



# Local Government Energy Audit: Energy Audit Report



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## Police Athletic League Building

2590 Ridge Avenue

Egg Harbor Township, NJ 08234

Egg Harbor Township

March 1, 2018

Final Report by:

**TRC Energy Services**

## Disclaimer

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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 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.

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# I EXECUTIVE SUMMARY

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The New Jersey Board of Public Utilities (NJ BPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Police Athletic League Building located at 2590 Ridge Avenue in Egg Harbor Township.

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, 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.

## I.1 Facility Summary

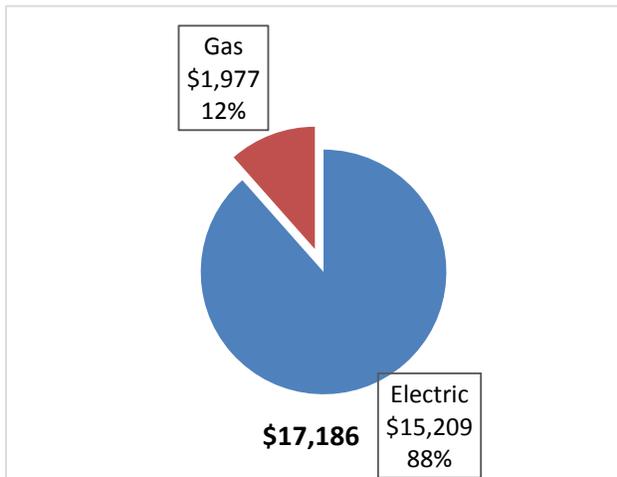
The Police Athletic League Building (located at 2590 Ridge Avenue) is a 5,820 square foot facility comprised of a few buildings. A nonprofit organization operates this facility. The first building includes meeting halls, office space, a kitchen, living room and classroom space on the second floor. There is a garage used as storage space. There is also a back building that includes open office and classroom space. The facility is used for youth courses in art, science, technology, engineering, math and robotics. Courses are provided in the evenings and the facility is open to the community year round. There are about four staff members and groups of youth vary throughout the year. There are many more occupants during the summer when the building is used more. The building was constructed in 2001 and is in good condition. A thorough description of the facility and our observations are located in Section 2.

## I.2 Your Cost Reduction Opportunities

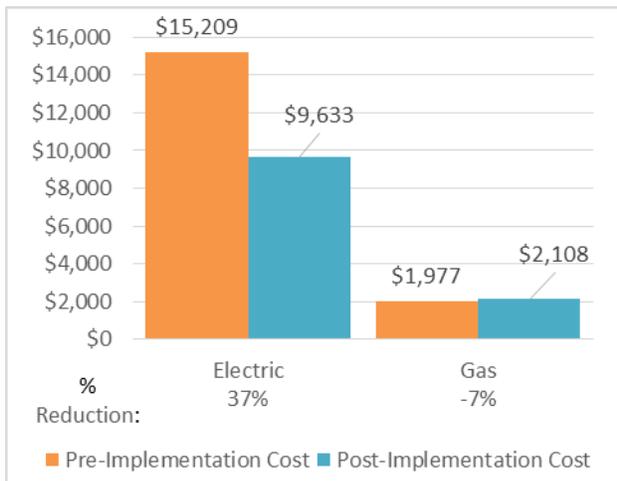
### Energy Conservation Measures

TRC Energy Services evaluated 7 measures and recommends 6 measures at this facility which together represent an opportunity for Egg Harbor Township to reduce annual energy costs by roughly \$5,444 and annual greenhouse gas emissions by 29,675 lbs CO<sub>2</sub>e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 6.4 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce the building's annual energy costs by 32%.

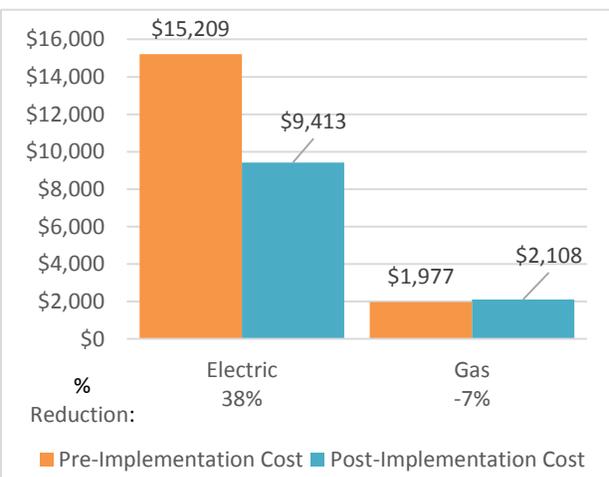
**Figure 1 – Previous 12 Month Utility Costs**



**Figure 2 – Potential Post-Implementation Costs (Evaluated Project Measures)**



**Figure 3 – Potential Post-Implementation Costs (High Priority Project Measures)**



A detailed description of the facility’s existing energy use can be found in Section 3 “Site Energy Use and Costs”.

