Local Government Energy Audit:
Energy Audit Report

Municipal Complex

50 Railroad Ave.
Waretown, NJ 08758

Ocean Township

November 6, 2018

Final Report by:
TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

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

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

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

Table of Contents

Table of Figures

1 EXECUTIVE SUMMARY

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

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

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

1.1 Facility Summary

The Municipal Complex is approximately 11,841 square feet. About 25% of the building is dedicated to the court, 25% to the police department and 50% for the town hall and offices. The building is comprised of mostly office areas and a court room. The town hall and court building are occupied between 8:00 AM and 4:30 PM, Monday through Friday. The police department is occupied 24/7. The entire complex is in operation year round. The building is 100% heated and cooled. The HVAC Equipment and some lighting fixtures at the community center are aging and inefficient. 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 six measures which together represent an opportunity for the Municipal Complex to reduce annual energy costs by $11,593 and annual greenhouse gas emissions by 74,262 lbs CO_2e. We estimate that if all recommended measures are implemented, the project will pay for itself in energy savings in 7.1 years. A breakdown of current utility costs is shown in Figure 1. The estimated reduction in utility costs for the proposed measures in shown in Figure 2. Together these measures represent an opportunity to reduce the Municipal Complex's annual energy use by 24%.

Figure 1 – Previous 12 Month Utility Costs

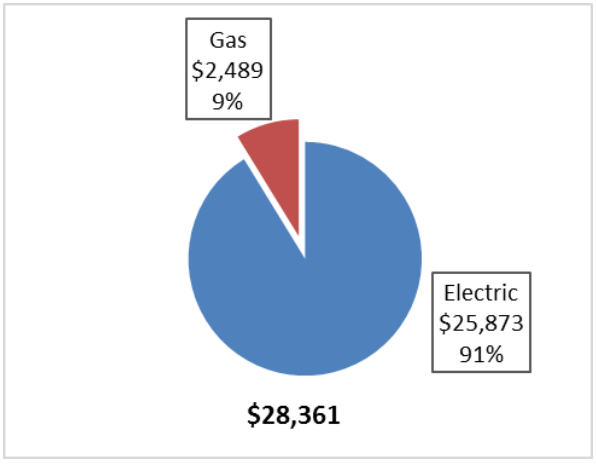
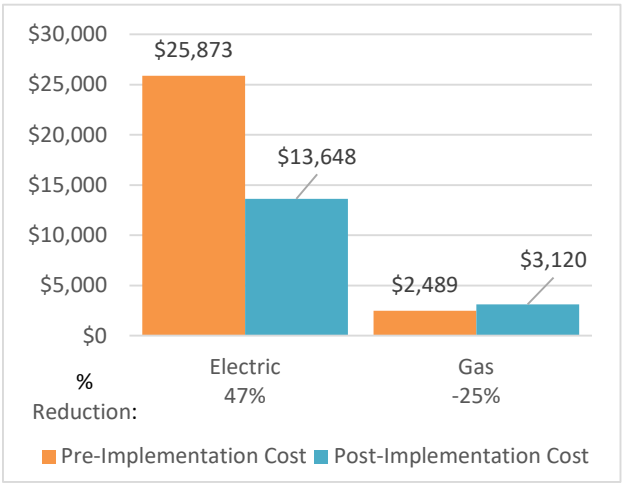


Figure 2 – Potential Post-Implementation Costs



A detailed description of Municipal Complex'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			37,828	6.4	0.0	$5,660.02	$33,881.87	$1,275.00	$32,606.87	5.8	38,092
ECM 1	Install LED Fixtures	Yes	10,728	1.6	0.0	$1,605.23	$22,394.57	$120.00	$22,274.57	13.9	10,803
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	3,813	0.7	0.0	$570.58	$2,168.33	$80.00	$2,088.33	3.7	3,840
ECM 3	Retrofit Fixtures with LED Lamps	Yes	23,286	4.1	0.0	$3,484.22	$9,318.97	$1,075.00	$8,243.97	2.4	23,449
Lighting Control Measures			5,197	0.8	0.0	$777.60	$5,680.00	$385.00	$5,295.00	6.8	5,233
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	5,197	0.8	0.0	$777.60	$5,600.00	$385.00	$5,215.00	6.7	5,233
Electric Unitary HVAC Measures			12,446	5.3	0.0	$1,862.25	$37,247.14	$2,254.00	$34,993.14	18.8	12,533
	Install High Efficiency Electric AC	No	12,446	5.3	0.0	$1,862.25	$37,247.14	$2,254.00	$34,993.14	18.8	12,533
Gas Heating (HVAC/Process) Replacement			0	0.0	10.1	$93.49	$3,126.71	$800.00	$2,326.71	24.9	1,186
	Install High Efficiency Furnaces	No	0	0.0	10.1	$93.49	$3,126.71	$800.00	$2,326.71	24.9	1,186
Domestic Water Heating Upgrade			26,202	0.9	-88.3	$3,105.80	$7,172.65	$600.00	$6,572.65	2.1	16,050
ECM 5	Install Tankless Water Heater	Yes	26,202	0.9	-89.4	$3,095.30	$7,136.80	$600.00	$6,536.80	2.1	15,917
ECM 6	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	1.1	$10.49	$35.85	$0.00	$35.85	3.4	133
Custom Measures			28	0.0	9.7	$93.98	$850.00	$0.00	$850.00	9.0	1,167
ECM 7	Building Envelope Weatherization	Yes	28	0.0	9.7	$93.98	$850.00	$0.00	$850.00	9.0	1,167
TOTALS			81,701	13.4	-68.4	$11,593.15	$87,958.37	$5,314.00	$82,644.37	7.1	74,262

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

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

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

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

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

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

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

Energy Efficient Practices

TRC also identified 19 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 operation and maintenance costs (O&M). Potential opportunities identified at Municipal Complex include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Turn Off Unneeded Motors
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Install Destratification Fans
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- 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 the Municipal Complex. Based on the configuration of the site and its loads there is a low potential for installing any PV or combined heat and power self-generation measures.

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

1.3 Implementation Planning

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

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

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

- SmartStart
- Direct Install
- 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 8.3 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

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

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Diane Amborsio	Business Adminstrator	clerk@twpoceannj.gov	609-693-3302
Dan Kehoe	Foreman - Public Works		609-839-7701
Matt Ambrosio	Superintendent - Public Works		609-618-0892
TRC Energy Services			
Aimee Lalonde	Auditor	alalonde@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On June 27, 2017, TRC performed an energy audit at the Municipal Complex located in Waretown, New Jersey. TRC's team met with Diane Amborsio, Business Administrator; Dan Kehoe, Forman – Public Works; and Matt Amborsio, Superintendent – Public Works to review the facility operations and help focus our investigation on specific energy-using systems.

