Local Government Energy Audit:
Energy Audit Report

Public Works Department

400 Mechanic St

Cape May Court House, New Jersey 08210

March 28, 2019

Middle Township

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 Middle Township Public Works Department.

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 Middle Township Public Works Department is a complex of buildings totaling 24,766 square feet. The office building is an approximately 5,000 square feet steel sided and roofed building with truss framed roof with an attached six bay heavy truck maintenance garage. Other buildings include maintenance and storage buildings, some of which are not conditioned.

Lighting consist of a mix of T8 and T12 fluorescent fixtures, high bay metal halide fixtures and a variety 4-foot LED fixtures with linear tubes. HVAC equipment for the Public Works and Emergency Medical Technician offices are standard 80% AFUE gas fired furnaces with split system air conditioning. The Truck bays and Sewer Department garage are heated with ceiling-hung, atmospheric, gas-fired unit heaters.

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

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated eight measures and recommends seven measures which together represent an opportunity for Middle Township Middle Township Public Works Department to reduce annual energy costs by roughly $3,818 and annual greenhouse gas emissions by 24,683 lbs. CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 3.5 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Middle Township Public Works Department's annual energy use by 7%.

Figure 1 – Previous 12 Month Utility Costs

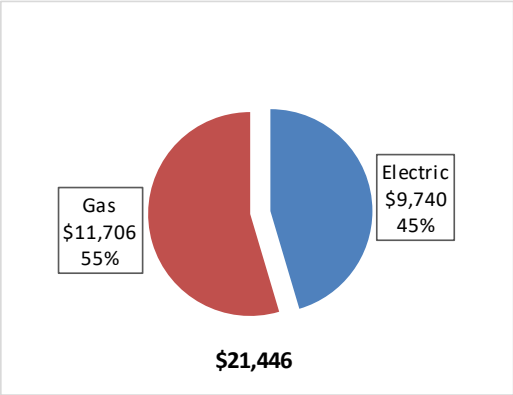
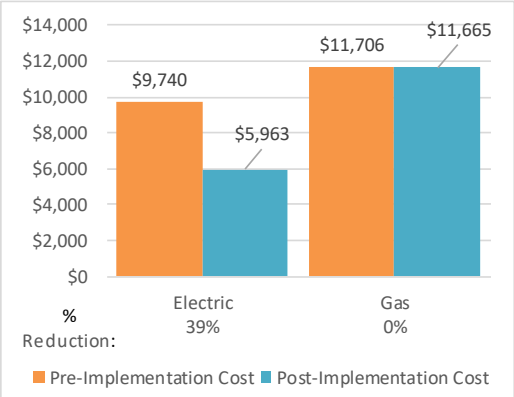


Figure 2 – Potential Post-Implementation Costs



A detailed description of Middle Township Middle Township Public Works Department'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			**16,814**	**7.8**	**0.0**	**$2,636.48**	**$12,672.76**	**$2,825.00**	**$9,847.76**	**3.7**	**16,932**
ECM 1	Install LED Fixtures	Yes	1,700	0.8	0.0	$266.62	$4,309.79	$1,450.00	$2,859.79	10.7	1,712
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	13,272	6.2	0.0	$2,081.08	$6,542.71	$1,055.00	$5,487.71	2.6	13,365
ECM 3	Retrofit Fixtures with LED Lamps	Yes	1,604	0.8	0.0	$251.53	$1,240.94	$320.00	$920.94	3.7	1,615
ECM 4	Install LED Exit Signs	Yes	238	0.0	0.0	$37.25	$579.32	$0.00	$579.32	15.6	239
Lighting Control Measures			**5,018**	**2.5**	**0.0**	**$786.79**	**$3,592.00**	**$470.00**	**$3,122.00**	**4.0**	**5,053**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	5,018	2.5	0.0	$786.79	$3,592.00	$470.00	$3,122.00	4.0	5,053
Electric Unitary HVAC Measures			**555**	**0.5**	**0.0**	**$87.06**	**$4,488.66**	**$276.00**	**$4,212.66**	**48.4**	**559**
	Install High Efficiency Electric AC	No	555	0.5	0.0	$87.06	$4,488.66	$276.00	$4,212.66	48.4	559
Domestic Water Heating Upgrade			**301**	**0.0**	**3.7**	**$88.66**	**$28.68**	**$0.00**	**$28.68**	**0.3**	**731**
ECM 6	Install Low-Flow Domestic Hot Water Devices	Yes	301	0.0	3.7	$88.66	$28.68	$0.00	$28.68	0.3	731
Plug Load Equipment Control - Vending Machine			**1,954**	**0.0**	**0.0**	**$306.44**	**$460.00**	**$0.00**	**$460.00**	**1.5**	**1,968**
ECM 7	Vending Machine Control	Yes	1,954	0.0	0.0	$306.44	$460.00	$0.00	$460.00	1.5	1,968
TOTALS FOR HIGH PRIORITY MEASURES			**24,087**	**10.3**	**3.7**	**$3,818.38**	**$16,753.44**	**$3,295.00**	**$13,458.44**	**3.5**	**24,683**
TOTALS FOR ALL EVALUATED MEASURES			**24,642**	**10.7**	**3.7**	**$3,905.44**	**$21,242.10**	**$3,571.00**	**$17,671.10**	**4.5**	**25,242**

* - 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.

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

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.