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

Figure 4 – 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 <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Upgrades</b>			<b>26,141</b>	<b>7.7</b>	<b>0.0</b>	<b>\$4,729.06</b>	<b>\$35,755.11</b>	<b>\$4,195.00</b>	<b>\$31,560.11</b>	<b>6.7</b>	<b>26,324</b>
ECM 1	Install LED Fixtures	Yes	16,005	3.5	0.0	\$2,895.30	\$26,854.89	\$3,000.00	\$23,854.89	8.2	16,116
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	5,699	1.7	0.0	\$1,031.03	\$4,003.17	\$400.00	\$3,603.17	3.5	5,739
ECM 3	Retrofit Fixtures with LED Lamps	Yes	4,437	2.4	0.0	\$802.73	\$4,897.06	\$795.00	\$4,102.06	5.1	4,468
<b>Lighting Control Measures</b>			<b>999</b>	<b>0.3</b>	<b>0.0</b>	<b>\$180.71</b>	<b>\$1,350.00</b>	<b>\$175.00</b>	<b>\$1,175.00</b>	<b>6.5</b>	<b>1,006</b>
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	999	0.3	0.0	\$180.71	\$1,350.00	\$175.00	\$1,175.00	6.5	1,006
<b>Electric Unitary HVAC Measures</b>			<b>1,218</b>	<b>0.6</b>	<b>0.0</b>	<b>\$220.34</b>	<b>\$4,488.66</b>	<b>\$276.00</b>	<b>\$4,212.66</b>	<b>19.1</b>	<b>1,226</b>
	Install High Efficiency Electric AC	No	1,218	0.6	0.0	\$220.34	\$4,488.66	\$276.00	\$4,212.66	19.1	1,226
<b>Domestic Water Heating Upgrade</b>			<b>3,680</b>	<b>1.4</b>	<b>-11.6</b>	<b>\$534.51</b>	<b>\$2,551.48</b>	<b>\$300.00</b>	<b>\$2,251.48</b>	<b>4.2</b>	<b>2,345</b>
ECM 5	Install Tankless Water Heater	Yes	3,680	1.4	-12.6	\$523.95	\$2,522.80	\$300.00	\$2,222.80	4.2	2,235
ECM 6	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	0.9	\$10.56	\$28.68	\$0.00	\$28.68	2.7	110
<b>TOTALS</b>			<b>32,038</b>	<b>9.9</b>	<b>-11.6</b>	<b>\$5,664.61</b>	<b>\$44,145.25</b>	<b>\$4,946.00</b>	<b>\$39,199.25</b>	<b>6.9</b>	<b>30,901</b>
<b>TOTALS (High Priority Measures)</b>			<b>30,820</b>	<b>9.4</b>	<b>-11.6</b>	<b>\$5,444.28</b>	<b>\$39,656.59</b>	<b>\$4,670.00</b>	<b>\$34,986.59</b>	<b>6.4</b>	<b>29,675</b>

\* - 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 conditioning systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

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

### Energy Efficient Practices

TRC Energy Services also identified 13 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at this site include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- 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 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 Energy Services evaluated the potential for installing on-site generation for this site. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

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

## **I.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 (SS)
- Direct Install (DI)

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 SS incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 4 are based on the SS 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 DI 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](http://www.njcleanenergy.com/ci)

## 2 FACILITY INFORMATION AND EXISTING CONDITIONS

### 2.1 Project Contacts

*Figure 5 – Project Contacts*

Name	Role	E-Mail	Phone #
<b>Customer</b>			
Matthew von der Hayden	Deputy Administrator	MVonDerHayden@ehtgov.org	609-926-4044
Sam Gioconda	Division Manager, Buildings & Grounds	sgioconda@ehtgov.org	609-926-3838
<b>TRC Energy Services</b>			
Aimee Lalonde	Auditor	Alalonde@trcsolutions.com	732-855-0033

### 2.2 General Site Information

On September 29, 2017, TRC Energy Services performed an energy audit at the Police Athletic League Building at 2590 Ridge Avenue located in Egg Harbor Township, NJ. TRC Energy Services’ team met with Matt & Sam to review the facility operations and help focus our investigation on specific energy-using systems.

The Police Athletic League Building (located at 2590 Ridge Avenue) is a 5,820 square foot facility comprised of a few buildings. The first building includes meeting halls, office space, a kitchen, living room and classroom space on the second floor. There is a garage used as storage space. There is also a back building that includes open office and classroom space. The facility is used for youth courses in art, science, technology, engineering, math and robotics. Courses are provided in the evenings and the facility is open to the community year round. The building was constructed in 2001 and is in good condition.

### 2.3 Building Occupancy

The facility is open Monday through Saturday between 9:00 AM and 5:00 PM. A nonprofit organization operates this facility. There are about four (4) staff members and groups of youth vary throughout the year. There are many more occupants and the building is used more in the summer. The typical schedule is presented in the table below.

*Figure 6 - Building Schedule*

Building Name	Weekday/Weekend	Operating Schedule
Police Athletic League Building	Weekday	9 AM - 5 PM
Police Athletic League Building	Weekend	9 AM - 5 PM (Sat)

### 2.4 Building Envelope

The Police Athletic League Buildings located at 2590 Ridge Avenue are of standard residential building construction with exterior clad siding. The main building has pitched roof sections and appears to be in fair condition. The windows are double pane and operable with vinyl frames and in fair condition. The exterior doors are constructed of aluminum and in good condition. The photo on the cover of this report is representative of the “front building” and the photo below is representative of the “back building”.



*Image 1 – Building Envelope (Back Building)*

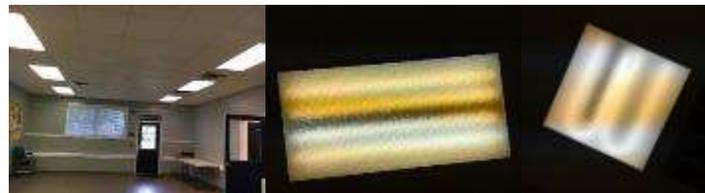
## 2.5 On-Site Generation

This facility does not have any on-site electric generation capacity.

## 2.6 Energy-Using Systems

### Lighting System

Lighting at the facility is provided mostly by linear fluorescent fixtures which have either T8 lamps with electronic ballasts or T12 lamps and magnetic ballasts. There are also incandescent and halogen lamp fixtures. The main rooms in both buildings and the garage are lit by high pressure sodium high bay fixtures. The light fixtures are manually controlled via wall switches. The exit signs in the buildings are LED.



