



# Local Government Energy Audit Report

Administration Building

April 19, 2019

*Prepared for:*

Union Township Public Schools  
2369 Morris Avenue  
Union, NJ 07083

*Prepared by:*

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## Disclaimer

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

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

TRC bases estimated installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. We encourage the owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual measures and conditions. TRC and NJBP 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 NJBP reserves the right to extend, modify, or terminate programs without prior notice. Review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

Perform any implementation of energy conservation measures in strict conformance with applicable local, state and federal requirements.

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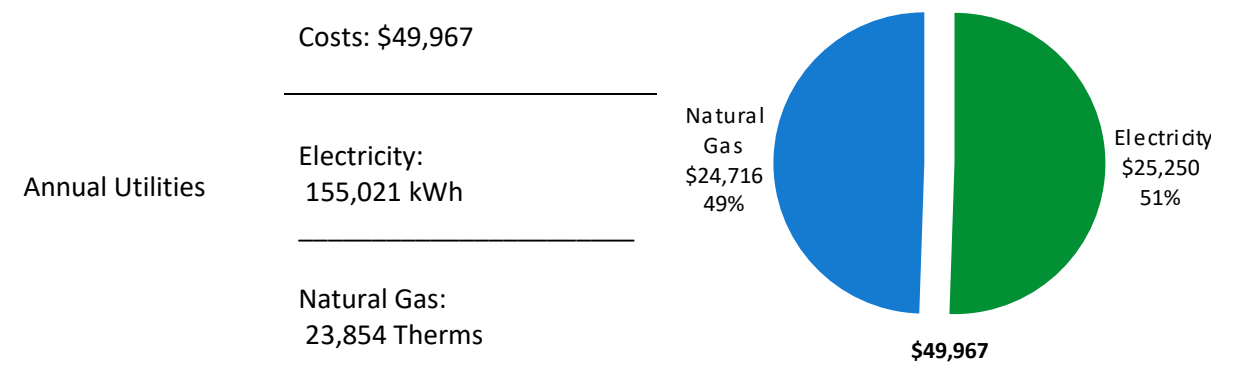
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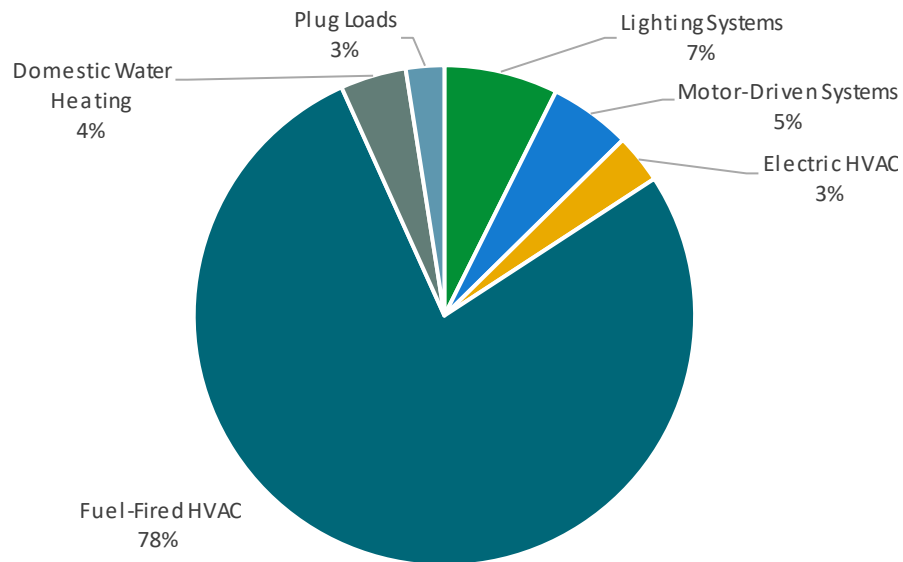
# 1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBP) has sponsored this Local Government Energy Audit (LGEA) report for Administration Building. This report provides you with information about your facility's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in your facility. TRC Energy Services (TRC) conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and help protect our environment by reducing statewide energy consumption.

## BUILDING PERFORMANCE REPORT



<p>ENERGY STAR® Benchmarking Score</p>	<p>15 <i>(1-100 scale)</i></p>	<p>This building performs at or below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.</p>
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*Figure 1 - Energy Use by System*

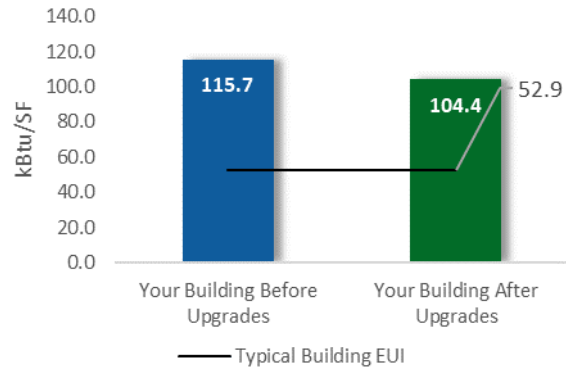
## POTENTIAL IMPROVEMENTS



This energy audit considered a range of potential energy improvements in your building. Costs and savings will vary between improvements. Presented below are two potential scopes of work for your consideration.

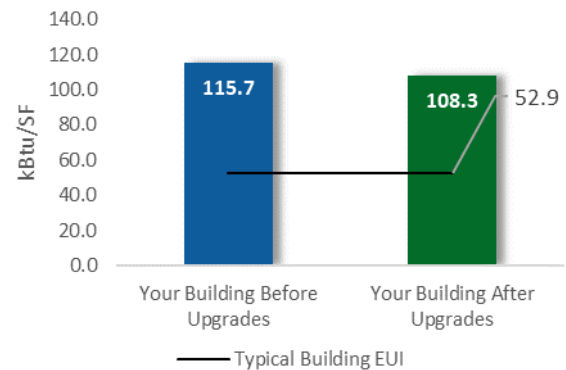
### Scenario 1: Full Package (all evaluated measures)

Installation Cost	\$70,224
Potential Rebates & Incentives <sup>1</sup>	\$5,930
Annual Cost Savings	\$9,631
Annual Energy Savings	Electricity: 59,578 kWh
Greenhouse Gas Emission Savings	30 Tons
Simple Payback	6.7 Years
Site Energy Savings (all utilities)	7%



### Scenario 2: Cost Effective Package<sup>2</sup>

Installation Cost	\$44,216
Potential Rebates & Incentives	\$4,871
Annual Cost Savings	\$9,073
Annual Energy Savings	Electricity: 56,151 kWh
Greenhouse Gas Emission Savings	28 Tons
Simple Payback	4.3 Years
Site Energy Savings (all utilities)	6%



### On-site Generation Potential

Photovoltaic	None
Combined Heat and Power	None

<sup>1</sup> Incentives are based on current SmartStart Prescriptive incentives. Other program incentives may apply.