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

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

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 Middle Township Middle Township Public Works Department include:

- Perform Proper Lighting Maintenance
- Install Destratification Fans
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Perform Proper Furnace Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

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

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Middle Township Public Works Department. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	20	kW DC STC
Electric Generation	23,827	kWh/yr
Displaced Cost	$2,070	/yr
Installed Cost	$57,200	

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 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Elizabeth Terenik	Township Administrator	eterenik@middletownship.com	609-465-8732
Robert Flynn	Superintendent of Public Work	rflynn@middletownship.com	(609) 465-8745
Designated Representative			
Jim Rutala	Prinicipal	jmrutala@comcast.net	609.743.0354
TRC Energy Services			
Robert Grindrod	Auditor	rgrindrod@trcsolutions.com	518-416-7202

2.2 General Site Information

On July 17, 2018, TRC performed an energy audit at Middle Township located in Cape May Court House, New Jersey. TRC's team met with Rob Flynn to review the facility operations and help focus our investigation on specific energy-using systems.

The Middle Township Public Works is a complex of buildings totaling 24,766 square feet. Constructed in 1979, the office building is an approximately 5,000 square feet steel sided and roofed building with truss framed roof with an attached six-bay heavy truck maintenance garage. Other buildings include vehicle maintenance and storage buildings, some of which are not conditioned.

2.3 Building Occupancy

The school building is open year-round, Monday through Friday. The typical schedule is presented in the table below though in the summer time, certain staff will start earlier to avoid the afternoon heat. The entire facility is used by the community and camps are run throughout the summer. During a typical day, the facility is occupied by approximately 20 staff members.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Public Works Building	Weekday	8:00:00 AM - 4:00 PM
Public Works Building	Weekend	Closed

2.4 Building Envelope

The office building is a slab on grade steel sided and roofed structure with an attached six-bay truck maintenance garage. Given the age to the building, the walls are likely insulated. The ceiling is insulated with at least R19 fiberglass. The windows are double glazed vinyl clad wood framed units. The main entry doors are commercial grade glazed aluminum units. The truck bay ceiling is also insulated with fiberglass held in place at the truss chords with building fabric and strapping. The ceiling insulation is in fair condition thought there are a few gaps in the air barrier. One part of the maintenance garage has a two-story section with offices and a locker room on the first floor and storage and mechanical space to the second level. The garage doors are insulated and in good shape.

Another building on site has truck maintenance bays and other bays assigned to various public works departments such as sewer and water. This is a concrete block building with a pitched wood truss, asphalt shingle roof. The garage overhead doors are insulated and in good shape. The ceilings are finished with painted dry wall. There are other unconditioned building containing light fixtures.

A backup generator is in a small concrete block building with "T-111" siding and a pitched asphalt shingle roof. This building supports the site's solar photovoltaic array. The interior walls are exposed painted concrete blocks.

Of notes, there are several places in the ceiling assemblies where there are gaps in the air barrier fabric or drywall that will allow warm air to escape the heated space.

Figure 7 - Truck bay ceiling with gap in air barrier showing

Figure 8 - Office building entrance

Figure 9 - Backup generator shed with T-111 siding

Figure 10 - Loose drywall in truck bay

Figure11 - Gap in air barrier in second story storage area.

Figure 12 - East Building Truck Bay

2.5 On-Site Generation

There is a 12 panel solar array on the back-up generator shed with an estimated output of 3 kW.

2.6 Energy-Using Systems

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

Lighting System

Interior lighting at the facility is provided by a mix of 32-Watt linear fluorescent T8 lamps with electronic ballasts, 40-Watt linear T12 lamps with magnetic ballasts, linear LED high bay fixtures and high bay HID fixtures. Exterior fixtures include LED and HID wall mounted fixtures and 40-Watt linear T12 lamps with magnetic ballasts in unconditioned sheds. The parking area and yard lights are owned by Atlantic City Electric and controlled with photosensors

Figure 13 - T12 2-lamp fixture - locker room

Figure 14 - Truck bay high bay metal halide fixture

Figure 15 - Linear LED high bay fixtures

Direct Expansion Air Conditioning System (DX)

Four split system air conditioning (AC) units served the offices in the main building with capacities ranging from 2 to 3.5-tons. The oldest condenser is a Frigidaire 3-ton unit with an estimated 10 SEER serving a portion of the office space. The remaining units are newer and include a Rheem 2.87-ton condenser, a Gibson 3.5-ton condenser, serving the main office and a Guardian 2-ton condenser serving the office spaces in the maintenance building attached to the office. A 10,000 Btu/hr., 9.6 EER window AC unit cools the second story office in the east maintenance shop. Non-programmable wall mounted zone thermostats control the split system AC units.

Figure 16 - Gibson 3.5-ton condenser

Figure 17 - Frigidaire 3-ton condenser

Figure 18 - LG 10,000 Btuh window AC unit

Fuel Fired Heating System

A number of ceiling hung non-condensing gas fired heating systems provide heat to the numerous truck bays and workspaces in the facility. The north garage has four 143.5 KBtu/hr. and 1 80 KBtu/hr. Modine unit heaters. The east garage and sewer crib has three Modine 143.5 KBtu/hr. unit heaters and a Reznor 100 KBtu/hr. unit heater.

The offices are served by four various furnaces ranging from 50 to 107 KBtu/hr. These are 80% nominal AFUE units and house evaporator coils mated with the above condensers. Non-programmable wall mounted zone thermostats control all fuel fired heaters.