**(Front Building)**



**(Back Building)**

*Image 2 – Interior Lighting*

The exterior fixtures are provided by high pressure sodium lamp fixtures. These include pole mounted area light fixtures, wall pack fixtures, and flood fixtures. There are also two LED flood fixtures.



*Image 3 – Exterior Lighting*

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

### **Electric HVAC**

The front building is conditioned by three split air-conditioning systems. Two of the outdoor condensing units are about 7 years old, high efficiency and in good condition. The other unit is about 16 years old, standard efficiency and in poor condition. The evaluation of replacing this system is provided within this report. The HVAC systems are controlled by programmable thermostats located in the space.



**(Front Building)**

*Image 4 – HVAC*

There is an office that has a window AC unit that is in fair condition and standard efficiency. The back building is conditioned by a split air-source heat pump system, an electric forced air furnace and two split air-conditioning systems. The outdoor condensing units are about 7 years old, high efficiency and in good condition. The HVAC systems are controlled by programmable thermostats located in the space.

The electric forced air furnace is in good condition. We recommend considering replacing with a gas-fired condensing high efficiency system once it reaches the end of its useful life.



**(Back Building)**

*Image 5 – HVAC*

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

### **Fuel HVAC**

The front building is conditioned by three gas fired condensing package units with forced air furnaces. These are of high efficiency and in good condition. These units are also equipped with cooling coils which are served by the outdoor condensing units. The HVAC systems are controlled by programmable thermostats located in the space.



**Front Building**  
*Image 6 – HVAC*

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility’s fuel HVAC equipment.

### Domestic Water Heating System

The domestic water heating system for the front building consists of a gas fired storage tank water heater with an input rating of 40 MBH and a nominal efficiency of 80%. The water heater has a 50 gallon storage tank capacity. The unit is in fair condition and is about 16 years old. Once this reaches the end of its useful life, we recommend considering the replacement with a gas fired condensing high efficiency tankless water heater. Due to the low energy intensity for this gas fired unit, this measure was not evaluated. This system serves sinks in the building.

The domestic hot water heating system for the back building consists of an electric storage tank water heater with an input rating of 4.5 kW. The water heater has a 50 gallon storage tank capacity. The unit is in fair condition and is about 16 years old. We recommend considering the replacement with a gas fired condensing high efficiency tankless water heater. This system serves sinks in the building.



**Front Building**



**Back Building**

*Image 7 – Domestic Hot Water*

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility’s domestic hot water equipment.

### Refrigeration

There are kitchen spaces in both buildings which have stand up refrigerators and there is also a small freezer chest. This equipment is in good condition and high efficiency.



*Image 8 – Refrigeration*

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

### **Building Plug Load**

The facility plug loads include general café equipment, fans, computers and hand tools.

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

## **2.7 Water-Using Systems**

There are a total of four faucets at the facility. These faucets are rated for 2.2 gpm. These may be replaced with low flow sink aerators to reduce energy consumption for hot water use.

### 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

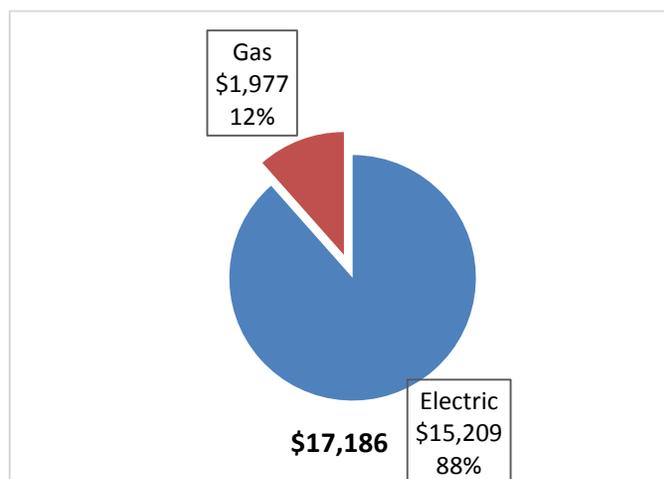
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

*Figure 7 - Utility Summary*

Utility Summary for Egg Harbor Township		
Fuel	Usage	Cost
Electricity	84,071 kWh	\$15,209
Natural Gas	1,752 Therms	\$1,977
<b>Total</b>		<b>\$17,186</b>

The current annual energy cost for this facility is \$17,186 as shown in the chart below.

*Figure 8 - Energy Cost Breakdown*



### 3.2 Electricity Usage

Electricity is provided by Atlantic City Electric. The average electric cost over the past 12 months was \$0.181/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 9 - Graph of 12 Months Electric Usage & Demand