<sup>2</sup> A cost-effective measure is defined as one where the simple payback does not exceed two-thirds of the expected proposed equipment useful life. Simple payback is based on the net measure cost after potential incentives.

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Lifetime Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Reduction (lbs)
<b>Lighting Upgrades</b>		<b>33,454</b>	<b>10.1</b>	<b>-5</b>	<b>\$5,393</b>	<b>\$80,899</b>	<b>\$10,666</b>	<b>\$2,601</b>	<b>\$8,065</b>	<b>1.5</b>	<b>33,057</b>
ECM 1	Install LED Fixtures	7,092	1.7	0	\$1,155	\$17,327	\$320	\$0	\$320	0.3	7,142
ECM 2	Retrofit Fixtures with LED Lamps	26,362	8.5	-5	\$4,238	\$63,571	\$10,347	\$2,601	\$7,746	1.8	25,916
<b>Lighting Control Measures</b>		<b>7,873</b>	<b>2.5</b>	<b>-2</b>	<b>\$1,265</b>	<b>\$10,122</b>	<b>\$7,620</b>	<b>\$910</b>	<b>\$6,710</b>	<b>5.3</b>	<b>7,735</b>
ECM 3	Install Occupancy Sensor Lighting Controls	6,717	2.1	-1	\$1,080	\$8,636	\$6,210	\$805	\$5,405	5.0	6,600
ECM 4	Install High/Low Lighting Controls	1,156	0.4	0	\$186	\$1,486	\$1,410	\$105	\$1,305	7.0	1,136
<b>Motor Upgrades</b>		<b>0</b>	<b>0.0</b>	<b>0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$5,991</b>	<b>\$0</b>	<b>\$5,991</b>	<b>0.0</b>	<b>0</b>
ECM 5	Premium Efficiency Motors	0	0.0	0	\$0	\$0	\$5,991	\$0	\$5,991	0.0	0
<b>Variable Frequency Drive (VFD) Measures</b>		<b>14,824</b>	<b>4.9</b>	<b>0</b>	<b>\$2,415</b>	<b>\$36,219</b>	<b>\$19,938</b>	<b>\$1,360</b>	<b>\$18,578</b>	<b>7.7</b>	<b>14,928</b>
ECM 6	Install VFDs on Constant Volume (CV) Fans	14,824	4.9	0	\$2,415	\$36,219	\$19,938	\$1,360	\$18,578	7.7	14,928
<b>Electric Unitary HVAC Measures</b>		<b>3,428</b>	<b>2.2</b>	<b>0</b>	<b>\$558</b>	<b>\$8,375</b>	<b>\$26,008</b>	<b>\$1,059</b>	<b>\$24,949</b>	<b>44.7</b>	<b>3,452</b>
	Install High Efficiency Air Conditioning Units	2,617	1.8	0	\$426	\$6,395	\$22,037	\$898	\$21,139	49.6	2,636
	Install High Efficiency Heat Pumps	810	0.4	0	\$132	\$1,980	\$3,971	\$161	\$3,810	28.9	816
<b>Gas Heating (HVAC/Process) Replacement</b>		<b>0</b>	<b>0.0</b>	<b>88</b>	<b>\$912</b>	<b>\$13,687</b>	<b>\$35,065</b>	<b>\$0</b>	<b>\$35,065</b>	<b>38.4</b>	<b>10,311</b>
	Install High Efficiency Unit Heaters	0	0.0	88	\$912	\$13,687	\$35,065	\$0	\$35,065	38.4	10,311
<b>TOTALS</b>		<b>59,578</b>	<b>19.7</b>	<b>81</b>	<b>\$10,544</b>	<b>\$149,301</b>	<b>\$105,290</b>	<b>\$5,930</b>	<b>\$99,360</b>	<b>9.4</b>	<b>69,483</b>

Figure 2 – Evaluated Energy Improvements

## 1.1 Planning Your Project

Careful planning makes for a successful energy project. When considering this scope of work, you will have some decisions to make, such as:

- ◆ How will the project be funded and/or financed?
- ◆ Is it best to pursue individual ECMs, groups of ECMs, or use a comprehensive approach where all ECMs are installed together?
- ◆ Are there other facility improvements that should happen at the same time?

### Pick Your Installation Approach

New Jersey’s Clean Energy Programs give you the flexibility to do a little or a lot. Rebates, incentives, and financing are available to help reduce both your installation costs and your energy bills. If you are planning to take advantage of these programs, make sure to review incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives before purchasing materials or starting installation.

The potential ECMs identified for this building likely qualify for multiple incentive and funding programs. Based on current program rules and requirements, your measures are likely to qualify for the following programs:

Energy Conservation Measure		SmartStart	Direct Install	Pay For Performance
ECM 1	Install LED Fixtures		X	
ECM 2	Retrofit Fixtures with LED Lamps	X	X	
ECM 3	Install Occupancy Sensor Lighting Controls	X	X	
ECM 4	Install High/Low Lighting Controls	X	X	
ECM 5	Premium Efficiency Motors		X	
ECM 6	Install VFDs on Constant Volume (CV) HVAC	X	X	

*Figure 3 – Funding Options*





## New Jersey's Clean Energy Programs At-A-Glance

	<b>SmartStart</b> Flexibility to install at your own pace	<b>Direct Install</b> Turnkey installation	<b>Pay for Performance</b> Whole building upgrades
<b>Who should use it?</b>	Buildings installing individual measures or small group of measures.	Small to mid-size facilities that can bundle multiple measures together.  Average peak demand should be below 200 kW.  Not suitable for significant building shell issues.	Mid to large size facilities looking to implement as many measures as possible at one time.  Peak demand should be over 200 kW.
<b>How does it work?</b>	Use in-house staff or your preferred contractor.	Pre-approved contractors pass savings along to you via reduced material and labor costs.	Whole-building approach to energy upgrades designed to reduce energy use by at least 15%. The more you save, the higher the incentives.
<b>What are the Incentives?</b>	Fixed incentives for specific energy efficiency measures.	Incentives pay up to 70% of eligible costs, up to \$125,000 per project.  You pay the remaining 30% directly to the contractor.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
<b>How do I participate?</b>	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified partner to develop your Energy Reduction Plan and set your energy savings targets.