Domestic Hot Water Heating System

A six-year old gas-fired 34 kBtu/hr. 40-gallon Bradford White water heater serves the main office and a 30+ year old 1.6 kW 30-gallon Philadelphia Electric water heater serves the east maintenance shop.

Figure 19 - 40-gallon Bradford White water heater

Figure 20 - 30-gallon Philadelphia Electric water heater

Building Plug Load

There are approximately eight desk top PCs with eight LCD monitors and a number of desk top printers. There is also a large free standing copier, two fax machines, IT connectivity equipment, portable two way radio changing stations, a desktop radio transmitter/receiver, two microwaves, two small refrigerators, a 20 cubic foot refrigerator, coffee makers and a security camera system. The maintenance garage has a 3400-Watt particulate filter regenerator used for refurbishing exhaust filters on diesel fueled trucks.

2.7 Water-Using Systems

There are four restrooms at this facility. A sampling of restrooms found that the faucets are rated for 2.0 gallons per minute (gpm), the toilets are rated at 1.6 gallons per flush (gpf) and the urinals are rated at 2 gpf. There are three restrooms in the main office and one in the east maintenance garage.

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

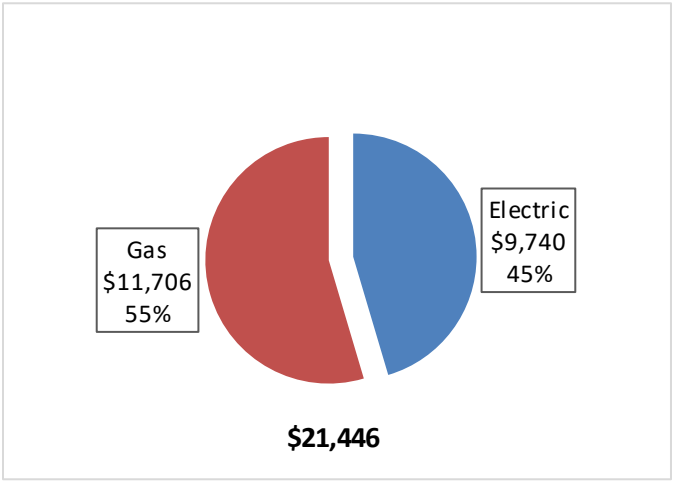
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 21 - Utility Summary

Utility Summary for Middle Township		
Fuel	**Usage**	**Cost**
Electricity	62,115 kWh	$9,740
Natural Gas	10,303 Therms	$11,706
Total		**$21,446**

The current annual energy cost for this facility is $21,446 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 $0.157/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below. The spikes in December and March are due to the use of electric heaters or perhaps and intermittently use process such as the Particulate Filter Regenerator in the north garage

Figure 23 - Electric Usage & Demand

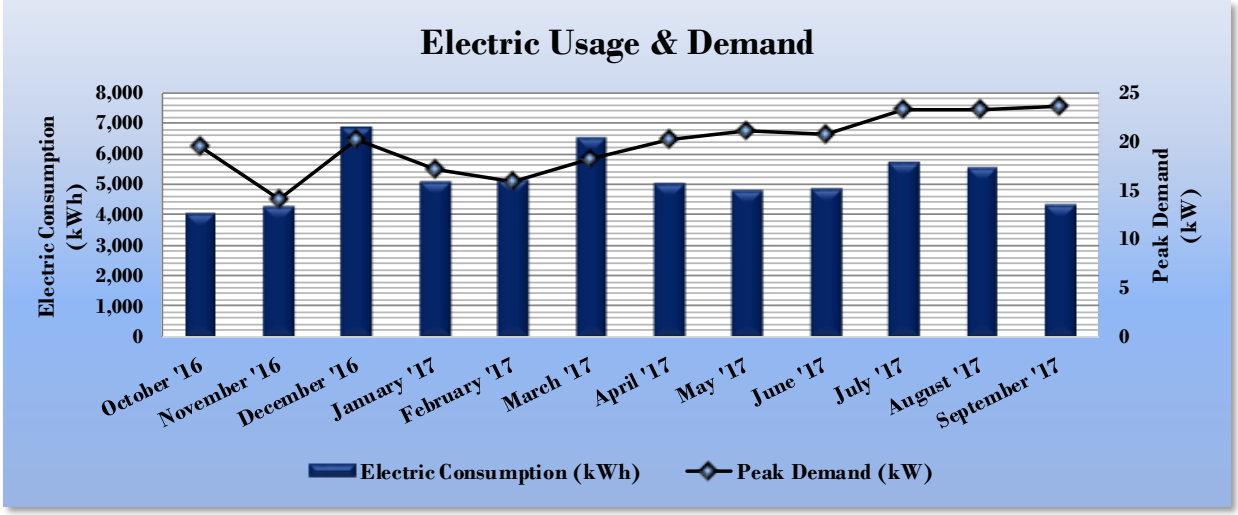


Figure 24 - Electric Usage & Demand

Electric Billing Data for Middle Township					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
11/10/16	30	4,027	20	$30	$651
12/10/16	30	4,264	14	$22	$685
1/12/17	33	6,838	20	$34	$1,087
2/9/17	28	5,082	17	$25	$801
3/10/17	29	5,120	16	$24	$800
4/11/17	32	6,500	18	$30	$1,003
5/11/17	30	5,007	20	$31	$769
6/12/17	32	4,816	21	$38	$744
7/12/17	30	4,860	21	$40	$722
8/10/17	29	5,717	23	$43	$964
9/13/17	34	5,550	23	$50	$868
10/11/17	28	4,334	24	$41	$645
Totals	**365**	**62,115**	**23.6**	**$408**	**$9,740**
Annual	**365**	**62,115**	**23.6**	**$408**	**$9,740**