The Municipal Complex is approximately 11,841 square feet in size and comprised of various space types within one building. About 25% of the building is dedicated to the court, 25% to the police department and 50% to the town hall and offices. The building is comprised of office areas and a court room. The building was constructed in 1940.

2.3 Building Occupancy

The building is mostly office space. The town hall and court building are occupied between 8:00 AM and 4:30 PM, Monday through Friday. The police department is occupied 24/7. The entire complex is in operation year round. The typical schedule is presented in the table below. During a typical day, the facility is occupied by 40 to 50 people.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Court & Town Hall	Weekday	8:00 AM - 4:30 PM
Court & Town Hall	Weekend	No Use
Police Dept	Weekday	24/7
Police Dept	Weekend	24/7

2.4 Building Envelope

The building envelope is in good condition. The walls have exterior cladding with pitched roofs which appear in good condition. The windows are double pane and operable with wood or vinyl frames. The exterior doors are typically metal with metal frames. The exterior doors have either missing or worn weather-stripping materials which show signs of excessive infiltration. The window frames were also noted to have cracks in sealant contributing to airflow. The building envelope has deficiencies and

contributes to a significant amount of air infiltration. There is an opportunity for energy savings by weather-stripping exterior doors and caulking window frames to reduce air infiltration, thus reducing the load on the building's HVAC systems.

2.5 On-Site Generation

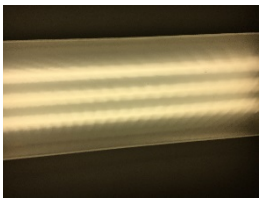
The Community Center does not have any on-site electric generation capacity. There is no potential for installing a PV system.

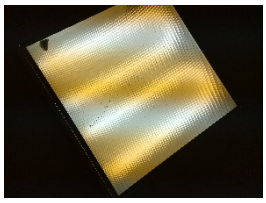
2.6 Energy-Using Systems

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

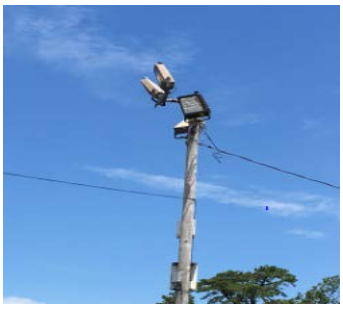
Lighting System

The building is primarily lit by linear fluorescent fixtures which contain 32-Watt T8 lamps. Fluorescent fixture types include wrap-around fixtures, box fixtures and recessed troffer fixtures. Some areas have recessed can fixtures with compact fluorescent plug in lamps. There are also some recessed can and 2x2 fixtures in the police department which were already converted to LED technology. There are also some fixtures in the town hall which are still contain T12 lamps and magnetic ballasts. The lighting in the Town hall offices were over lit and there is an opportunity to reduce the number of lamps per fixture for further energy savings. All exit signs throughout the building are already LED technology.





The exterior lighting includes building-mounted LED fixtures, compact fluorescent and incandescent lamp fixtures. The flood fixtures use high pressure sodium lamps. There is an opportunity for energy savings by upgrading the remaining fixtures to LED technology.

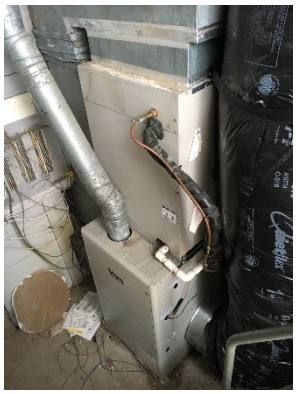


The lighting in individual rooms are manually controlled via wall switches. There is an opportunity for energy savings by the installation of occupancy-based sensors in locations that are occupied intermittently such as hallways, the meeting room and the game room. The exterior lighting is controlled by a timeclock. There is one LED flood fixture that was on during the daytime and control needs to be added to limit operation to dusk to dawn.

Heating Systems

The building is heated by a variety of systems. There is a gas-fired condensing hot water boiler that is in good condition. The boiler provides hot water to baseboard radiators within three zones which span the police department and the courtroom. The remainder of the areas are heated by gas-fired furnaces. There is a condensing furnace that is in good condition, the remainder are in fair to poor condition.

Facility personnel stated that the building's HVAC equipment in the police department is over 20 years old and requires frequent service and maintenance. There is an opportunity for energy savings by replacing these with high efficiency systems.




Cooling Systems

There are a number of air-handling units which are equipped with cooling coils as part of split AC systems. The outdoor condensing units vary in age, capacity and efficiency. There is an opportunity for energy savings by replacing the inefficient units that are in poor condition and nearing the end of their useful life.




HVAC Controls

The building's HVAC equipment is controlled by thermostats located in the space. The HVAC systems in the police department and town hall sections are controlled by programmable thermostats which were set at 72°F in the summer months and 68°F during the winter months. The police department has no opportunity for temperature setbacks, however, the town hall and court building may provide an opportunity. The manual dial thermostats could be replaced with occupancy-based or programmable thermostats (properly scheduled) to meet the operating hours of the space. This should be considered as more of a maintenance item.





The boiler operates with basic controls that reduce the supply water temperature based on the outdoor air temperature. The hot water baseboard system includes three zones. One zone is in the upper court room which has a very different use schedule than the rest of the building. Due to the unavailability of mechanical drawings and existing controls, additional controls would need to be investigated further by a mechanical contractor who specializes in HVAC controls.

Domestic Hot Water Heating System

The building is supplied domestic hot water by electric storage tank water heaters that are in good condition. The sink aerators throughout the building are fit with higher flow devices (2.2 gallons per minute [gpm]). There is an opportunity for energy savings by replacing these aerators with low-flow devices. This is a cost-effective approach to reducing energy used to provide hot water throughout the building.


Refrigeration and Kitchen Equipment

The kitchenette has a stand-up refrigerator that is in good condition. There is also a stove that is used only when the large community spaces are rented out for parties. There are no recommendations for improvement.

Building Plug Load

There are large floor fans, ceiling fans and general residential café equipment. There are also 40 computers throughout the building. There are no recommendations for improvement.

2.7 Water-Using Systems

There are restrooms in the facility. A sampling of these spaces found that the faucets are rated for 2.2 gpm. There is an opportunity for energy savings by installing low-flow devices throughout the building.