Take the next step by visiting [www.njcleanenergy.com](http://www.njcleanenergy.com) for program details, applications, and to contact a qualified contractor.

### *Individual Measures with SmartStart*

For facilities wishing 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, you can use internal resources or an outside firm or contractor to perform the final design of the ECM(s) and install the equipment. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation.

### *Turnkey Installation with Direct Install*

The Direct Install program provides 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. Direct Install contractors will assess and verify individual measure eligibility and, in most cases, they perform the installation work. The Direct Install program is available to sites with an average peak demand of less than 200 kW.

### *Whole Building Approach with Pay for Performance*

Pay for Performance can be a good option for medium to large sized facilities to achieve deep energy savings. Pay for Performance allows you to install as many measures as possible under a single project as well as address measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also use this program. Pay for Performance works for larger customers with a peak demand over 200 kW. The minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings.

## **More Options from Around the State**

### *Financing and Planning Support with the Energy Savings Improvement Program (ESIP)*

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the 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. You have already taken the first step as an LGEA customer, because this report is required to participate in ESIP.

### *Resiliency with Return on Investment through Combined Heat & Power (CHP)*

The CHP program provides incentives for combined heat and power (aka cogeneration) and waste heat to power projects. Combined heat and power systems generate power on-site and recover heat from the generation system to meet on-site thermal loads. Waste heat to power systems use waste heat to generate power. You will work with a qualified developer who will design a system that meets your building's heating and cooling needs.

### *Ongoing Electric Savings with Demand Response*

The Demand Response Energy Aggregator program reduces 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. By enabling commercial facilities to reduce their electric demand 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 demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

## 2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Administration Building. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs. This report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

TRC conducted this study as part of a comprehensive effort to assist New Jersey educational and local government facilities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

### 2.1 Site Overview

On September 2, 2018, TRC performed an energy audit at Administration Building located in Union, NJ. TRC met with Raymond E. Mason Jr. to review the facility operations and help focus our investigation on specific energy-using systems.

The Administration Building is a 1-story, 25,200 square foot building built in 2003. Spaces include: offices, conference room, restrooms, bus garage, mechanical shop, storage rooms, boiler room and a break room.



*Board Conference Room*

## 2.2 Building Occupancy

The facility is occupied year-round. Typical weekday occupancy is 25 staff. There are no weekend activities.

Building Name	Weekday/Weekend	Operating Schedule
Administration Building	Weekday	7:00 AM - 6:00 PM
	Weekend	None

*Figure 4 - Building Occupancy Schedule*

## 2.3 Building Envelope

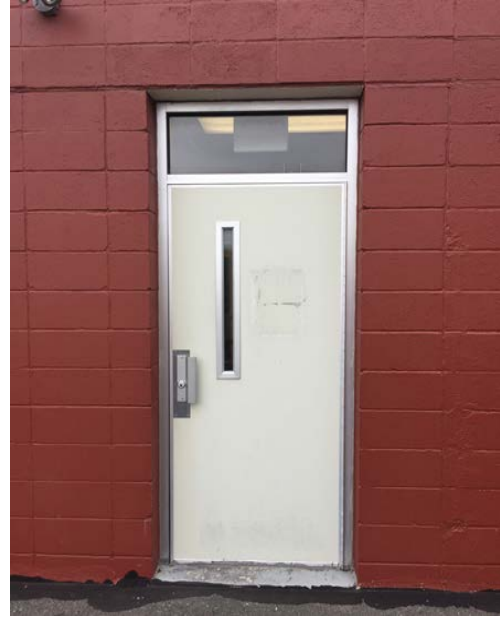
Building walls are concrete block over structural steel with a brick veneer facade. The roof is flat and covered with white membrane and light stone. The roof is in fair condition.

Steel trusses support a pitched roof with a metal deck. The roof encloses conditioned space. The thermal barrier is between this space and the conditioned space below.

Most of the windows are double glazed with low-e glass and have aluminum frames with a thermal break. The glass-to-frame seals are in good condition. The operable window weather seals are in fair condition, showing little evidence of excessive wear. Exterior doors have aluminum frames and are in good condition with undamaged door seals.



*Building Envelope*



*Building Envelope*

## 2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. Additionally, there are some compact fluorescent lamps (CFL) and halogen incandescent general-purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts. Fixture types include 2, 3, or 4-lamp, 4-foot long surface mounted fixtures and 2-foot fixtures with linear tube lamps. Most fixtures are in good condition.

All exit signs are LED fixtures. Interior lighting levels were generally sufficient. Lighting fixtures in all the interior spaces are controlled by wall switches.

Exterior fixtures include wall packs and flood lights with High Pressure Sodium (HPS) Metal Halide (MH) and LED lamps. Exterior light fixtures are typically controlled by time clocks.



*Typical Interior Lights*



*Exterior Lights and Timer*

## 2.5 Air Handling Systems

Air is exhausted in various areas by roof mounted exhaust fans.

### **Packaged Units**

The building is served by multiple packaged roof top units (RTUs) with gas fired heating section. They provided cooling and heating to various spaces. Additionally, there are two split system air source heat pumps that are used to provide cooling and heating to small dedicated spaces. These 9.2 EER units have a heating capacity of 14 and 10 MBh each and 1-ton and 0.75-ton of cooling capacity per unit respectively. The packaged and split system heat pumps are controlled with programmable thermostats.

Some units have been evaluated for replacement as they are nearing the end of their useful life and appear in fair condition.

Refer to Appendix A for detailed information about each unit.



*Roof Top Packaged Units*



*Split System Heat Pump & Programmable Thermostat*

## 2.6 Heating Hot Water Systems

Two Weil-McLain 810 MBh non-condensing hot water boilers serve the building's heating load. The burners are modulating with a nominal efficiency of 80%. The boilers are configured in a lead-lag control scheme. Both boilers are required under high load conditions. Installed in 1994, they are in fair condition. There is a service contract in place.