3.3 Natural Gas Usage

Natural gas is provided by South Jersey Gas. The average gas cost for the past 12 months is $1.136/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

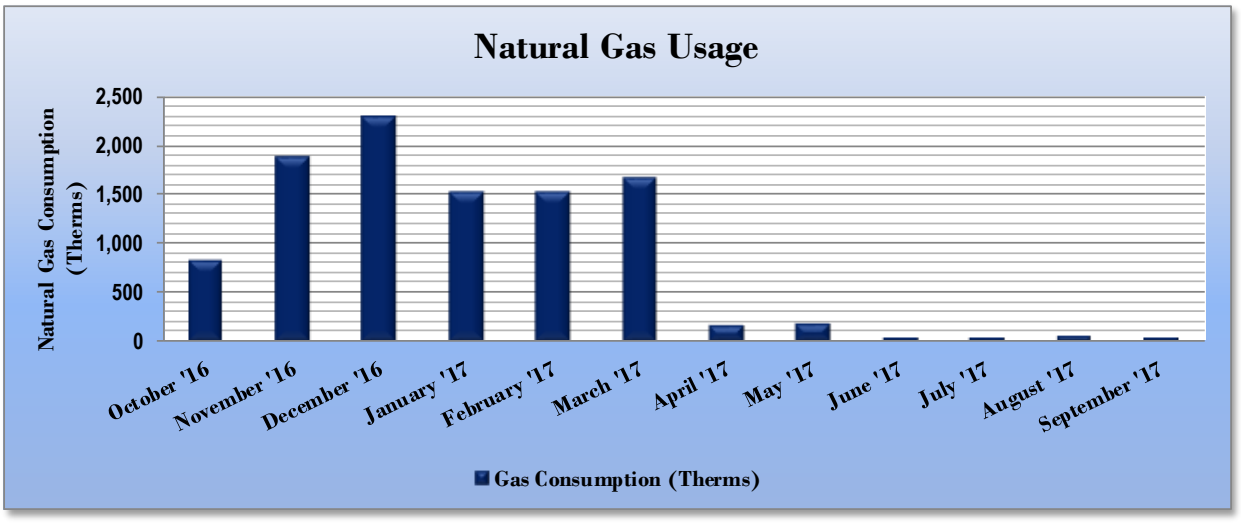


Figure 26 - Natural Gas Usage

Gas Billing Data for Middle Township				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
11/10/16	30	825	$888	Yes
12/10/16	30	1,899	$2,061	No
1/12/17	33	2,306	$2,768	No
2/9/17	28	1,529	$1,670	No
3/10/17	29	1,535	$1,558	No
4/11/17	32	1,679	$1,879	No
5/11/17	30	168	$228	No
6/12/17	32	182	$243	No
7/12/17	30	45	$103	No
8/10/17	29	44	$100	No
9/13/17	34	51	$109	No
10/11/17	28	43	$99	No
Totals	**365**	**10,303**	**$11,706**	
Annual	**365**	**10,303**	**$11,706**	

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		
	Middle Township	National Median Building Type: Other - General
Source Energy Use Intensity (kBtu/ft^2)	70.6	123.1
Site Energy Use Intensity (kBtu/ft^2)	50.2	78.8

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

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

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Middle Township	National Median Building Type: Other - General
Source Energy Use Intensity (kBtu/ft^2)	60.0	123.1
Site Energy Use Intensity (kBtu/ft^2)	46.7	78.8

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. Your building is not one of the building categories that are eligible to receive a score.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance.