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

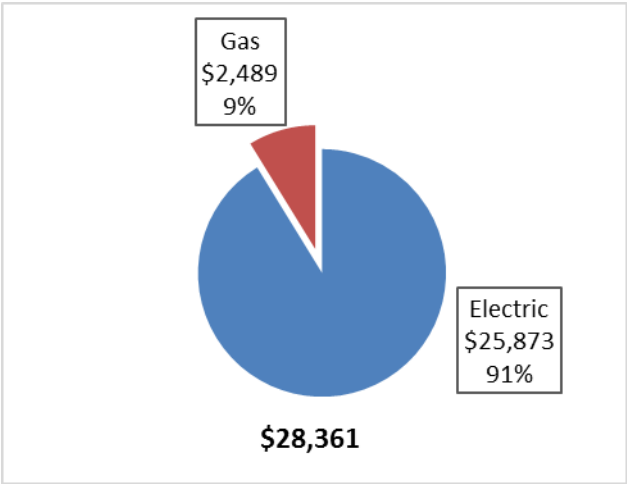
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Municipal Complex		
Fuel	Usage	Cost
Electricity	172,915 kWh	$25,873
Natural Gas	2,697 Therms	$2,489
Total		$28,361

The current annual energy cost for this facility is $28,361 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.150/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 facility pays electric demand charges. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

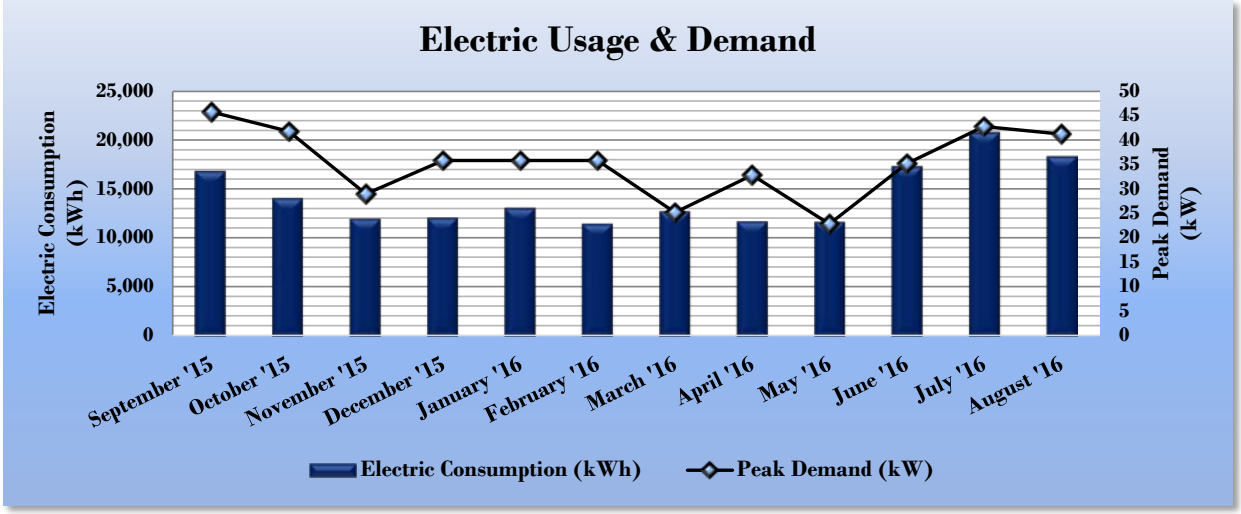


Figure 9 - Electric Usage & Demand

Electric Billing Data for Municipal Complex					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
9/28/15	33	16,885	46	$215	$2,579
10/29/15	31	14,124	42	$178	$2,124
11/27/15	29	11,999	29	$107	$1,800
12/29/15	32	12,113	36	$98	$1,837
1/27/16	29	13,103	36	$111	$1,996
2/26/16	30	11,486	36	$115	$1,810
3/28/16	31	12,771	25	$141	$1,884
4/26/16	29	11,744	33	$151	$1,877
5/26/16	30	11,701	23	$128	$1,716
6/23/16	28	17,328	35	$212	$2,520
7/28/16	35	20,806	43	$257	$3,043
8/24/16	27	18,382	41	$248	$2,616
Totals	364	172,442	45.8	$1,961	$25,802
Annual	365	172,915	45.8	$1,966	$25,873

3.3 Natural Gas Usage

Natural gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $0.923/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Natural Gas Usage

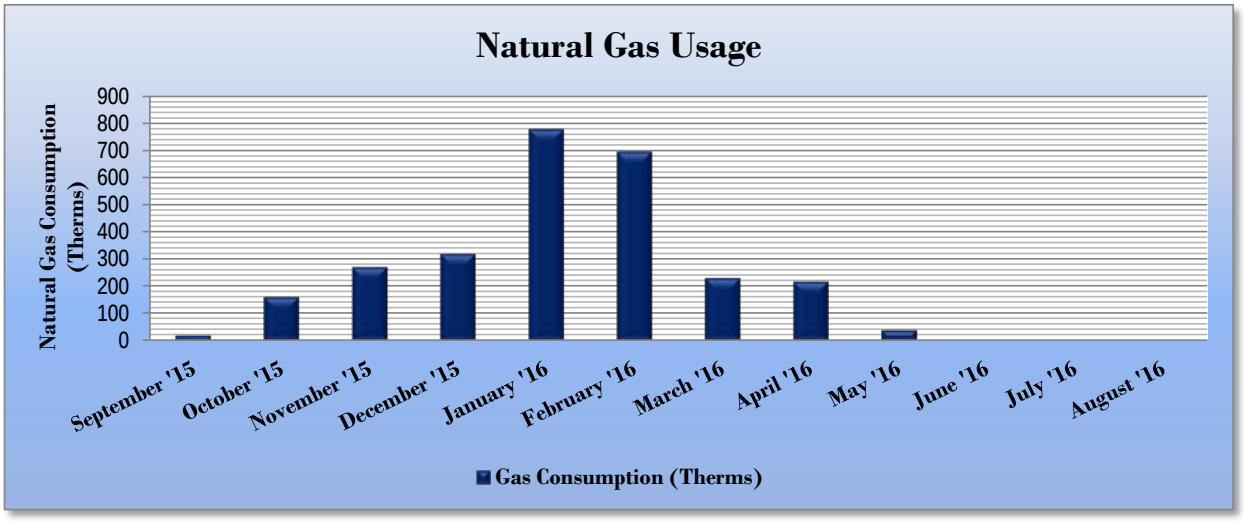


Figure 11 - Natural Gas Usage

Gas Billing Data for Municipal Complex				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
10/5/15	33	19	$50	No
11/4/15	30	161	$170	No
12/7/15	33	270	$199	Yes
1/8/16	32	320	$230	Yes
2/8/16	31	778	$601	Yes
3/7/16	28	696	$644	Yes
4/5/16	29	231	$236	Yes
5/9/16	34	218	$224	No
6/8/16	30	38	$67	No
7/8/16	30	0	$33	No
8/6/16	29	1	$34	No
9/6/16	31	1	$34	Yes
Totals	370	2,734	$2,523	6
Annual	365	2,697	$2,489	