The hydronic distribution system is a 3-pipe heating only system. The boilers are configured in a constant flow primary distribution with four 0.25 hp constant speed hot water pumps. The boilers provide hot water to unit ventilators, hydronic unit heaters, and baseboards.

In addition to the heating hot water system, five gas-fired Reznor furnaces located on the roof are used to provide supplemental heat to various spaces. Each unit has 240 MBh output capacity with a combustion efficiency of 80%. They have passed their useful life and appear in poor condition. The units have been evaluated for replacement.



*Two Boilers*



*Four Heating Hot Water Pumps*

*Heating Hot Water System*

## 2.7 Domestic Hot Water

Hot water is produced with a 98 gallon 75.1 MBh gas-fired storage water heater with an 80% combustion efficiency. The hot water heater appears in good condition. The domestic hot water pipes are insulated.



*Domestic Hot Water Heater*

## 2.8 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume approximately 2.5% percent of total building energy use. This is lower than a typical building.

The location is doing a great job managing their electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are approximately 32 computer work stations throughout the facility. Plug loads throughout the building include general office equipment along with miscellaneous equipment in the building's mechanical shop.

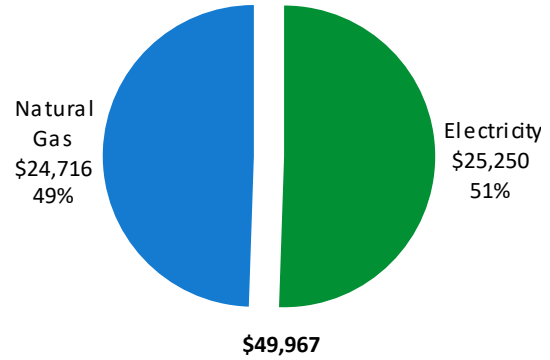
There are three residential style refrigerators throughout the facility. The additional plug loads include, coffee maker, microwaves, printers and copy machines.



### 3 ENERGY USE AND COSTS

Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

Utility Summary		
Fuel	Pre-Implementation Usage	Pre-Implementation Cost
Electricity	155,021	\$25,250
Natural Gas	23,854	\$24,716
<b>Total (MMBtu &amp; \$)</b>	<b>2,914.4</b>	<b>\$49,967</b>



An energy balance identifies and quantifies energy use in your various building systems. This can highlight areas with the most potential for improvement. This energy balance was developed using calculated energy use for each of the end uses noted in the figure.

The energy auditor collects information regarding equipment operating hours, capacity, efficiency, and other operational parameters from facility staff, drawings, and on-site observations. This information is used as the inputs to calculate the existing conditions energy use for the site. The calculated energy use is then compared to the historical energy use and the initial inputs are revised, as necessary, to balance the calculated energy use to the historical energy use.

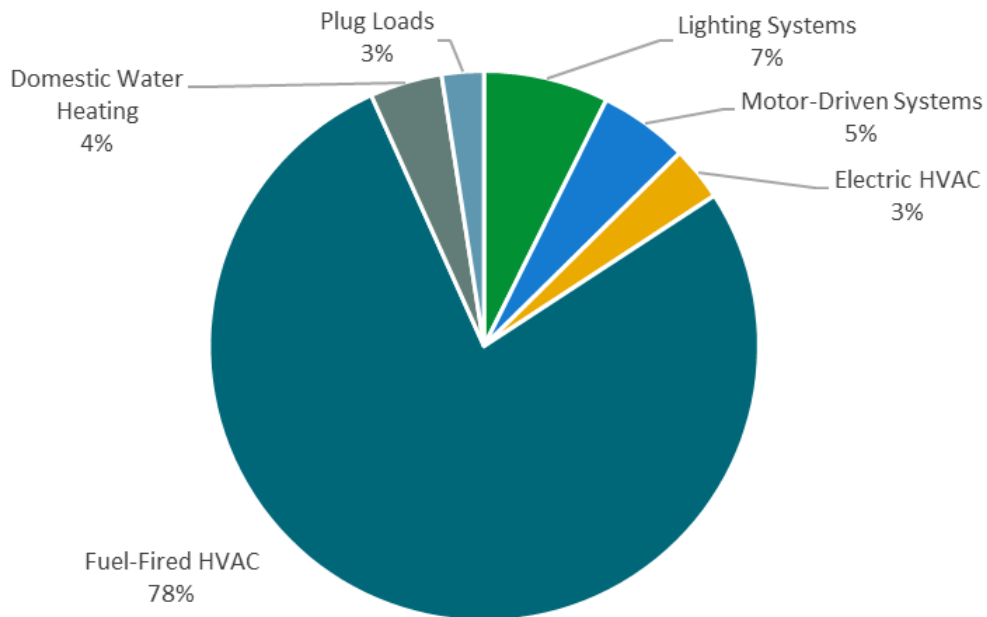
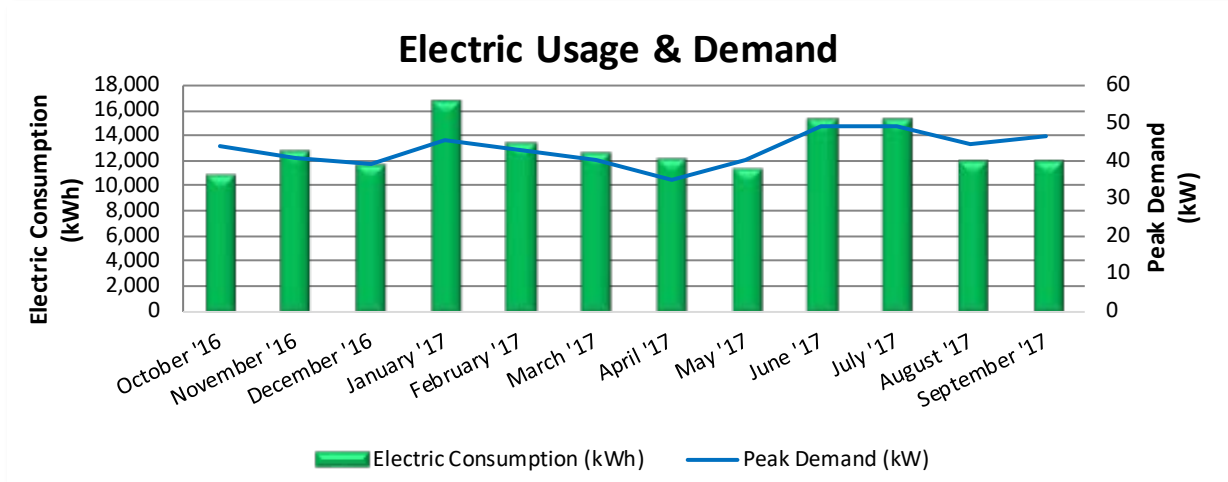


Figure 5 - Energy Balance

### 3.1 Electricity

PSE&G delivers electricity under rate class GLP, with electric production provided by Agera Energy / SJE, a third-party supplier.