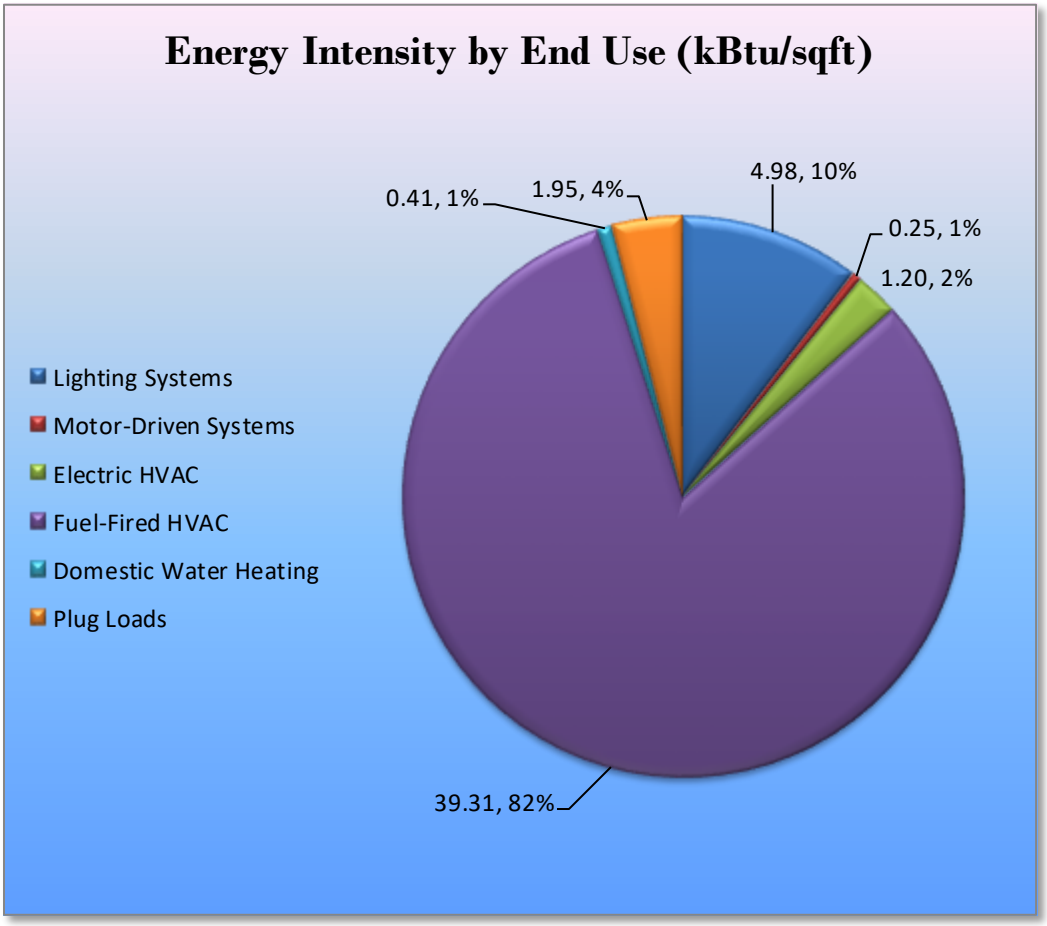
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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 29 - 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 Middle Township Public Works Department 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 30 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**16,814**	**7.8**	**0.0**	**$2,636.48**	**$12,672.76**	**$2,825.00**	**$9,847.76**	**3.7**	**16,932**
ECM 1	Install LED Fixtures	1,700	0.8	0.0	$266.62	$4,309.79	$1,450.00	$2,859.79	10.7	1,712
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	13,272	6.2	0.0	$2,081.08	$6,542.71	$1,055.00	$5,487.71	2.6	13,365
ECM 3	Retrofit Fixtures with LED Lamps	1,604	0.8	0.0	$251.53	$1,240.94	$320.00	$920.94	3.7	1,615
ECM 4	Install LED Exit Signs	238	0.0	0.0	$37.25	$579.32	$0.00	$579.32	15.6	239
Lighting Control Measures		**5,018**	**2.5**	**0.0**	**$786.79**	**$3,592.00**	**$470.00**	**$3,122.00**	**4.0**	**5,053**
ECM 5	Install Occupancy Sensor Lighting Controls	5,018	2.5	0.0	$786.79	$3,592.00	$470.00	$3,122.00	4.0	5,053
Domestic Water Heating Upgrade		**301**	**0.0**	**3.7**	**$88.66**	**$28.68**	**$0.00**	**$28.68**	**0.3**	**731**
ECM 6	Install Low-Flow Domestic Hot Water Devices	301	0.0	3.7	$88.66	$28.68	$0.00	$28.68	0.3	731
Plug Load Equipment Control - Vending Machine		**1,954**	**0.0**	**0.0**	**$306.44**	**$460.00**	**$0.00**	**$460.00**	**1.5**	**1,968**
ECM 7	Vending Machine Control	1,954	0.0	0.0	$306.44	$460.00	$0.00	$460.00	1.5	1,968
TOTALS		**24,087**	**10.3**	**3.7**	**$3,818.38**	**$16,753.44**	**$3,295.00**	**$13,458.44**	**3.5**	**24,683**

* - 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 31 below.

Figure 31 – 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		**16,814**	**7.8**	**0.0**	**$2,636.48**	**$12,672.76**	**$2,825.00**	**$9,847.76**	**3.7**	**16,932**
ECM 1	Install LED Fixtures	1,700	0.8	0.0	$266.62	$4,309.79	$1,450.00	$2,859.79	10.7	1,712
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	13,272	6.2	0.0	$2,081.08	$6,542.71	$1,055.00	$5,487.71	2.6	13,365
ECM 3	Retrofit Fixtures with LED Lamps	1,604	0.8	0.0	$251.53	$1,240.94	$320.00	$920.94	3.7	1,615
ECM 4	Install LED Exit Signs	238	0.0	0.0	$37.25	$579.32	$0.00	$579.32	15.6	239

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	1,407	0.7	0.0	$220.57	$3,150.00	$1,350.00	$1,800.00	8.2	1,417
Exterior	294	0.1	0.0	$46.05	$1,159.79	$100.00	$1,059.79	23.0	296

Measure Description

We recommend replacing existing exterior wall mounted fixtures and the high bay lighting in the north truck bay containing HID lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output. Affect fixtures are the high bay HID fixtures in the north garage and the remaining HID wall pack on the exterior of the buildings

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are longer than HID lamps and have the added advantage on having no restrike time

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	9,631	4.8	0.0	$1,510.09	$5,392.76	$885.00	$4,507.76	3.0	9,698
Exterior	3,641	1.4	0.0	$570.99	$1,149.95	$170.00	$979.95	1.7	3,667

Measure Description

We recommend retrofitting existing T12 fluorescent fixtures in the offices and truck bays by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. The affected fixtures are the T12 lamps in the offices and storage area in Building B.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tube and more than ten times longer than many incandescent lamps.