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 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Municipal Complex	National Median Building Type: Fire/Police Station
Source Energy Use Intensity (kBtu/ft^2)	180.4	154.4
Site Energy Use Intensity (kBtu/ft^2)	72.6	88.3

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

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

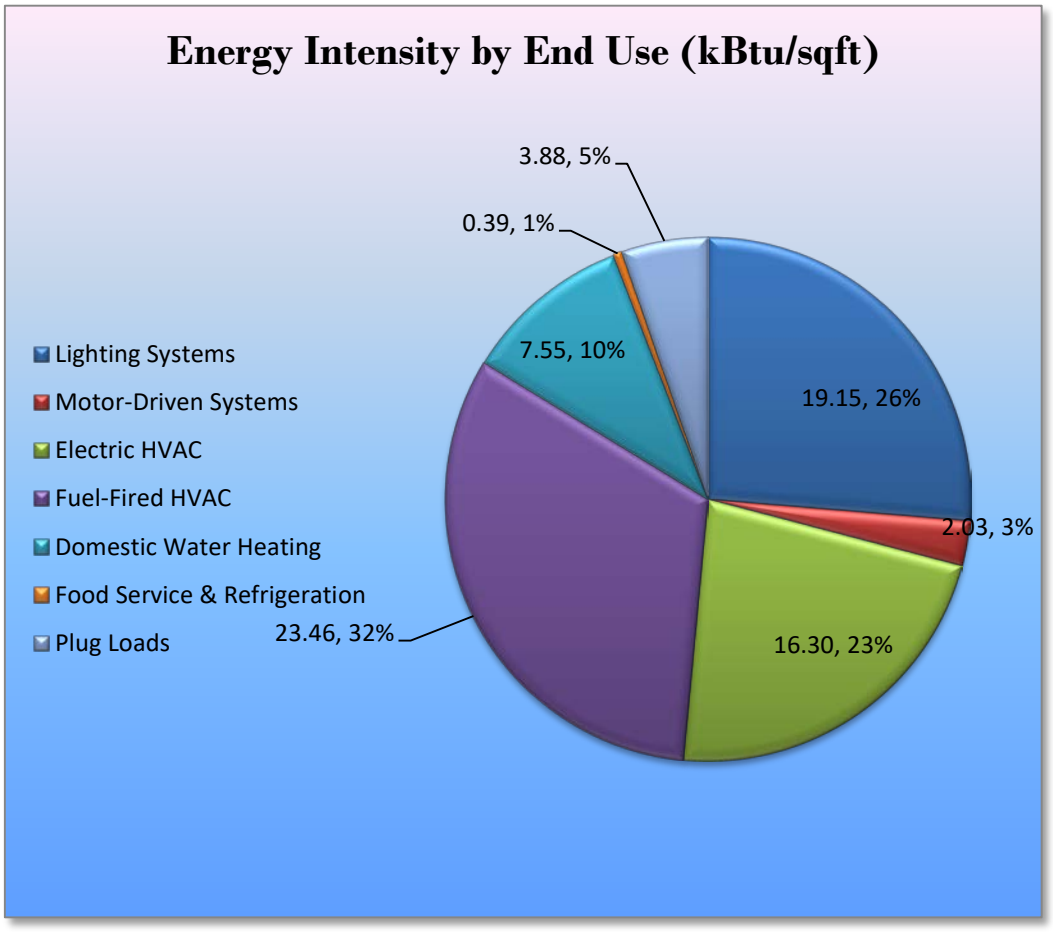
Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Municipal Complex	National Median Building Type: Fire/Police Station
Source Energy Use Intensity (kBtu/ft^2)	124.7	154.4
Site Energy Use Intensity (kBtu/ft^2)	59.3	88.3

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75% of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. Your building is not is one of the building categories that are eligible to receive a score.

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 14 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Municipal Complex 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 15 – 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		37,828	6.4	0.0	$5,660.02	$33,881.87	$1,275.00	$32,606.87	5.8	38,092
ECM 1	Install LED Fixtures	10,728	1.6	0.0	$1,605.23	$22,394.57	$120.00	$22,274.57	13.9	10,803
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	3,813	0.7	0.0	$570.58	$2,168.33	$80.00	$2,088.33	3.7	3,840
ECM 3	Retrofit Fixtures with LED Lamps	23,286	4.1	0.0	$3,484.22	$9,318.97	$1,075.00	$8,243.97	2.4	23,449
Lighting Control Measures		5,197	0.8	0.0	$777.60	$5,600.00	$385.00	$5,215.00	6.7	5,233
ECM 4	Install Occupancy Sensor Lighting Controls	5,197	0.8	0.0	$777.60	$5,600.00	$385.00	$5,215.00	6.7	5,233
Domestic Water Heating Upgrade		26,202	0.9	-88.3	$3,105.80	$7,172.65	$600.00	$6,572.65	2.1	16,050
ECM 5	Install Tankless Water Heater	26,202	0.9	-89.4	$3,095.30	$7,136.80	$600.00	$6,536.80	2.1	15,917
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	1.1	$10.49	$35.85	$0.00	$35.85	3.4	133
Custom Measures		28	0.0	9.7	$93.98	$850.00	$0.00	$850.00	9.0	1,167
ECM 7	Building Envelope Weatherization	28	0.0	9.7	$93.98	$850.00	$0.00	$850.00	9.0	1,167
TOTALS		69,255	8.0	-78.5	$9,637.41	$47,504.52	$2,260.00	$45,244.52	4.7	60,543

* - 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 16 below.