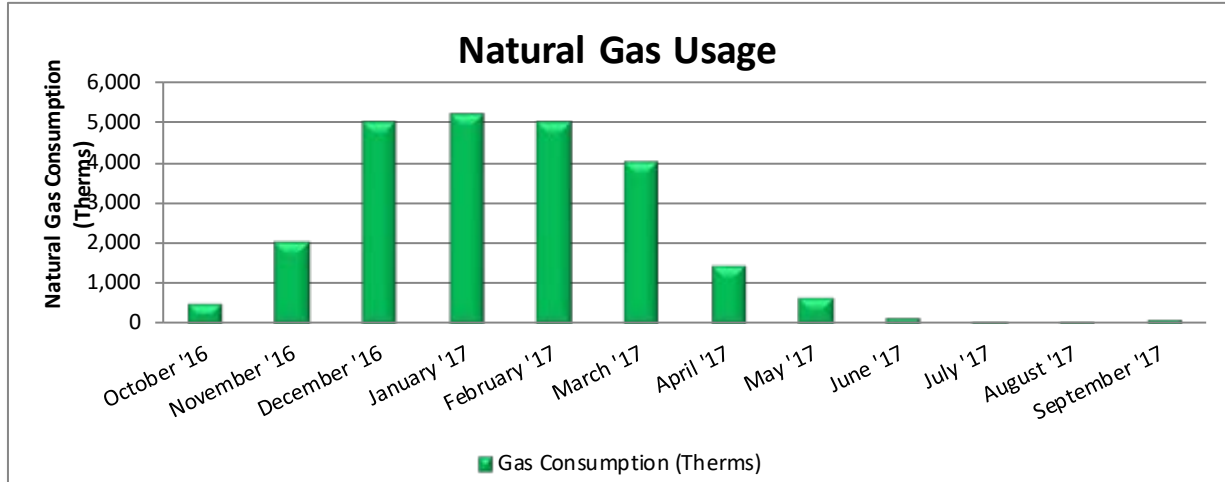
Electric Billing Data						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
10/13/16	30	11,010	44	\$195	\$1,489	Yes
11/14/16	31	12,810	41	\$182	\$2,003	No
12/14/16	29	11,700	39	\$176	\$1,848	No
1/17/17	33	16,860	46	\$204	\$2,624	No
2/14/17	27	13,500	43	\$190	\$2,129	No
3/16/17	29	12,600	40	\$180	\$2,038	No
4/17/17	31	12,270	35	\$157	\$1,966	No
5/16/17	28	11,340	40	\$181	\$1,853	Yes
6/16/17	30	15,315	49	\$278	\$2,702	Yes
7/31/17	44	15,315	49	\$278	\$2,702	No
8/29/17	28	12,000	44	\$200	\$2,068	No
9/28/17	29	12,000	47	\$213	\$2,106	No
<b>Totals</b>	<b>369</b>	<b>156,720</b>	<b>49</b>	<b>\$2,434</b>	<b>\$25,527</b>	
<b>Annual</b>	<b>365</b>	<b>155,021</b>	<b>49</b>	<b>\$2,407</b>	<b>\$25,250</b>	

Notes:

- Peak demand of 49 kW occurred in June and July '17.
- The average electric cost over the past 12 months was \$0.163/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

### 3.2 Natural Gas

Elizabethtown Gas delivers natural gas under rate class 231, with natural gas supply provided by Hudson Energy, a third-party supplier.



Gas Billing Data				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
10/31/16	31	486	\$861	Yes
12/1/16	31	2,001	\$2,654	Yes
12/30/16	29	4,986	\$6,463	Yes
1/30/17	31	5,175	\$4,148	No
2/28/17	29	4,980	\$3,994	No
3/29/17	29	4,023	\$3,352	No
4/28/17	30	1,452	\$1,335	No
5/31/17	33	625	\$728	No
6/29/17	29	125	\$363	No
7/31/17	32	27	\$315	No
8/30/17	30	29	\$301	No
10/2/17	33	78	\$337	No
<b>Totals</b>	<b>367</b>	<b>23,985</b>	<b>\$24,852</b>	
<b>Annual</b>	<b>365</b>	<b>23,854</b>	<b>\$24,716</b>	

Notes:

- The average gas cost for the past 12 months is \$1.036/therm, which is the blended rate used throughout the analysis.

### 3.3 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's (EPA) *Portfolio Manager*® software. Benchmarking compares your building's energy use to that of similar buildings across the county, while neutralizing variations due to location, occupancy and operating hours. Some building types can be scored with a 1-100 ranking of a building's energy performance relative to the national building market. A score of 50 represents the national average and a score of 100 is best.

This ENERGY STAR® benchmarking score provides a comprehensive snapshot of your building's energy performance. It assesses the building's physical assets, operations, and occupant behavior, which is compiled into a quick and easy-to-understand score.

<b>Benchmarking Score</b>	<b>15</b>
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This report contains suggestions about how to improve building performance and reduce energy costs.