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	1,604	0.8	0.0	$251.53	$1,240.94	$320.00	$920.94	3.7	1,615
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing T8 fluorescent fixtures LED lamps in fixtures in the main office. 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.

This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. This include fixture in break room, lady's rest room, men's rest room, north garage office, IT room, loft and sewer office.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent tubes and more than ten times longer than many incandescent lamps.

ECM 4: 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	238	0.0	0.0	$37.25	$579.32	$0.00	$579.32	15.6	239
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 32 below.

Figure 32 – 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		**5,018**	**2.5**	**0.0**	**$786.79**	**$3,592.00**	**$470.00**	**$3,122.00**	**4.0**	**5,053**
ECM 5	Install Occupancy Sensor Lighting Controls	5,018	2.5	0.0	$786.79	$3,592.00	$470.00	$3,122.00	4.0	5,053

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 5: 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)
5,018	2.5	0.0	$786.79	$3,592.00	$470.00	$3,122.00	4.0	5,053

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, storage rooms, office 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 33 below.

Figure 33 - 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		**301**	**0.0**	**3.7**	**$88.66**	**$28.68**	**$0.00**	**$28.68**	**0.3**	**731**
ECM 6	Install Low-Flow Domestic Hot Water Devices	301	0.0	3.7	$88.66	$28.68	$0.00	$28.68	0.3	731

ECM 6: 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)
301	0.0	3.7	$88.66	$28.68	$0.00	$28.68	0.3	731

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.

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

4.1.4 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment control measures are summarized in Figure 34 below.

Figure 34 - Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		**1,954**	**0.0**	**0.0**	**$306.44**	**$460.00**	**$0.00**	**$460.00**	**1.5**	**1,968**
ECM 7	Vending Machine Control	1,954	0.0	0.0	$306.44	$460.00	$0.00	$460.00	1.5	1,968

ECM 7: 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)
1,954	0.0	0.0	$306.44	$460.00	$0.00	$460.00	1.5	1,968

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

4.2 ECM Evaluated but Not Recommended

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

Figure 35 – 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	**555**	**0.5**	**0.0**	**$87.06**	**$4,488.66**	**$276.00**	**$4,212.66**	**48.4**	**559**
Install High Efficiency Electric AC	555	0.5	0.0	$87.06	$4,488.66	$276.00	$4,212.66	48.4	559
TOTALS	**555**	**0.5**	**0.0**	**$87.06**	**$4,488.66**	**$276.00**	**$4,212.66**	**48.4**	**559**

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

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

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
555	0.5	0.0	$87.06	$4,488.66	$276.00	$4,212.66	48.4	559

Measure Description

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

Reasons for not Recommending

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 allowing for better control of indoor air quality through controlled ventilation. In the Public Works facility, pay particular attention to repairing and sealing drywall and fabric air barrier gaps and openings around mechanical penetrations.

Perform Regular 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.

Install Destratification Fans

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

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

Clean 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 Regular 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 Regular 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 "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Water Conservation

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

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

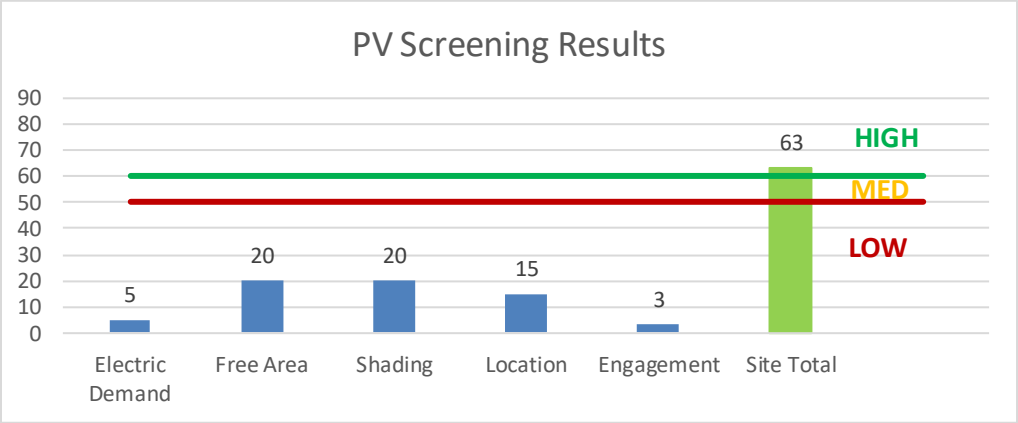
6.1 Photovoltaic

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 **high** potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the main building/ground next to the building/over the main parking lot may be feasible. If Middle Township is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 36 - Photovoltaic Screening



Potential	High	
System Potential	20	kW DC STC
Electric Generation	23,827	kWh/yr
Displaced Cost	$2,070	/yr
Installed Cost	$57,200	

Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) 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 developed new solar projects and insight into future SREC pricing. Refer to Section 8.3 for additional information.