Figure 16 – 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		37,828	6.4	0.0	$5,660.02	$33,881.87	$1,275.00	$32,606.87	5.8	38,092
ECM 1	Install LED Fixtures	10,728	1.6	0.0	$1,605.23	$22,394.57	$120.00	$22,274.57	13.9	10,803
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	3,813	0.7	0.0	$570.58	$2,168.33	$80.00	$2,088.33	3.7	3,840
ECM 3	Retrofit Fixtures with LED Lamps	23,286	4.1	0.0	$3,484.22	$9,318.97	$1,075.00	$8,243.97	2.4	23,449

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	2,614	0.4	0.0	$391.18	$2,444.61	$120.00	$2,324.61	5.9	2,633
Exterior	8,114	1.2	0.0	$1,214.05	$19,949.96	$0.00	$19,949.96	16.4	8,171

Measure Description

We recommend replacing the compact fluorescent biax lamp fixtures with new LED fixtures. This measure is recommended based on the existing condition of the fixtures.

We also recommend replacing the high pressure sodium lamp flood fixtures new LED flood fixtures. The proposed lighting equipment are new high performance LEDs which have much longer lifespans. Therefore this measure saves energy by reducing the electrical demand and use of the light fixtures, improves light output, and reduces required maintenance.

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	3,813	0.7	0.0	$570.58	$2,168.33	$80.00	$2,088.33	3.7	3,840
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing fluorescent T12 fixtures 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.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes 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	22,588	4.0	0.0	$3,379.80	$9,050.21	$1,065.00	$7,985.21	2.4	22,746
Exterior	698	0.1	0.0	$104.42	$268.77	$10.00	$258.77	2.5	703

Measure Description

We recommend re-lamping existing linear fluorescent fixtures by removing fluorescent tubes and replacing them with LEDs (assuming the existing ballasts are compatible with the proposed LED lamps). This measure uses the existing fixture housing but replaces the lamps with more efficient lighting technology. We also recommend replacing all compact fluorescent and incandescent lamps with LED lamps. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than ten times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Our recommendation for upgrades to existing lighting controls is summarized in Figure 17 below.

Figure 17 – 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		5,197	0.8	0.0	$777.60	$5,600.00	$385.00	$5,215.00	6.7	5,233
ECM 3	Install Occupancy Sensor Lighting Controls	5,197	0.8	0.0	$777.60	$5,600.00	$385.00	$5,215.00	6.7	5,233

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

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,197	0.8	0.0	$777.60	$5,600.00	$385.00	$5,215.00	6.7	5,233

Measure Description

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

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

4.1.3 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 18 below.

Figure 18 - 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		26,202	0.9	-88.3	$3,105.80	$7,172.65	$600.00	$6,572.65	2.1	16,050
ECM 5	Install Tankless Water Heater	26,202	0.9	-89.4	$3,095.30	$7,136.80	$600.00	$6,536.80	2.1	15,917
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	1.1	$10.49	$35.85	$0.00	$35.85	3.4	133

ECM 5: Install Tankless Hot Water Heater

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)
26,202	0.9	-89.4	$3,095.30	$7,136.80	$600.00	$6,536.80	2.1	15,917

Measure Description

We recommend replacing the existing tank water heater with a tankless water heating system. Tankless water heaters (a.k.a. "on-demand water heaters") only heat water when hot water is needed. Water is heated as it flows through the pipe to the hot water tap. Energy savings from a tankless water heater is based from eliminating heat losses associated with maintaining unnecessary standby hot water capacity.

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)
0	0.0	1.1	$10.49	$35.85	$0.00	$35.85	3.4	133

Measure Description

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

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

4.1.4 Customer Measures

Additional custom measure energy saving opportunities are addressed in this section. Recommended custom measures are summarized in Figure 19 below.

Figure 19 - Summary of Custom 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)
Custom Measures		28	0.0	9.7	$93.98	$850.00	$0.00	$850.00	9.0	1,167
ECM 7	Building Envelope Weatherization	28	0.0	9.7	$93.98	$850.00	$0.00	$850.00	9.0	1,167

ECM 7:Building Envelope Weatherization

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)
28	0.0	9.7	$93.98	$850.00	$0.00	$850.00	9.0	1,167

Measure Description

We recommend weather-stripping the exterior doors throughout the building. There were two double doors and five single doors which have missing or worn weather-stripping with clear air gaps. The window frames were noted to have cracked caulk around the perimeter. Building envelopes that limit air infiltration and that have adequate insulation play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort. Cracks and gaps throughout your building – around windows and doors, through utility openings, at the foundation and roof may not seem significant, but their effects add up. Reducing uncontrolled air infiltration through air sealing is a cost effective way to improve the performance and energy efficiency of your facility. The proper sealing of sources for air infiltration and exfiltration will mitigate the air through the building and thus reduce the load on the facility's heating and cooling equipment. Exterior doors should be properly weather-stripped which may include the installation of a bottom sweep, center sweep and weather-stripping around the perimeter of the door.

4.2 ECMs Evaluated But Not Recommended

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

Figure 20 – 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	12,446	5.3	0.0	$1,862.25	$37,247.14	$2,254.00	$34,993.14	18.8	12,533
Install High Efficiency Electric AC	12,446	5.3	0.0	$1,862.25	$37,247.14	$2,254.00	$34,993.14	18.8	12,533
Gas Heating (HVAC/Process) Replacement	0	0.0	10.1	$93.49	$3,126.71	$800.00	$2,326.71	24.9	1,186
Install High Efficiency Furnaces	0	0.0	10.1	$93.49	$3,126.71	$800.00	$2,326.71	24.9	1,186
TOTALS	12,446	5.3	10.1	$1,955.74	$40,373.85	$3,054.00	$37,319.85	19.1	13,719

* - 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)
12,446	5.3	0.0	$1,862.25	$37,247.14	$2,254.00	$34,993.14	18.8	12,533

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

This measure is cost prohibitive.

Install High Efficiency Furnaces

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	10.1	$93.49	$3,126.71	$800.00	$2,326.71	24.9	1,186

Measure Description

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

Reasons for not Recommending

This measure is cost prohibitive.

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.

Close Doors and Windows

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

Use Window Treatments/Coverings

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

Perform Proper Lighting Maintenance

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

Develop a Lighting Maintenance Schedule

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

Ensure Lighting Controls Are Operating Properly

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

Turn Off Unneeded Motors

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Reducing run hours for these motors can result in significant energy savings. Whenever possible, use automatic devices such as twist timers or occupancy sensors to ensure that motors are turned off when not needed.