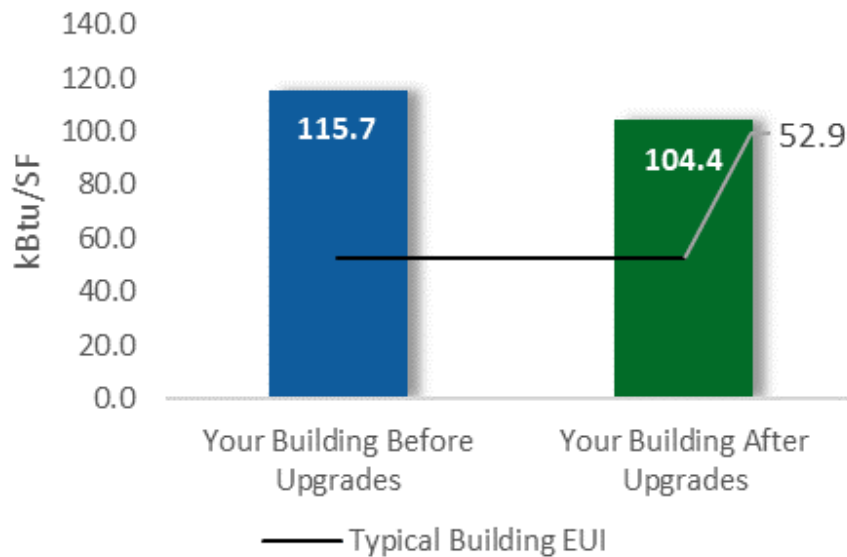


Figure 6 - Energy Use Intensity Comparison

This building performs at, or below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

Energy use intensity (EUI) measures energy consumption per square foot and is the standard metric for comparing buildings' energy performance. A lower EUI means better performance and less energy consumed. A number of factors can cause a building to vary from the "typical" energy usage. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and occupant behavior all contribute to a building's energy use and the benchmarking score.

## **Tracking Your Energy Performance**

Keeping track of your energy use on a monthly basis is one of the best ways to keep energy costs in check. Update your utility information in Portfolio Manager® regularly, so that you can keep track of your building's performance.

**We have created a Portfolio Manager® account for your facility and we have already entered the monthly utility data shown above for you. Account login information for your account will be sent via email.**

Free online training is available to help you use ENERGY STAR® Portfolio Manager® to track your building's performance at: <https://www.energystar.gov/buildings/training>.

For more information on ENERGY STAR® and Portfolio Manager®, visit their website<sup>3</sup>.

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<sup>3</sup> <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1>

## 4 ENERGY CONSERVATION MEASURES

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The goal of this audit report is to identify and evaluate potential energy efficiency improvements, provide information about the cost effectiveness of those improvements, and recognize potential financial incentives from NJBPU. Most energy conservation measures have received preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is typically sufficient to demonstrate project cost-effectiveness and help prioritize energy measures.

Calculations of energy use and savings are based on the current version of the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the NNJBPU. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances.

Operation and maintenance costs for the proposed new equipment will generally be lower than the current costs for the existing equipment—especially if the existing equipment is at or past its normal useful life. We have conservatively assumed there to be no impact on overall maintenance costs over the life of the equipment.

Financial incentives are based on the current NJCEP prescriptive SmartStart program. A higher level of investigation may be necessary to support any SmartStart Custom, Pay for Performance, or Direct Install incentive applications. Some measures and proposed upgrades may be eligible for higher incentives than those shown below through other NJCEP programs described in a following section of this report.

For a detailed list of the list of the locations and recommended energy conservations measures for all inventoried equipment, see **Appendix A: Equipment Inventory & Recommendations**.

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Lifetime Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Reduction (lbs)
<b>Lighting Upgrades</b>		<b>33,454</b>	<b>10.1</b>	<b>-5</b>	<b>\$5,393</b>	<b>\$80,899</b>	<b>\$10,666</b>	<b>\$2,601</b>	<b>\$8,065</b>	<b>1.5</b>	<b>33,057</b>
ECM 1	Install LED Fixtures	7,092	1.7	0	\$1,155	\$17,327	\$320	\$0	\$320	0.3	7,142
ECM 2	Retrofit Fixtures with LED Lamps	26,362	8.5	-5	\$4,238	\$63,571	\$10,347	\$2,601	\$7,746	1.8	25,916
<b>Lighting Control Measures</b>		<b>7,873</b>	<b>2.5</b>	<b>-2</b>	<b>\$1,265</b>	<b>\$10,122</b>	<b>\$7,620</b>	<b>\$910</b>	<b>\$6,710</b>	<b>5.3</b>	<b>7,735</b>
ECM 3	Install Occupancy Sensor Lighting Controls	6,717	2.1	-1	\$1,080	\$8,636	\$6,210	\$805	\$5,405	5.0	6,600
ECM 4	Install High/Low Lighting Controls	1,156	0.4	0	\$186	\$1,486	\$1,410	\$105	\$1,305	7.0	1,136
<b>Motor Upgrades</b>		<b>0</b>	<b>0.0</b>	<b>0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$5,991</b>	<b>\$0</b>	<b>\$5,991</b>	<b>0.0</b>	<b>0</b>
ECM 5	Premium Efficiency Motors	0	0.0	0	\$0	\$0	\$5,991	\$0	\$5,991	0.0	0
<b>Variable Frequency Drive (VFD) Measures</b>		<b>14,824</b>	<b>4.9</b>	<b>0</b>	<b>\$2,415</b>	<b>\$36,219</b>	<b>\$19,938</b>	<b>\$1,360</b>	<b>\$18,578</b>	<b>7.7</b>	<b>14,928</b>
ECM 6	Install VFDs on Constant Volume (CV) Fans	14,824	4.9	0	\$2,415	\$36,219	\$19,938	\$1,360	\$18,578	7.7	14,928
<b>Electric Unitary HVAC Measures</b>		<b>3,428</b>	<b>2.2</b>	<b>0</b>	<b>\$558</b>	<b>\$8,375</b>	<b>\$26,008</b>	<b>\$1,059</b>	<b>\$24,949</b>	<b>44.7</b>	<b>3,452</b>
	Install High Efficiency Air Conditioning Units	2,617	1.8	0	\$426	\$6,395	\$22,037	\$898	\$21,139	49.6	2,636
	Install High Efficiency Heat Pumps	810	0.4	0	\$132	\$1,980	\$3,971	\$161	\$3,810	28.9	816
<b>Gas Heating (HVAC/Process) Replacement</b>		<b>0</b>	<b>0.0</b>	<b>88</b>	<b>\$912</b>	<b>\$13,687</b>	<b>\$35,065</b>	<b>\$0</b>	<b>\$35,065</b>	<b>38.4</b>	<b>10,311</b>
	Install High Efficiency Unit Heaters	0	0.0	88	\$912	\$13,687	\$35,065	\$0	\$35,065	38.4	10,311
<b>TOTALS</b>		<b>59,578</b>	<b>19.7</b>	<b>81</b>	<b>\$10,544</b>	<b>\$149,301</b>	<b>\$105,290</b>	<b>\$5,930</b>	<b>\$99,360</b>	<b>9.4</b>	<b>69,483</b>

