factor contributing to the potential for a Demand Response application. In our opinion, the facility does not appear to have enough demand for a cost-effective DR measure.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 39 for a list of the eligible programs identified for each recommended ECM.

Figure 39 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	x		x			
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x		x			
ECM 3	Retrofit Fixtures with LED Lamps	x		x			
ECM 4	Install Occupancy Sensor Lighting Controls	x		x			
ECM 5	Install Low-Flow Domestic Hot Water Devices			x			

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 Direct Install

Overview

Direct Install is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for any recent 12-month period. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

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

How to Participate

To participate in the Direct Install program, you will need to contact the participating contractor who the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct Install website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since Direct Install offers a free assessment of eligible measures, Direct Install is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

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

8.3 SREC Registration Program

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

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

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

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

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

8.4 Energy Savings Improvement Program

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

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

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

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

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

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

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Police Garage	29	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	800	Relamp	No	29	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	800	1.29	1,520	0.0	$240.89	$2,117.87	$580.00	6.38
Zoning Hall	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,321	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,624	0.35	1,196	0.0	$189.48	$554.18	$140.00	2.19
Zoing Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,321	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,624	0.18	598	0.0	$94.74	$335.09	$80.00	2.69
Plan Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,321	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,624	0.29	996	0.0	$157.90	$481.15	$120.00	2.29
Construction Outer Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,321	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,321	0.18	608	0.0	$96.38	$292.12	$80.00	2.20
Construction Inner Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,321	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,321	0.18	608	0.0	$96.38	$292.12	$80.00	2.20
PBA Meeting 2nd fl	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,321	Relamp	No	6	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,321	0.27	912	0.0	$144.57	$438.18	$120.00	2.20
Const Plan Room	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,321	Relamp	Yes	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,624	0.25	845	0.0	$133.90	$695.68	$20.00	5.05
Const Break Room	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,321	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,624	0.12	422	0.0	$66.95	$405.84	$20.00	5.76
Const Break Room	2	Incandescent: Recessed Inc PAR 75W	Wall Switch	75	2,321	LED Retrofit	No	2	LED Screw-In Lamps: (1) LED Screw-In Lamp	Wall Switch	23	2,321	0.08	285	0.0	$45.18	$40.00	$10.00	0.66
Kitchen	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,321	LED Retrofit	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,321	0.09	315	0.0	$49.91	$256.00	$0.00	5.13
Boiler Room	2	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,321	Fixture Replacement	No	2	LED - Fixtures: Ambient - 8' - Direct Fixture	Wall Switch	90	2,321	0.11	369	0.0	$58.51	$116.00	$150.00	-0.58
Police Garage rear Hall	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,321	LED Retrofit	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,321	0.03	90	0.0	$14.20	$58.00	$10.00	3.38
Free Standing Garage	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,321	LED Retrofit	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,321	0.08	269	0.0	$42.60	$174.00	$30.00	3.38
Swat Police room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,321	LED Retrofit	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,321	0.11	358	0.0	$56.79	$232.00	$40.00	3.38
Dive Police Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,321	LED Retrofit	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,321	0.08	269	0.0	$42.60	$174.00	$30.00	3.38
Const Rear Closet	1	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,321	LED Retrofit	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,321	0.10	350	0.0	$55.50	$58.00	$10.00	0.86
PBA Rec Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	50	LED Retrofit	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	50	0.11	8	0.0	$1.22	$232.00	$40.00	156.90
PBA Rest Room	1	Incandescent: Vanity 1L	Wall Switch	60	50	LED Retrofit	No	1	LED Screw-In Lamps: (1) LED Screw-In Lamp	Wall Switch	18	50	0.03	2	0.0	$0.39	$20.00	$5.00	38.52
PBA Closet	1	Incandescent: Utility 1L	Wall Switch	60	50	LED Retrofit	No	1	LED Screw-In Lamps: (1) LED Screw-In Lamp	Wall Switch	18	50	0.03	2	0.0	$0.39	$20.00	$5.00	38.52
PBA stair	1	Incandescent: Pendant 1L	Wall Switch	60	50	LED Retrofit	No	1	LED Screw-In Lamps: (1) LED Screw-In Lamp	Wall Switch	42	50	0.01	1	0.0	$0.17	$20.00	$5.00	89.89
PBA stair	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	50	LED Retrofit	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	50	0.03	2	0.0	$0.31	$58.00	$10.00	156.90
Vestibule	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,000	LED Retrofit	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,000	0.02	68	0.0	$10.75	$64.00	$0.00	5.95
Flood lights	4	Halogen Incandescent: Haologen Floods 1L	Daylight Dimming	500	4,100	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	150	4,100	1.11	6,716	0.0	$1,064.28	$3,863.86	$0.00	3.63
Wall Area Lights	5	High-Pressure Sodium: (1) 70W Lamp	Daylight Dimming	95	4,100	Fixture Replacement	No	5	LED - Fixtures: Wall Sconces	Daylight Dimming	48	4,100	0.19	1,139	0.0	$180.55	$1,132.98	$0.00	6.28