Perform Routine Motor Maintenance

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

Use Fans to Reduce Cooling Load

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

Install Destratification Fans

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

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

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Clean Evaporator/Condenser Coils on AC Systems

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

Clean and/or Replace HVAC Filters

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

Check for and Seal Duct Leakage

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

Perform Proper Boiler Maintenance

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

Perform Proper Furnace Maintenance

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

Perform Proper Water Heater Maintenance

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

Plug Load Controls

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

Water Conservation

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

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

Refer to Section 4.1.3 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.

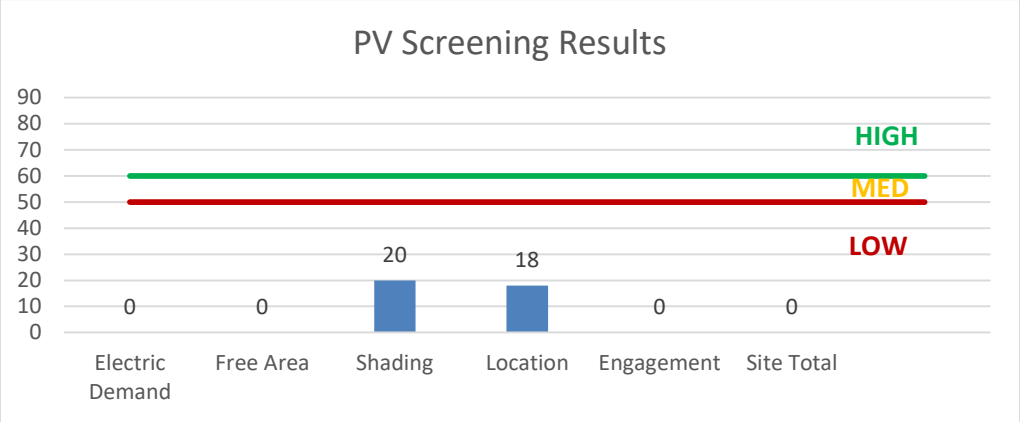
6.1 Photovoltaic

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 current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

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

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

Figure 21 - Photovoltaic 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.

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

Figure 22 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	x		x			
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x		x			
ECM 3	Retrofit Fixtures with LED Lamps	x		x			
ECM 4	Install Occupancy Sensor Lighting Controls	x		x			
ECM 5	Install Tankless Water Heater	x		x			
ECM 6	Install Low-Flow Domestic Hot Water Devices			x			
ECM 7	Building Envelope Weatherization						

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 an average peak electric demand that does not exceed 200 kW over the recent 12-month period. You 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. Each entity is limited to incentives up to $250,000 per fiscal year.

How to Participate

To participate in Direct Install, you will need to contact the participating contractor assigned to 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.

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

8.3 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 description 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.

8.4 Demand Response Energy Aggregator

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

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

See Section 7 for additional information.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Police - Hallway	2	Compact Fluorescent: Biax Lamps	None	80	7,884	Fixture Replacement	Yes	2	LED - Fixtures: Ambient - 2' - Indirect Fixture	Occupancy Sensor	42	5,519	0.07	798	0.0	$119.38	$758.92	$40.00	6.02
Police Exterior	1	Compact Fluorescent: Plug In Lamps	None	26	8,760	Relamp	Yes	1	LED Screw-In Lamps: Plug in Lamps	Wall Switch	7	8,760	0.02	188	0.0	$28.14	$147.51	$0.00	5.24
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,884	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	7,884	0.11	1,176	0.0	$175.96	$234.00	$40.00	1.10
Dispatch Office	8	LED - Fixtures: Downlight Recessed	Wall Switch	9	7,884	None	No	8	LED - Fixtures: Downlight Recessed	Wall Switch	9	7,884	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Dispatch Office	2	LED - Fixtures: Downlight Recessed	Wall Switch	9	7,884	None	No	2	LED - Fixtures: Downlight Recessed	Wall Switch	9	7,884	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchenette	4	LED - Fixtures: Downlight Recessed	Wall Switch	9	7,884	None	No	4	LED - Fixtures: Downlight Recessed	Wall Switch	9	7,884	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Restroom	1	LED - Fixtures: Downlight Recessed	Wall Switch	9	7,884	None	No	1	LED - Fixtures: Downlight Recessed	Wall Switch	9	7,884	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,884	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,519	0.07	743	0.0	$111.17	$233.00	$20.00	1.92
Storage/Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,884	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,519	0.10	1,115	0.0	$166.76	$291.50	$50.00	1.45
Conference Hall	3	Compact Fluorescent: Biax Lamps	Wall Switch	80	7,884	Fixture Replacement	Yes	3	LED - Fixtures: Ambient - 2' - Indirect Fixture	Occupancy Sensor	42	5,519	0.12	1,352	0.0	$202.35	$1,003.38	$60.00	4.66
Conference Room	12	Compact Fluorescent: Plug In Lamps	Wall Switch	26	7,884	Relamp	Yes	12	LED Screw-In Lamps: Plug in Lamps	Occupancy Sensor	7	5,519	0.21	2,256	0.0	$337.52	$1,406.07	$20.00	4.11
Restroom	1	Compact Fluorescent: Biax Lamps	Wall Switch	80	7,884	Fixture Replacement	No	1	LED - Fixtures: Ambient - 2' - Indirect Fixture	Wall Switch	42	7,884	0.03	339	0.0	$50.65	$244.46	$20.00	4.43
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,884	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,519	0.14	1,486	0.0	$222.34	$350.00	$60.00	1.30
Hallway	9	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	22	7,884	None	Yes	9	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	22	5,519	0.05	529	0.0	$79.18	$270.00	$0.00	3.41
Locker Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,884	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,519	0.10	1,115	0.0	$166.76	$445.50	$65.00	2.28
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,884	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,519	0.07	743	0.0	$111.17	$233.00	$20.00	1.92
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,884	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,519	0.07	743	0.0	$111.17	$233.00	$20.00	1.92
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,884	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,519	0.07	743	0.0	$111.17	$233.00	$20.00	1.92
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,884	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,519	0.03	372	0.0	$55.59	$174.50	$10.00	2.96
Meeting Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,884	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,519	0.03	372	0.0	$55.59	$174.50	$10.00	2.96
Electric Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,884	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	7,884	0.03	294	0.0	$43.99	$58.50	$10.00	1.10
Office	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	22	7,884	None	Yes	4	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	22	5,519	0.02	235	0.0	$35.19	$116.00	$0.00	3.30
Office	2	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	22	7,884	None	Yes	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	22	5,519	0.01	118	0.0	$17.60	$116.00	$0.00	6.59
Town Hall - Hallway	2	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,641	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,249	0.08	513	0.0	$76.74	$504.00	$0.00	6.57
Hallway	2	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,641	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,249	0.08	513	0.0	$76.74	$504.00	$0.00	6.57