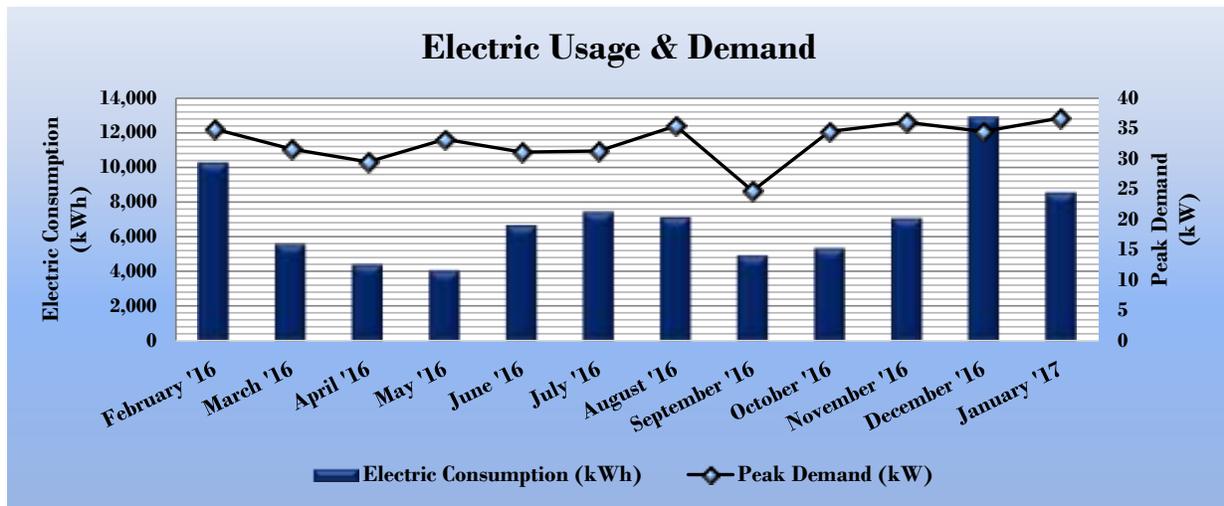


Figure 10 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for Egg Harbor Township					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
3/10/16	30	10,277	35	\$123	\$1,915
4/11/16	32	5,577	32	\$116	\$1,086
5/10/16	29	4,405	30	\$92	\$862
6/10/16	31	4,057	33	\$101	\$786
7/13/16	33	6,666	31	\$89	\$1,195
8/12/16	30	7,437	31	\$86	\$1,311
9/12/16	31	7,136	35	\$101	\$1,295
10/12/16	30	4,920	25	\$66	\$908
11/9/16	28	5,336	35	\$82	\$815
12/9/16	30	7,063	36	\$103	\$1,293
1/11/17	33	12,880	35	\$112	\$2,262
2/9/17	29	8,547	37	\$97	\$1,522
<b>Totals</b>	<b>366</b>	<b>84,301</b>	<b>36.7</b>	<b>\$1,167</b>	<b>\$15,250</b>
<b>Annual</b>	<b>365</b>	<b>84,071</b>	<b>36.7</b>	<b>\$1,164</b>	<b>\$15,209</b>

### 3.3 Natural Gas Usage

Natural Gas is provided by South Jersey Gas. The average gas cost for the past 12 months is \$1.129/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 11 - Graph of 12 Months Natural Gas Usage

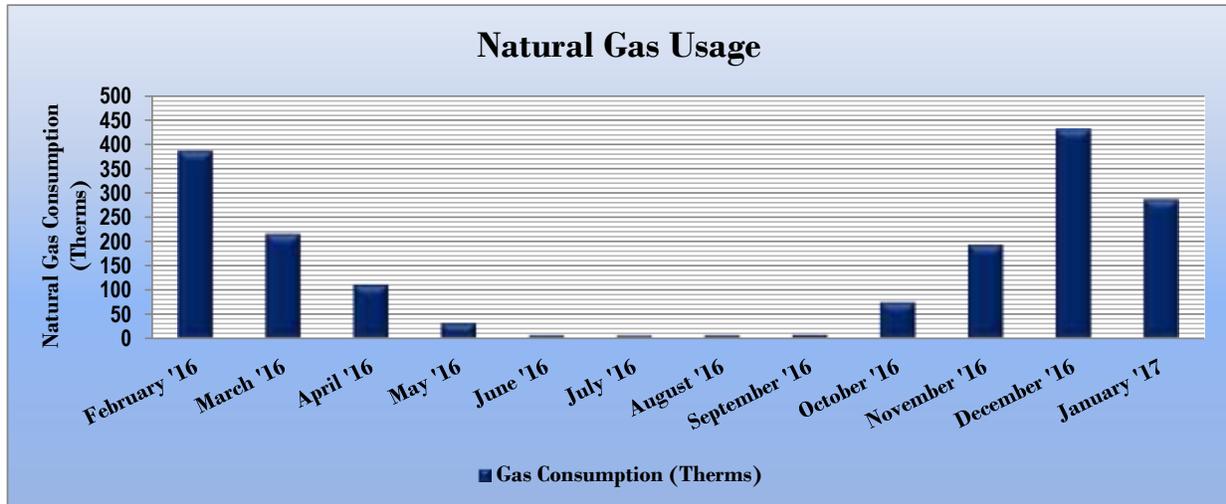


Figure 12 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Egg Harbor Township			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
3/10/16	30	387	\$465
4/12/16	33	216	\$273
5/10/16	28	111	\$150
6/10/16	31	31	\$65
7/13/16	33	6	\$38
8/12/16	30	5	\$34
9/12/16	31	6	\$36
10/12/16	30	7	\$40
11/9/16	28	75	\$116
12/9/16	30	193	\$263
1/11/17	33	432	\$298
2/9/17	29	287	\$203
<b>Totals</b>	<b>366</b>	<b>1,757</b>	<b>\$1,982</b>
<b>Annual</b>	<b>365</b>	<b>1,752</b>	<b>\$1,977</b>

### 3.4 Benchmarking

This facility was benchmarked using *Portfolio Manager*, an online tool created and managed by the U.S. 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.

Energy Use Intensity is a measure of a facility’s energy consumption per square foot, and it is the standard metric for comparing buildings’ energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more 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 13 - Energy Use Intensity Comparison – Existing Conditions**

Energy Use Intensity Comparison - Existing Conditions		
	Egg Harbor Township	National Median Building Type: Municipal
Source Energy Use Intensity (kBtu/ft <sup>2</sup> )	186.4	148.1
Site Energy Use Intensity (kBtu/ft <sup>2</sup> )	79.4	67.3