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

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

6.2 Combined Heat and Power

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

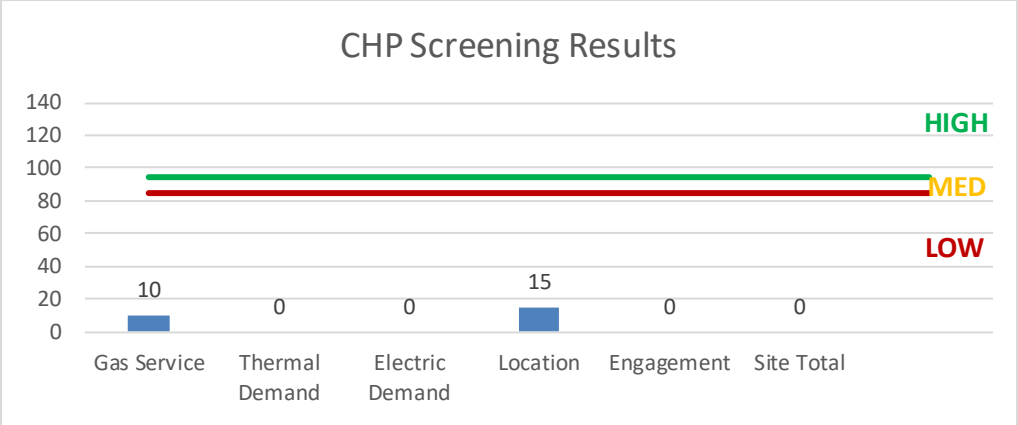
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste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

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

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 37 - 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 38 for a list of the eligible programs identified for each recommended ECM.

Figure 38 - 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 LED Exit Signs	x		x			
ECM 5	Install Occupancy Sensor Lighting Controls	x		x			
ECM 6	Install Low-Flow Domestic Hot Water Devices			x			
ECM 7	Vending Machine Control	x		x			

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 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 of 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 of 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
Corridor	11	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,456	Relamp & Reballast	No	11	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,456	1.06	2,136	0.0	$334.86	$1,301.99	$220.00	3.23
Server Room	4	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,456	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,019	0.22	446	0.0	$69.86	$391.09	$60.00	4.74
Conference Room	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,456	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.44	891	0.0	$139.72	$589.45	$100.00	3.50
Secretary	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,456	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.22	446	0.0	$69.86	$352.73	$60.00	4.19
Assistannt Superintendent	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,456	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.22	446	0.0	$69.86	$352.73	$60.00	4.19
Maintenance Office	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,456	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.22	446	0.0	$69.86	$352.73	$60.00	4.19
Superintendent Office	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,456	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.22	446	0.0	$69.86	$352.73	$60.00	4.19
Exit	8	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	8	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	238	0.0	$37.25	$579.32	$0.00	15.55
North Side Wall Pack	1	Metal Halide: (1) 70W Lamp	Wall Switch	95	1,456	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	48	1,456	0.04	78	0.0	$12.25	$965.97	$100.00	70.67
Exit	1	Exit Signs: LED - 2 W Lamp	Wall Switch	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	Wall Switch	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
EMS	5	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,456	Relamp & Reballast	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.55	1,114	0.0	$174.65	$707.82	$120.00	3.37
Locker	6	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,456	Relamp & Reballast	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.66	1,337	0.0	$209.58	$826.18	$140.00	3.27
Storage	1	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,456	Relamp & Reballast	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.11	223	0.0	$34.93	$234.36	$20.00	6.14
West (garage) Corridor	1	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,456	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,456	0.10	194	0.0	$30.44	$118.36	$20.00	3.23
Break Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,456	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.24	483	0.0	$75.74	$408.12	$100.00	4.07
Rest Room	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,456	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,019	0.03	64	0.0	$10.04	$188.46	$0.00	18.78
Lady's Rest Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,456	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.06	121	0.0	$18.94	$189.03	$20.00	8.93
Men's Rest Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,456	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.06	121	0.0	$18.94	$189.03	$20.00	8.93
North Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,456	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.06	121	0.0	$18.94	$189.03	$40.00	7.87
IT Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,456	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,019	0.17	343	0.0	$53.79	$298.58	$70.00	4.25
West Garage	9	Metal Halide: (1) 150W Lamp	Wall Switch	190	1,456	Fixture Replacement	Yes	9	LED - Fixtures: High-Bay	Occupancy Sensor	95	1,019	0.90	1,829	0.0	$286.75	$3,690.00	$1,420.00	7.92
Loft	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,456	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,456	0.13	271	0.0	$42.57	$182.58	$50.00	3.11
Sewer Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,456	Relamp	yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,019	0.24	483	0.0	$75.74	$408.12	$100.00	4.07
North Out Building	8	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	100	None	No	8	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	100	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
North Out Building	1	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	100	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	100	0.10	13	0.0	$2.09	$118.36	$20.00	47.05