	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
Restroom	1	Incandescent: Globe Lamps	Wall Switch	40	3,094	Relamp	No	1	LED Screw-In Lamps: Globe Lamps	Wall Switch	4	3,094	0.03	126	0.0	$18.83	$176.20	$20.00	8.29
Restroom	1	Incandescent: Globe Lamps	Wall Switch	40	3,094	Relamp	No	1	LED Screw-In Lamps: Globe Lamps	Wall Switch	4	3,094	0.03	126	0.0	$18.83	$176.20	$20.00	8.29
Closet	1	Incandescent: Screw in Lamp	Wall Switch	60	3,094	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	3,094	0.04	185	0.0	$27.73	$53.75	$5.00	1.76
Hallway	8	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,641	Relamp & Reballast	Yes	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,249	0.32	2,052	0.0	$306.97	$1,206.00	$0.00	3.93
Hallway	1	Compact Fluorescent: Plug In Lamps	Wall Switch	26	4,641	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	4,641	0.02	100	0.0	$14.91	$107.51	$0.00	7.21
Office	2	Compact Fluorescent: Biax Lamps	Wall Switch	108	3,094	Fixture Replacement	Yes	2	LED - Fixtures: Ambient - 2' - Indirect Fixture	Occupancy Sensor	42	2,166	0.13	550	0.0	$82.24	$604.92	$20.00	7.11
Conference Room	2	Compact Fluorescent: Biax Lamps	Wall Switch	108	3,094	Fixture Replacement	Yes	2	LED - Fixtures: Ambient - 2' - Indirect Fixture	Occupancy Sensor	42	2,166	0.13	550	0.0	$82.24	$604.92	$20.00	7.11
Mayor's Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,094	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.30	1,310	0.0	$196.07	$510.00	$60.00	2.30
Tax Offices	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,094	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.61	2,621	0.0	$392.13	$904.00	$100.00	2.05
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,094	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.12	508	0.0	$76.06	$313.00	$40.00	3.59
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,094	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.30	1,310	0.0	$196.07	$510.00	$60.00	2.30
Finance Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,094	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.30	1,310	0.0	$196.07	$510.00	$60.00	2.30
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,094	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.30	1,310	0.0	$196.07	$510.00	$60.00	2.30
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,094	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.30	1,310	0.0	$196.07	$510.00	$60.00	2.30
Clerk Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,094	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.30	1,310	0.0	$196.07	$510.00	$60.00	2.30
Diane's Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,094	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.30	1,310	0.0	$196.07	$510.00	$60.00	2.30
Hallway	1	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,641	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,641	0.03	205	0.0	$30.60	$117.00	$0.00	3.82
Mail Storage	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	3,094	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,166	0.44	1,894	0.0	$283.32	$763.33	$80.00	2.41
Court - Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,641	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,641	0.11	692	0.0	$103.58	$234.00	$40.00	1.87
Women's Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,094	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,166	0.06	257	0.0	$38.40	$230.13	$37.50	5.02
Women's Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,094	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.07	292	0.0	$43.63	$252.00	$37.50	4.92
Men's Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,094	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,166	0.06	257	0.0	$38.40	$230.13	$37.50	5.02
Men's Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,094	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.07	292	0.0	$43.63	$252.00	$37.50	4.92
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,641	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,249	0.07	437	0.0	$65.44	$387.00	$20.00	5.61
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,094	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.07	292	0.0	$43.63	$233.00	$20.00	4.88

	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
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,094	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,166	0.07	292	0.0	$43.63	$233.00	$20.00	4.88
Waiting Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,094	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,094	0.03	115	0.0	$17.26	$58.50	$10.00	2.81
Court Room	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,094	Relamp	No	9	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,094	0.41	1,762	0.0	$263.65	$856.20	$180.00	2.56
Storage Rooms	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,094	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,094	0.05	231	0.0	$34.53	$117.00	$20.00	2.81
Exterior - Court	1	Compact Fluorescent: Wall Pack	None	26	4,745	None	No	1	Compact Fluorescent: Wall Pack	None	26	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior - Police	1	Compact Fluorescent: Screw in Lamp	None	13	4,745	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	None	7	4,745	0.00	32	0.0	$4.81	$53.75	$0.00	11.17
Exterior - Police	2	Compact Fluorescent: Wall Pack	None	26	4,745	None	No	2	Compact Fluorescent: Wall Pack	None	26	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior - Police	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	38	8,760	None	Yes	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	38	8,760	0.00	0	0.0	$0.00	$40.00	$0.00	0.00
Exterior - Town Hall	2	High-Pressure Sodium: (1) 400W Lamp	None	465	4,745	Fixture Replacement	No	2	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	None	180	4,745	0.46	3,056	0.0	$457.29	$6,649.99	$0.00	14.54
Exterior - Town Hall	2	Incandescent: Screw in Lamp	None	60	4,745	Relamp	No	2	LED Screw-In Lamps: Screw in Lamp	None	7	4,745	0.09	568	0.0	$85.04	$107.51	$10.00	1.15
Exterior - Town Hall	2	LED - Fixtures: Architectural Flood/Spot Luminaire	None	12	4,745	None	No	2	LED - Fixtures: Architectural Flood/Spot Luminaire	None	12	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior - Parking Lot	4	High-Pressure Sodium: (1) 400W Lamp	None	465	4,745	Fixture Replacement	No	4	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	None	180	4,745	0.93	6,113	0.0	$914.59	$13,299.97	$0.00	14.54

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
Mechaniical Room	Hydronic System	3	Heating Hot Water Pump	0.3	60.0%	No	3,500	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechaniical Room	Circulator	1	Boiler Feed Water Pump	0.1	60.0%	No	3,500	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechaniical Room	Furnaces	4	Supply Fan	0.5	60.0%	No	3,500	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Police Section	AHU	2	Split-System AC	4.00		Yes	2	Split-System AC	4.00		14.00		No	1.25	3,270	0.0	$489.21	$11,969.76	$736.00	22.96
Police Section	AHU	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	0.95	2,484	0.0	$371.74	$5,236.77	$322.00	13.22
Police Section	AHU	1	Split-System AC	3.00		Yes	1	Split-System AC	3.00		14.00		No	0.82	2,130	0.0	$318.63	$4,488.66	$276.00	13.22
Court Section	AHU	1	Split-System AC	4.00		Yes	1	Split-System AC	4.00		14.00		No	0.77	999	0.0	$149.48	$5,984.88	$368.00	37.58
Court Section	AHU	1	Split-System AC	2.00		Yes	1	Split-System AC	2.00		14.00		No	0.38	500	0.0	$74.74	$2,992.44	$184.00	37.58
Police Section	AHU	1	Split-System AC	4.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Police Section	AHU	1	Split-System AC	4.00		Yes	1	Split-System AC	4.00		14.00		No	1.09	2,839	0.0	$424.84	$5,984.88	$368.00	13.22
Police Section	AHU	1	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Police Section	Office	1	Window AC	0.54		Yes	1	Window AC	0.54		12.00		No	0.09	225	0.0	$33.60	$589.75	$0.00	17.55