	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
Soffit Recessed	4	Compact Fluorescent: Recessed CFL	Daylight Dimming	28	4,100	Relamp	No	4	LED Screw-In Lamps: Recessed LED Screw in	Daylight Dimming	20	4,100	0.03	161	0.0	$25.54	$275.60	$80.00	7.66
Exit	8	Exit Signs: Fluorescent	None	7	8,760	Fixture Replacement	No	8	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	82	0.0	$12.99	$579.32	$0.00	44.58
Generator Room	2	Linear Fluorescent - T12: 8' T12 (75W) - 2L	None	158	800	Fixture Replacement	No	2	LED - Fixtures: Ambient - 8' - Direct Fixture	None	90	800	0.11	127	0.0	$20.17	$1,947.32	$0.00	96.53
Construction rest rooms	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	None	62	2,210	LED Retrofit	No	2	LED - Linear Tubes: (2) U-Lamp	None	33	2,210	0.05	150	0.0	$23.77	$128.00	$0.00	5.39

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
Boiler Room	Zone 1	1	Heating Hot Water Pump	0.5	65.0%	No	2,745	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Zone 2	1	Heating Hot Water Pump	0.1	65.0%	No	2,745	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Air Handler	Construction/Zoning Office	1	Supply Fan	0.8	65.0%	No	2,745	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
South West ground mount	Office	1	Ductless Mini-Split HP	1.00	13.60	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
South West ground mount	Office	1	Ductless Mini-Split AC	0.75		Yes	1	Ductless Mini-Split AC	0.75		18.00		No	0.04	71	0.0	$11.20	$2,054.62	$0.00	183.41
South West ground mount	Office	1	Ductless Mini-Split AC	2.00		Yes	1	Ductless Mini-Split AC	2.00		18.00		No	0.11	189	0.0	$29.87	$5,478.99	$0.00	183.41
South West ground mount	Office	1	Split-System AC	3.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
South West ground mount	Office	1	Ductless Mini-Split AC	1.50		Yes	1	Ductless Mini-Split AC	1.50		18.00		No	0.50	846	0.0	$133.99	$4,109.24	$0.00	30.67
Roof	Second Floor	1	Ductless Mini-Split AC	1.00		Yes	1	Ductless Mini-Split AC	1.00		18.00		No	0.36	603	0.0	$95.59	$2,739.49	$0.00	28.66
second Floor archive Swat room	second Floor archive	2	Window AC	0.83		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
second Floor IT closet	Second Floor	1	Packaged Terminal AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
South West ground mount	N/A	1	Split-System AC	1.50		Yes	1	Ductless Mini-Split AC	1.50		18.00		No	0.54	905	0.0	$143.39	$4,109.24	$0.00	28.66

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Construction/Zoning Office First Floor	1	Non-Condensing Hot Water Boiler	1,162.00	Yes	1	Condensing Hot Water Boiler	1,162.00	91.00%	Et	0.00	0	14.0	$163.63	$27,891.98	$2,556.40	154.84
Office	First Floor Office	1	Furnace	80.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

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

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Rest Rooms	3	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	3.7	$42.57	$21.51	$0.00	0.51

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker 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
Police hall	1	Self-Contained Unit (≥175 lbs/day), Continuous	No	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?
Whole Building	9	Desktop PCs	70.0	No
Whole Building	11	LCD monitors	50.0	No
Whole Building	1	small printer	150.0	No
Front Office	1	Large Screen LCD tv	150.0	No
Zoning	1	wide format Printer	142.0	No
Front Office	1	Large Printer	33.0	No
PBA rec room	1	Refrigerator	256.0	No
Kitchen	1	Refrigerator	112.8	No
Kitchen	1	Refrigerator	345.0	No
Break Room	1	Water Cooler	164.0	No
IT equipement	1	IT Equipment	550.0	No

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Middle Township Construction Office

Primary Property Type: Office
Gross Floor Area (ft²): 9,114
Built: 1926

For Year Ending: October 31, 2017
Date Generated: October 15, 2018

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Middle Township Construction Office 10 S. Boyd Street Cape May Court House, New Jersey 08210	Township of Middle 33 Mechanic Street Cape May Court House, NJ 08210 609-465-8732	Elizabeth Terenik 33 Mechanic Street Cape May Court House, NJ 08210 609-465-8732 eterenik@middletownship.com

Property ID: 6542596

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
53.2 kBtu/ft²

Source EUI
94.8 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	203,079 (42%)
Natural Gas (kBtu)	281,555 (58%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	43.7
National Median Source EUI (kBtu/ft²)	78
% Diff from National Median Source EUI	22%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	36

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)