	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
Carpentry Outbuilding	7	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	1,000	Relamp & Reballast	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.73	1,020	0.0	$160.00	$481.41	$70.00	2.57
Carpentry Outbuilding	4	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,000	Relamp & Reballast	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.19	267	0.0	$41.82	$275.09	$40.00	5.62
West Garage North wall	1	High-Pressure Sodium: (1) 70W Lamp	Daylight Dimming	95	4,015	Fixture Replacement	No	1	LED - Fixtures: Wall-Wash Lights	Daylight Dimming	48	4,015	0.04	216	0.0	$33.79	$193.82	$0.00	5.74
West Garage South wall	1	LED - Fixtures: Downlight Surface Mount	Daylight Dimming	35	4,015	None	No	1	LED - Fixtures: Downlight Surface Mount	Daylight Dimming	35	4,015	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Sewer Garage	4	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	4,015	Relamp & Reballast	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,015	0.42	2,341	0.0	$367.08	$275.09	$40.00	0.64
C Bldg	9	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	1,456	Relamp & Reballast	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,456	0.94	1,910	0.0	$299.52	$618.95	$90.00	1.77
Sewer Bay	16	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Wall Switch	153	1,456	None	Yes	16	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Occupancy Sensor	153	1,019	0.60	1,208	0.0	$189.46	$270.00	$35.00	1.24
Maintenance Garage (N)	25	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Wall Switch	153	1,456	None	Yes	25	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Occupancy Sensor	153	1,019	0.93	1,888	0.0	$296.03	$270.00	$35.00	0.79
Garage Locker	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,456	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,456	0.05	97	0.0	$15.22	$68.77	$10.00	3.86
Garage RR	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	1,456	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,456	0.03	52	0.0	$8.13	$50.52	$5.00	5.60
Garage South Bay	10	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Wall Switch	153	1,456	None	No	10	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Wall Switch	153	1,456	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Garage South Bay	1	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	1,456	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,456	0.10	194	0.0	$30.44	$118.36	$20.00	3.23
Garage South Bay	3	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Wall Switch	153	1,456	None	No	3	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Wall Switch	153	1,456	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Tool Crib	2	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Wall Switch	153	1,456	None	Yes	2	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Occupancy Sensor	153	1,019	0.07	151	0.0	$23.68	$270.00	$35.00	9.92
Parts Mezzanine	2	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Wall Switch	153	1,456	None	Yes	2	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Occupancy Sensor	153	1,019	0.07	151	0.0	$23.68	$270.00	$35.00	9.92
Maint. Garage Office	2	LED - Linear Tubes: (2) 4' T5HO (25W) Lamps	Wall Switch	51	1,456	None	Yes	2	LED - Linear Tubes: (2) 4' T5HO (25W) Lamps	Occupancy Sensor	51	1,019	0.02	50	0.0	$7.89	$116.00	$20.00	12.16

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
Garages	Unit Heaters	5	Supply Fan	0.3	82.5%	No	491	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	Office Air Handlers	1	Supply Fan	1.0	82.5%	No	491	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	Office Air Handlers	1	Supply Fan	1.0	82.5%	No	491	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	Office Air Handlers	1	Supply Fan	1.0	82.5%	No	491	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	Office Air Handlers	1	Supply Fan	1.0	82.5%	No	491	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Exterior	Office	1	Split-System AC	3.00		Yes	1	Split-System AC	3.00		14.00		No	0.47	555	0.0	$87.06	$4,488.66	$276.00	48.39
Exterior	Office	1	Split-System AC	2.87		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	Office	1	Split-System AC	3.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	Office	1	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
North Garage	North Garage	4	Warm Air Unit Heater	143.50	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
North Garage	North Garage	1	Warm Air Unit Heater	80.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hall Closet	Office	1	Furnace	107.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Garage Storage	Garage offices and EMS	1	Furnace	50.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ceiling over office	Office	1	Furnace	80.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ceiling over office	Office	1	Furnace	80.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Sewer Garage	Sewer Garage	1	Warm Air Unit Heater	143.50	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Maintenance Garage East	Maintenance Garage East	2	Warm Air Unit Heater	143.50	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Maintenance Garage East	Maintenance Garage East	2	Warm Air Unit Heater	100.00	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
Hall Closet	Office Building	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Garage Bay	Garage	1	Tankless Water Heater	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
Office rest rooms	3	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	3.7	$41.53	$21.51	$0.00	0.52
Garage rest room	1	Faucet Aerator (Lavatory)	2.00	1.00	0.00	301	0.0	$47.13	$7.17	$0.00	0.15

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Main Office	8	Desk Top PC	120.0	No
Main Office	8	LCD Monitor	80.0	No
Main Office	7	Small Printer	13.0	No
Main Office	1	Keurig	900.0	No
Main Office	2	Microwave	1,200.0	No
Main Office	2	Fax	360.0	No
Main Office	1	Large Copier	202.0	No
Main Office	2	Network Switches	150.0	No
Main Office	1	Security Camera	40.0	No
Main Office	1	Radio Receiver	150.0	No
Main Office	8	Radio Chargers	4.0	No
North Garage	1	Particulate Filter Regenerator	3,400.0	No
Break Room	1	Refrigerator	0.1	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Garage	1	Non-Refrigerated	Yes	0.00	343	0.0	$53.71	$230.00	$0.00	4.28
Garage	1	Refrigerated	Yes	0.00	1,612	0.0	$252.74	$230.00	$0.00	0.91

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Middle Township Public Works

Primary Property Type: Repair Services (Vehicle, Shoe, Locksmith, etc.)
Gross Floor Area (ft²): 24,776
Built: 1979

For Year Ending: September 30, 2017
Date Generated: November 27, 2018

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
Middle Township Public Works 400 Mechanic 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: 6542594

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
54.1 kBtu/ft²

Source EUI
78 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	1,030,273 (77%)
Electric - Grid (kBtu)	300,238 (22%)
Electric - Solar (kBtu)	11,031 (1%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	67.2
National Median Source EUI (kBtu/ft²)	96.9
% Diff from National Median Source EUI	-20%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	85

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)