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

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

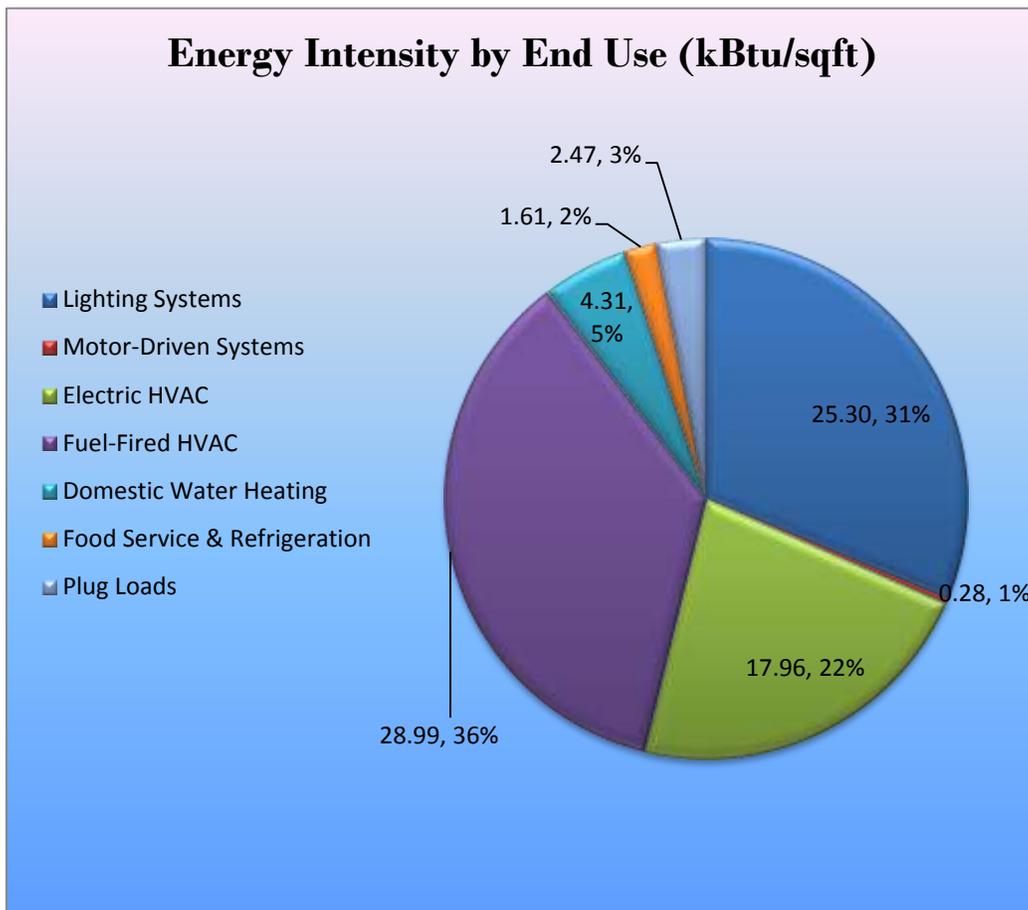
Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Egg Harbor Township	National Median Building Type: Municipal
Source Energy Use Intensity (kBtu/ft <sup>2</sup> )	131.7	148.1
Site Energy Use Intensity (kBtu/ft <sup>2</sup> )	63.3	67.3

Many types of commercial buildings are also eligible to receive an ENERGY STAR™ score. This score is a percentile ranking from 1 to 100. It compares your building’s energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. 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 15 - 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 Egg Harbor Township 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 16 – 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 <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Upgrades</b>		<b>26,141</b>	<b>7.7</b>	<b>0.0</b>	<b>\$4,729.06</b>	<b>\$35,755.11</b>	<b>\$4,195.00</b>	<b>\$31,560.11</b>	<b>6.7</b>	<b>26,324</b>
ECM 1	Install LED Fixtures	16,005	3.5	0.0	\$2,895.30	\$26,854.89	\$3,000.00	\$23,854.89	8.2	16,116
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	5,699	1.7	0.0	\$1,031.03	\$4,003.17	\$400.00	\$3,603.17	3.5	5,739
ECM 3	Retrofit Fixtures with LED Lamps	4,437	2.4	0.0	\$802.73	\$4,897.06	\$795.00	\$4,102.06	5.1	4,468
<b>Lighting Control Measures</b>		<b>999</b>	<b>0.3</b>	<b>0.0</b>	<b>\$180.71</b>	<b>\$1,350.00</b>	<b>\$175.00</b>	<b>\$1,175.00</b>	<b>6.5</b>	<b>1,006</b>
ECM 4	Install Occupancy Sensor Lighting Controls	999	0.3	0.0	\$180.71	\$1,350.00	\$175.00	\$1,175.00	6.5	1,006
<b>Domestic Water Heating Upgrade</b>		<b>3,680</b>	<b>1.4</b>	<b>-11.6</b>	<b>\$534.51</b>	<b>\$2,551.48</b>	<b>\$300.00</b>	<b>\$2,251.48</b>	<b>4.2</b>	<b>2,345</b>
ECM 5	Install Tankless Water Heater	3,680	1.4	-12.6	\$523.95	\$2,522.80	\$300.00	\$2,222.80	4.2	2,235
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	0.9	\$10.56	\$28.68	\$0.00	\$28.68	2.7	110
<b>TOTALS</b>		<b>30,820</b>	<b>9.4</b>	<b>-11.6</b>	<b>\$5,444.28</b>	<b>\$39,656.59</b>	<b>\$4,670.00</b>	<b>\$34,986.59</b>	<b>6.4</b>	<b>29,675</b>

\* - 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

Recommended upgrades to existing lighting fixtures are summarized in Figure 17 below.

Figure 17 – 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 <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Upgrades</b>		<b>26,141</b>	<b>7.7</b>	<b>0.0</b>	<b>\$4,729.06</b>	<b>\$35,755.11</b>	<b>\$4,195.00</b>	<b>\$31,560.11</b>	<b>6.7</b>	<b>26,324</b>
ECM 1	Install LED Fixtures	16,005	3.5	0.0	\$2,895.30	\$26,854.89	\$3,000.00	\$23,854.89	8.2	16,116
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	5,699	1.7	0.0	\$1,031.03	\$4,003.17	\$400.00	\$3,603.17	3.5	5,739
ECM 3	Retrofit Fixtures with LED Lamps	4,437	2.4	0.0	\$802.73	\$4,897.06	\$795.00	\$4,102.06	5.1	4,468

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. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended upgrades for each lighting measure.