Figure 7 – All Evaluated 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>33,454</b>	<b>10.1</b>	<b>-5</b>	<b>\$5,393</b>	<b>\$10,666</b>	<b>\$2,601</b>	<b>\$8,065</b>	<b>1.5</b>	<b>33,057</b>
ECM 1	Install LED Fixtures	7,092	1.7	0	\$1,155	\$320	\$0	\$320	0.3	7,142
ECM 2	Retrofit Fixtures with LED Lamps	26,362	8.5	-5	\$4,238	\$10,347	\$2,601	\$7,746	1.8	25,916
<b>Lighting Control Measures</b>		<b>7,873</b>	<b>2.5</b>	<b>-2</b>	<b>\$1,265</b>	<b>\$7,620</b>	<b>\$910</b>	<b>\$6,710</b>	<b>5.3</b>	<b>7,735</b>
ECM 3	Install Occupancy Sensor Lighting Controls	6,717	2.1	-1	\$1,080	\$6,210	\$805	\$5,405	5.0	6,600
ECM 4	Install High/Low Lighting Controls	1,156	0.4	0	\$186	\$1,410	\$105	\$1,305	7.0	1,136
<b>Motor Upgrades</b>		<b>0</b>	<b>0.0</b>	<b>0</b>	<b>\$0</b>	<b>\$5,991</b>	<b>\$0</b>	<b>\$5,991</b>	<b>0.0</b>	<b>0</b>
ECM 5	Premium Efficiency Motors	0	0.0	0	\$0	\$5,991	\$0	\$5,991	0.0	0
<b>Variable Frequency Drive (VFD) Measures</b>		<b>14,824</b>	<b>4.9</b>	<b>0</b>	<b>\$2,415</b>	<b>\$19,938</b>	<b>\$1,360</b>	<b>\$18,578</b>	<b>7.7</b>	<b>14,928</b>
ECM 6	Install VFDs on Constant Volume (CV) Fans	14,824	4.9	0	\$2,415	\$19,938	\$1,360	\$18,578	7.7	14,928
<b>TOTALS</b>		<b>56,151</b>	<b>17.4</b>	<b>-7</b>	<b>\$9,073</b>	<b>\$44,216</b>	<b>\$4,871</b>	<b>\$39,345</b>	<b>4.3</b>	<b>55,720</b>

\* - All incentives presented in this table are based on NJ SmartStart 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).

*Figure 8 – Cost Effective ECMs*



## 4.1 Lighting

#	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>33,454</b>	<b>10.1</b>	<b>-5</b>	<b>\$5,393</b>	<b>\$10,666</b>	<b>\$2,601</b>	<b>\$8,065</b>	<b>1.5</b>	<b>33,057</b>
ECM 1	Install LED Fixtures	7,092	1.7	0	\$1,155	\$320	\$0	\$320	0.3	7,142
ECM 2	Retrofit Fixtures with LED Lamps	26,362	8.5	-5	\$4,238	\$10,347	\$2,601	\$7,746	1.8	25,916

When considering lighting upgrades, we suggest using a comprehensive design approach that simultaneously upgrades lighting fixtures and controls to maximize energy savings and improve occupant lighting. Comprehensive design will also consider appropriate lighting levels for different space types to make sure that the right amount of light is delivered where needed. If conversion to LED light sources are proposed, we suggest converting all of a specific lighting type (e.g. linear fluorescent) to LED lamps to minimize the number of lamp types in use at the facility, which should help reduce future maintenance costs.

### **ECM 1: Install LED Fixtures**

Replace existing fixtures containing HID lamps with new LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

In some cases, HID fixtures can be retrofit with screw-based LED lamps. Replacing an existing HID fixture with a new LED fixture will generally provide better overall lighting optics; however, replacing the HID lamp with a LED screw-in lamp is typically a less expensive retrofit. We recommend you work with your lighting contractor to determine which retrofit solution is best suited to your needs and will be compatible with the existing fixture(s).

Maintenance savings may also be achieved since LED lamps last longer than other light sources and therefore do not need to be replaced as often.

**Affected building areas:** Exterior fixtures

### **ECM 2: Retrofit Fixtures with LED Lamps**

Replace fluorescent, CFL, and incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps 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. Maintenance savings may also be available, as longer-lasting LEDs lamps will not need to be replaced as often as the existing lamps.

**Affected building areas:** Office Area, Restrooms, Garages, Mechanical shop, and hallways

## 4.2 Lighting Controls

#	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>7,873</b>	<b>2.5</b>	<b>-2</b>	<b>\$1,265</b>	<b>\$7,620</b>	<b>\$910</b>	<b>\$6,710</b>	<b>5.3</b>	<b>7,735</b>
ECM 3	Install Occupancy Sensor Lighting Controls	6,717	2.1	-1	\$1,080	\$6,210	\$805	\$5,405	5.0	6,600
ECM 4	Install High/Low Lighting Controls	1,156	0.4	0	\$186	\$1,410	\$105	\$1,305	7.0	1,136

Lighting controls reduce energy use by turning off or lowering, lighting fixture power levels when not in use. A comprehensive approach to lighting design should upgrade the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

### **ECM 3: Install Occupancy Sensor Lighting Controls**

Install occupancy sensors to control lighting fixtures in areas that are frequently unoccupied, even for short periods. For most spaces, we recommend that lighting controls use dual technology sensors, which reduce the possibility of lights turning off unexpectedly.

Occupancy sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Most occupancy sensor lighting controls allow users to manually turn fixtures on/off, as needed. Some controls can also provide dimming options.

Occupancy sensors can be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are best suited to single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in large spaces, locations without local switching, and where wall switches are not in the line-of-sight of the main work area.

This measure provides energy savings by reducing the lighting operating hours.

**Affected building areas:** Office Area, Restrooms, Garages, Mechanical shop, and hallways

### **ECM 4: Install High/Low Lighting Controls**

Install occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons.

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Fixtures automatically switch back to low level after a predefined period of vacancy. In parking lots and parking garages with significant ambient lighting, this control can sometimes be combined with photocell controls to turn the lights off when there is sufficient daylight.

This measure provides energy savings by reducing the light fixture power draw when reduced light output is appropriate.

**Affected building areas:** hallways, bus garage

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage must be provided to ensure that lights turn on in each area as an occupant approaches.