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
Mechanical Room	Hyronic Heating System - Police	1	Condensing Hot Water Boiler	250.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Police	1	Furnace	93.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Police	1	Furnace	61.00	Yes	1	Furnace	61.00	95.00%	AFUE	0.00	0	5.8	$53.20	$1,382.10	$400.00	18.46
Mechanical Room	Town Hall	1	Furnace	77.00	Yes	1	Furnace	77.00	95.00%	AFUE	0.00	0	4.4	$40.29	$1,744.61	$400.00	33.37
Mechanical Room	Court	1	Furnace	93.00	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
Attic	Court	1	Storage Tank Water Heater (≤ 50 Gal)	Yes	1	Tankless Water Heater	Natural Gas	82.00%	EF	0.45	13,101	-44.7	$1,547.65	$3,568.40	$300.00	2.11
Mechanical Room	Police	1	Storage Tank Water Heater (≤ 50 Gal)	Yes	1	Tankless Water Heater	Natural Gas	82.00%	EF	0.45	13,101	-44.7	$1,547.65	$3,568.40	$300.00	2.11

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
Restrooms	5	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	1.1	$10.49	$35.85	$0.00	3.42

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Police Kitchenette	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Municipal Complex	40	Computers	120.0	
Municipal Complex	1	Fans	100.0	
Municipal Complex	1	Toaster	1,200.0	
Municipal Complex	1	Microwaves	1,850.0	
Municipal Complex	1	Coffee Maker	1,200.0	
Municipal Complex	3	TV	120.0	
Municipal Complex	10	Printers	250.0	
Municipal Complex	2	Water Cooler	1,200.0	

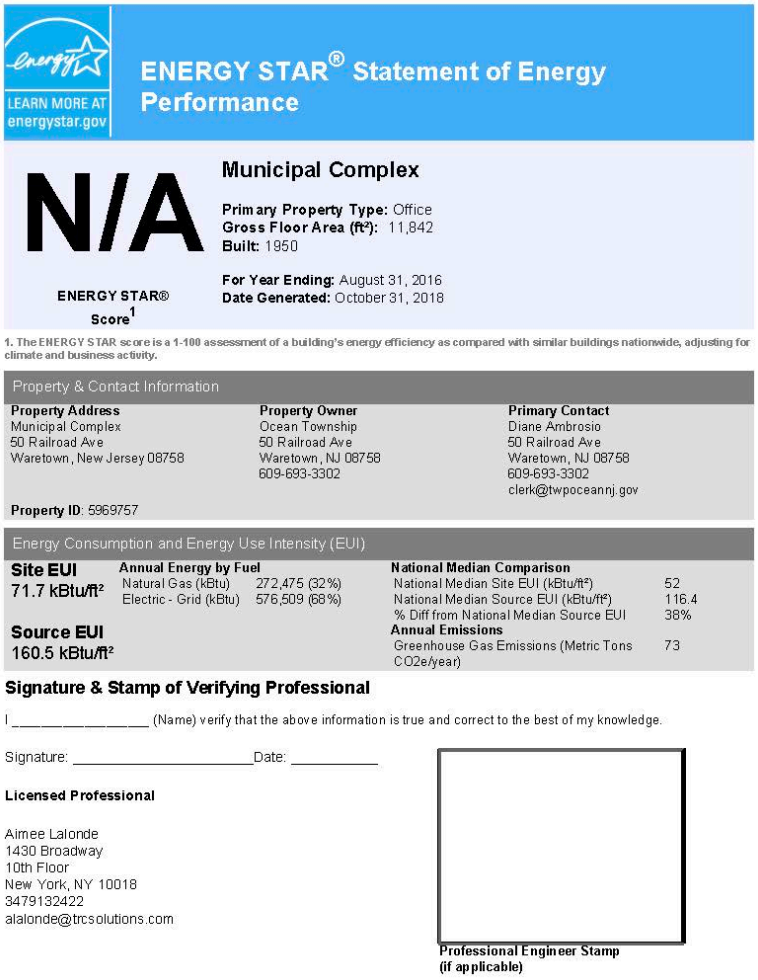
Custom Recommendations

Building Envelope Weatherization

Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis				
Annual Electric HVAC Energy Use (kWh)	*Annual Heating Energy Use (mmBtu)*	Assumed % Electric HVAC Savings	Assumed % Gas HVAC Savings	Total Annual kWh Savings	Total Annual mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
56,558	277.8	0.1%	3.5%	28	10	$94	$850	9.04

	qty	unit	$/unit	est. costs
Weather-strip Exterior Double Doors	2	EA	100	$ 200
Weather-strip Exterior Single Doors	5	EA	50	$ 250
Caulk the Perimeter of Windows & Seal Wall Cracks	100	LF	4	$ 400
		Total Estimated Costs		$ 850

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]

Municipal Complex

Primary Property Type: Office
Gross Floor Area (ft²): 11,842
Built: 1950

For Year Ending: August 31, 2016
Date Generated: October 31, 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
Municipal Complex 50 Railroad Ave Waretown, New Jersey 08758	Ocean Township 50 Railroad Ave Waretown, NJ 08758 609-693-3302	Diane Ambrosio 50 Railroad Ave Waretown, NJ 08758 609-693-3302 clerk@twpoceannj.gov

Property ID: 5969757

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
71.7 kBtu/ft²

Source EUI
160.5 kBtu/ft²

Annual Energy by Fuel		
Natural Gas (kBtu)	272,475	(32%)
Electric - Grid (kBtu)	576,509	(68%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	52
National Median Source EUI (kBtu/ft²)	116.4
% Diff from National Median Source EUI	38%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	73

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

Aimee Lalonde
1430 Broadway
10th Floor
New York, NY 10018
3479132422
alalonde@trcsolutions.com

Professional Engineer Stamp (if applicable)