### 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 <sub>2</sub> e Emissions Reduction (lbs)
Interior	1,872	0.4	0.0	\$338.74	\$5,370.40	\$300.00	\$5,070.40	15.0	1,886
Exterior	14,132	3.1	0.0	\$2,556.56	\$21,484.49	\$2,700.00	\$18,784.49	7.3	14,231

#### *Measure Description*

We recommend replacing existing fixtures containing high pressure sodium lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have much longer lifetimes than traditional HID technology.

### 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 <sub>2</sub> e Emissions Reduction (lbs)
Interior	5,699	1.7	0.0	\$1,031.03	\$4,003.17	\$400.00	\$3,603.17	3.5	5,739
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.

## 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 <sub>2</sub> e Emissions Reduction (lbs)
Interior	4,148	2.3	0.0	\$750.36	\$4,642.45	\$775.00	\$3,867.45	5.2	4,177
Exterior	290	0.2	0.0	\$52.38	\$254.60	\$20.00	\$234.60	4.5	292

### Measure Description

We recommend retrofitting existing fluorescent T8 fixtures incandescent and halogen with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

## 4.1.2 Lighting Control Measures

Figure 18 – 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 <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Control Measures</b>	<b>999</b>	<b>0.3</b>	<b>0.0</b>	<b>\$180.71</b>	<b>\$1,350.00</b>	<b>\$175.00</b>	<b>\$1,175.00</b>	<b>6.5</b>	<b>1,006</b>
ECM 4   Install Occupancy Sensor Lighting Controls	999	0.3	0.0	\$180.71	\$1,350.00	\$175.00	\$1,175.00	6.5	1,006

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. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended lighting controls upgrades for each lighting measure.

## 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 <sub>2</sub> e Emissions Reduction (lbs)
999	0.3	0.0	\$180.71	\$1,350.00	\$175.00	\$1,175.00	6.5	1,006

### Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in the large rooms throughout the facility. This includes a classroom, meeting area and open area. 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 19 below.

Figure 19 - 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 <sub>2</sub> e Emissions Reduction (lbs)
<b>Domestic Water Heating Upgrade</b>	<b>3,680</b>	<b>1.4</b>	<b>-11.6</b>	<b>\$534.51</b>	<b>\$2,551.48</b>	<b>\$300.00</b>	<b>\$2,251.48</b>	<b>4.2</b>	<b>2,345</b>
ECM 5   Install Tankless Water Heater	3,680	1.4	-12.6	\$523.95	\$2,522.80	\$300.00	\$2,222.80	4.2	2,235
ECM 6   Install Low-Flow Domestic Hot Water Devices	0	0.0	0.9	\$10.56	\$28.68	\$0.00	\$28.68	2.7	110

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on the facility's existing domestic hot water equipment and recommended system upgrades.

## **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 <sub>2</sub> e Emissions Reduction (lbs)
3,680	1.4	-12.6	\$523.95	\$2,522.80	\$300.00	\$2,222.80	4.2	2,235

### *Measure Description*

We recommend replacing the existing electric storage 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 <sub>2</sub> e Emissions Reduction (lbs)
0	0.0	0.9	\$10.56	\$28.68	\$0.00	\$28.68	2.7	110

### *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.

## **4.2 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 <sub>2</sub> e Emissions Reduction (lbs)
<b>Electric Unitary HVAC Measures</b>	<b>1,218</b>	<b>0.6</b>	<b>0.0</b>	<b>\$220.34</b>	<b>\$4,488.66</b>	<b>\$276.00</b>	<b>\$4,212.66</b>	<b>19.1</b>	<b>1,226</b>
Install High Efficiency Electric AC	1,218	0.6	0.0	\$220.34	\$4,488.66	\$276.00	\$4,212.66	19.1	1,226
<b>TOTALS</b>	<b>1,218</b>	<b>0.6</b>	<b>0.0</b>	<b>\$220.34</b>	<b>\$4,488.66</b>	<b>\$276.00</b>	<b>\$4,212.66</b>	<b>19.1</b>	<b>1,226</b>

\* - 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 <sub>2</sub> e Emissions Reduction (lbs)
1,218	0.6	0.0	\$220.34	\$4,488.66	\$276.00	\$4,212.66	19.1	1,226

### *Measure Description*

We typically recommend replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units when cost effective. 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.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

### *Reasons for not Recommending*

The payback period associated with this measure exceeds the average useful life of the equipment, therefore, the project is not recommended on the basis of energy alone. However, this measure could be considered for implementation based on other factors such as the condition of the equipment and the unit nearing the end of its useful life.

## 5 ENERGY EFFICIENT PRACTICES

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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.

## **Practice Proper Use of Thermostat Schedules and Temperature Resets**

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

## **Clean Evaporator/Condenser Coils on AC Systems**

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

## **Clean and/or Replace HVAC Filters**

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

## **Check for and Seal Duct Leakage**

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

## **Perform Proper 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 “Assessing and Reducing Plug and Process Loads in Office Buildings” <http://www.nrel.gov/docs/fy13osti/54175.pdf>, or “Plug Load Best Practices Guide” <http://www.advancedbuildings.net/plug-load-best-practices-guide-offices>

## **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.

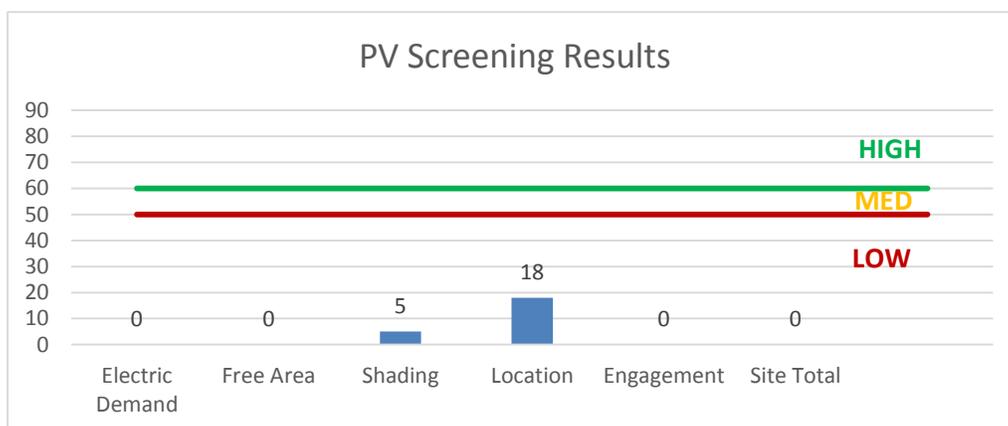
### 6.1 Photovoltaic

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*



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

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

## 6.2 Combined Heat and Power

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

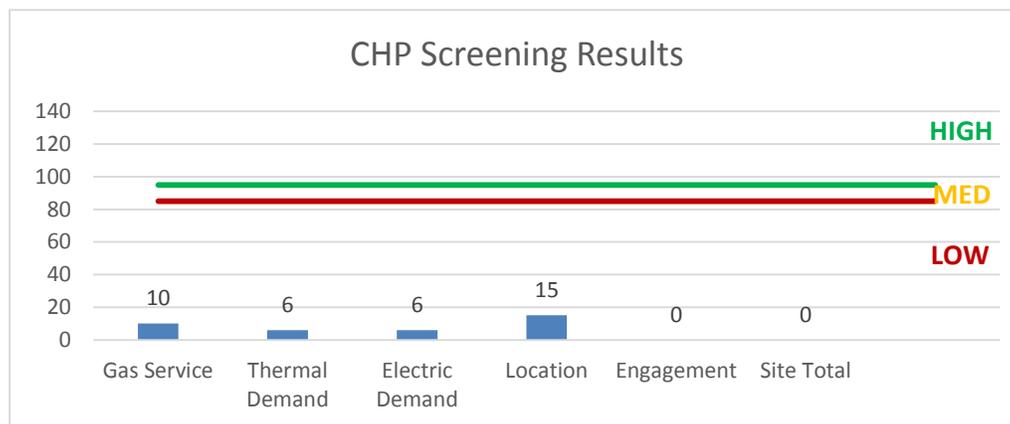
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste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

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

Low or infrequent thermal load is the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: [http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved\\_vendorsearch/](http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/)

**Figure 22 - Combined Heat and Power Screening**



## 7 DEMAND RESPONSE

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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 ([www.pjm.com/markets-and-operations/demand-response/csps.aspx](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 ([www.pjm.com/training/trainingmaterial.aspx](http://www.pjm.com/training/trainingmaterial.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.

In our opinion this building does not appear to be a good candidate for the demand response program.

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

*Figure 23 - ECM Incentive Program Eligibility*

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	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		x			

SmartStart (SS) 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 (DI) 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 SS 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](http://www.njcleanenergy.com/ci)

### 8.1 SmartStart

#### Overview

The SmartStart (SS) 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 SS prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SS 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](http://www.njcleanenergy.com/SSB)

## **8.2 Direct Install**

### **Overview**

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

### **Incentives**

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

### **How to Participate**

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

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

Detailed program descriptions and applications can be found at: [www.njcleanenergy.com/DI](http://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 descriptions and application can be found at: [www.njcleanenergy.com/ESIP](http://www.njcleanenergy.com/ESIP)

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

## 9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

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### 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](http://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](http://www.state.nj.us/bpu/commercial/shopping.html).

# Appendix A: Equipment Inventory & Recommendations

## Lighting Inventory & Recommendations

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	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
Area Lighting	1	High-Pressure Sodium: (1) 250W Lamp	None	295	3,285	Fixture Replacement	No	1	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	120	3,285	0.13	575	0.0	\$104.00	\$1,952.99	\$100.00	17.82
STEM Building	7	High-Pressure Sodium: (1) 250W Lamp	None	295	3,285	Fixture Replacement	No	7	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	120	3,285	1.00	4,547	0.0	\$822.62	\$2,734.74	\$700.00	2.47
STEM Building	2	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	3,285	Fixture Replacement	No	2	LED - Fixtures: High-Bay	Wall Switch	180	3,285	0.46	2,116	0.0	\$382.77	\$5,370.40	\$300.00	13.25
Main Room	2	Incandescent: Ceiling Fan Fixture	Wall Switch	120	1,248	Relamp	No	2	LED Screw-In Lamps: Screw in lamps	Wall Switch	14	1,248	0.17	299	0.0	\$54.09	\$254.60	\$0.00	4.71
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	100	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	100	0.05	6	0.0	\$1.14	\$95.13	\$20.00	65.63
Men's Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,248	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,248	0.05	79	0.0	\$14.29	\$95.13	\$20.00	5.26
Women's Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,248	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,248	0.05	79	0.0	\$14.29	\$95.13	\$20.00	5.26
Sink Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	100	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	100	0.05	6	0.0	\$1.14	\$95.13	\$20.00	65.63
Kitchen	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,248	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,248	0.09	158	0.0	\$28.57	\$190.27	\$40.00	5.26
Shop	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,248	Relamp	No	5	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,248	0.23	395	0.0	\$71.43	\$475.67	\$100.00	5.26
Living Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,248	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,248	0.05	93	0.0	\$16.84	\$117.00	\$20.00	5.76
Stairs	4	Incandescent: Surface Mounted Dome Fixture	Wall Switch	120	1,248	Relamp	No	4	LED Screw-In Lamps: Screw in lamps	Wall Switch	14	1,248	0.34	598	0.0	\$108.17	\$430.02	\$40.00	3.61
2nd Floor Classroom	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,248	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	874	0.54	932	0.0	\$168.53	\$1,126.20	\$215.00	5.41
Simulation Room	3	Halogen Incandescent: Flood Lamp Recessed Can Fixture	Wall Switch	65	100	Relamp	No	3	LED Screw-In Lamps: Screw in lamps	Wall Switch	7	100	0.14	20	0.0	\$3.56	\$190.95	\$15.00	49.47
Transition Spaces	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Back Building	4	High-Pressure Sodium: (1) 250W Lamp	None	295	3,285	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	120	3,285	0.57	2,598	0.0	\$470.07	\$1,562.71	\$400.00	2.47
Garage	4	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	100	None	No	4	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	100	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Garage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	100	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	100	0.05	7	0.0	\$1.35	\$117.00	\$20.00	71.90
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	100	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	100	0.11	15	0.0	\$2.70	\$234.00	\$40.00	71.90
Parking Lot	6	High-Pressure Sodium: (1) 400W Lamp	None	465	3,285	Fixture Replacement	No	6	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	180	3,285	1.39	6,348	0.0	\$1,148.31	\$11,717.96	\$600.00	9.68
Flag	2	LED - Fixtures: Other	None	13	3,285	None	No	2	LED - Fixtures: Other	None	13	3,285	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Exterior	4	High-Pressure Sodium: (1) 50W Lamp	None	66	3,285	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	18	3,285	0.16	713	0.0	\$128.93	\$1,562.71	\$400.00	9.02
Exterior	5	High-Pressure Sodium: (1) 70W Lamp	None	95	3,285	Fixture Replacement	No	5	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	35	3,285	0.24	1,114	0.0	\$201.46	\$1,953.39	\$500.00	7.21
Exterior	4	Halogen Incandescent: Flood Lamp Recessed Can Fixture	None	65	1,248	Relamp	No	4	LED Screw-In Lamps: Screw in lamps	None	7	1,248	0.19	327	0.0	\$59.19	\$254.60	\$20.00	3.96

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	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
Large Open Area	11	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,496	Relamp & Reballast	Yes	11	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,747	1.21	4,201	0.0	\$759.95	\$2,320.17	\$290.00	2.67
Office	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,496	Relamp	No	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,496	0.36	1,264	0.0	\$228.59	\$761.07	\$160.00	2.63
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,496	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,496	0.18	632	0.0	\$114.29	\$380.53	\$80.00	2.63
Hallway	1	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	2,496	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,496	0.03	110	0.0	\$19.90	\$117.00	\$0.00	5.88
Restroom	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,248	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,248	0.05	83	0.0	\$15.05	\$117.00	\$10.00	7.11
Restroom	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	1,248	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,248	0.05	83	0.0	\$15.05	\$117.00	\$10.00	7.11
Large Meeting Area	15	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,496	Relamp & Reballast	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,747	0.83	2,864	0.0	\$518.15	\$2,295.00	\$220.00	4.00
Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	100	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	100	0.05	7	0.0	\$1.21	\$117.00	\$10.00	88.72
Ceiling Fan Fixtures	4	Incandescent: Ceiling Fan Fixture	Wall Switch	80	1,000	Relamp	No	4	LED Screw-In Lamps: Screw in lamps	Wall Switch	8	1,000	0.23	325	0.0	\$58.87	\$254.60	\$0.00	4.32

### Motor Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
		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
Furnace	Furnace	3	Supply Fan	0.3	60.0%	No	690	No	60.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

### Electric HVAC Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions		Proposed Conditions									Energy Impact & Financial Analysis							
		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
Office/Storage	Office/Storage	1	Window AC	0.50		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
STEM Building	STEM Building	1	Split-System Air-Source HP	0.75	9.00	No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
STEM Building	STEM Building	1	Split-System AC	4.50		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
STEM Building	STEM Building	1	Split-System AC	3.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
STEM Building	STEM Building	1	Electric Forced Air Furnace		51.20	No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Main Building	Main Building	1	Split-System AC	3.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Main Building	Main Building	1	Split-System AC	3.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Main Building	Main Building	1	Split-System AC	3.00		Yes	1	Split-System AC	3.00		14.00		No	0.57	1,218	0.0	\$220.34	\$4,488.66	\$276.00	19.12

### Fuel Heating Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions		Proposed Conditions							Energy Impact & Financial Analysis								
		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		
Main Building	Main Building	3	Furnace	75.00	No								0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

### DHW Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
		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
Mechanical Room	Restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Mechanical Room	Restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	Yes	1	Tankless Water Heater	Natural Gas	82.00%	EF	1.35	3,680	-12.6	\$523.95	\$2,522.80	\$300.00	4.24

### Low-Flow Device Recommendations

Location	Recommendation Inputs				Energy Impact & Financial Analysis						
	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
Restroom	2	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	0.5	\$5.28	\$14.34	\$0.00	2.72
Restroom	2	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	0.5	\$5.28	\$14.34	\$0.00	2.72

### Commercial Refrigerator/Freezer Inventory & Recommendations

Location	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
	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
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (≤15 cu. ft.)	Yes	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Kitchen	1	Freezer Chest	Yes	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

**Plug Load Inventory**

Existing Conditions				
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
PAL Building	3	Microwave	1,500.0	
PAL Building	2	Toaster	900.0	
PAL Building	22	Computer	100.0	
PAL Building	2	Printer	250.0	
PAL Building	5	TV	90.0	
PAL Building	2	Mini Fridge	260.0	
PAL Building	5	Fans	100.0	
PAL Building	1	Tools	1,500.0	