### 4.3 Motors

#	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>Motor Upgrades</b>		<b>0</b>	<b>0.0</b>	<b>0</b>	<b>\$0</b>	<b>\$5,991</b>	<b>\$0</b>	<b>\$5,991</b>	<b>0.0</b>	<b>0</b>
ECM 5	Premium Efficiency Motors	0	0.0	0	\$0	\$5,991	\$0	\$5,991	0.0	0

#### ECM 5: Premium Efficiency Motors

Replace standard efficiency motors with IHP 2014 efficiency motors. This evaluation assumes that existing motors will be replaced with motors of equivalent size and type. In some cases, additional savings may be possible by downsizing motors to better meet the motor’s current load requirements.

Premium Efficiency motors have been proposed to be installed only in conjunction with proposed variable frequency drive (VFD) motor measures. This analysis conservatively assumes that although current motors may be premium efficiency, they will need to be replaced with inverter duty compatible units for the VFD measure. A qualified electrical contractor should further investigate prior to installation the VFD measure.

Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours. The base case motor energy consumption is estimated using the efficiencies found on nameplates or estimated based on the age of the motor and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the current *New Jersey’s Clean Energy Program Protocols to Measure Resource Savings*.

**Affected motors:** Furnaces supply fan motor and supply fan motor of packaged AC unit

### 4.4 Variable Frequency Drives (VFD)

#	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>Variable Frequency Drive (VFD) Measures</b>		<b>14,824</b>	<b>4.9</b>	<b>0</b>	<b>\$2,415</b>	<b>\$19,938</b>	<b>\$1,360</b>	<b>\$18,578</b>	<b>7.7</b>	<b>14,928</b>
ECM 6	Install VFDs on Constant Volume (CV) Fans	14,824	4.9	0	\$2,415	\$19,938	\$1,360	\$18,578	7.7	14,928

Variable frequency drives control motors for fans, pumps, and process equipment based on the actual output required of the driven equipment. Energy savings result from more efficient control of motor energy usage when equipment operates at partial load. The magnitude of energy savings depends on the estimated amount of time that the motor would operate at partial load. For equipment with proposed VFDs, we have included replacing the controlled motor with a new motor — unless the existing motor meets or exceeds IHP 2014 standards — to conservatively account for the cost of an inverter duty rated motor. The savings and cost associated with the new motor are presented with the Premium Efficiency Motor measures. If the proposed VFD measure is not selected for implementation the motor replacement should be reevaluated.

## **ECM 6: Install VFDs on Constant Volume (CV) Fans**

Install VFDs to control constant volume fan motor speeds. This converts a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one.

Zone thermostats signal the VFD to adjust fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature.

VAV system controls should not raise the supply air temperature at the expense of the fan power. A common mistake is to reset the supply air temperature to achieve chiller energy savings, which can lead to additional air flow requirements. Supply air temperature should be kept low (e.g. 55°F) until the minimum fan speed (typically about 50%) is met. At this point, it is efficient to raise the supply air temperature as the load decreases, but not such that additional air flow and thus fan energy is required.

Energy savings result from reducing the fan speed (and power) when conditions allow for reduced air flow.

## 4.5 Electric Unitary HVAC

#	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>3,428</b>	<b>2.2</b>	<b>0</b>	<b>\$558</b>	<b>\$26,008</b>	<b>\$1,059</b>	<b>\$24,949</b>	<b>44.7</b>	<b>3,452</b>
	Install High Efficiency Air Conditioning Units	2,617	1.8	0	\$426	\$22,037	\$898	\$21,139	49.6	2,636
	Install High Efficiency Heat Pumps	810	0.4	0	\$132	\$3,971	\$161	\$3,810	28.9	816

Replacing the unitary HVAC units has a long payback period and may not be justifiable based simply on energy considerations. However, most of the units at this facility are nearing or have reached the end of their normal useful life. Typically, the marginal cost of purchasing a high efficiency unit can be justified by the marginal savings from the improved efficiency. When the packaged AC units and packaged air based heat pumps are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

### **Install High Efficiency Air Conditioning Units**

Replace standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. 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.

This measure is not recommended on the basis of energy savings as the measure simple payback is longer than the expected life of the replacement equipment.

### **Install High Efficiency Heat Pumps**

Replace standard efficiency heat pumps with high efficiency heat pumps. A higher EER or SEER rating indicates a more efficient cooling system and a higher HPSF rating indicates more efficient heating mode. 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 heating and cooling loads, and the estimated annual operating hours.

This measure is not recommended on the basis of energy savings as the measure simple payback is longer than the expected life of the replacement equipment.

## 4.6 Gas-Fired Heating

#	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>Gas Heating (HVAC/Process) Replacement</b>	<b>0</b>	<b>0.0</b>	<b>88</b>	<b>\$912</b>	<b>\$35,065</b>	<b>\$0</b>	<b>\$35,065</b>	<b>38.4</b>	<b>10,311</b>
	Install High Efficiency Unit Heaters	0	0.0	88	\$912	\$35,065	\$0	\$35,065	38.4	10,311

Installing high efficiency unit heater has a long payback period and may not be justifiable based simply on energy considerations. However, most of the units at this facility are nearing or have reached the end of their normal useful life. Typically, the marginal cost of purchasing a high efficiency unit can be justified by the marginal savings from the improved efficiency. When the air heating units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

### **Install High Efficiency Furnaces**

Replace existing standard gas-fired unit heaters with high efficiency gas-fired unit heaters. Improved combustion technology and heat exchanger design optimize the heat recovery from the combustion gases which can significantly improve unit heater efficiency. Savings result from improved system efficiency.

Note: these units produce acidic condensate that requires proper drainage.

## 5 ENERGY EFFICIENT BEST PRACTICES

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A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs. You may already be doing some of these things— see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

### **Energy Tracking with ENERGY STAR® Portfolio Manager®**



You've heard it before - you can't manage what you don't measure. ENERGY STAR® Portfolio Manager® is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions<sup>4</sup>. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

### **Lighting Maintenance**



- Clean lamps, reflectors and lenses of dirt, dust, oil, and smoke buildup every six to twelve months. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust. Together, this can reduce total light output by up to 60% while still drawing full power.
- In addition to routine cleaning, developing a maintenance schedule can ensure that maintenance is performed regularly, and it can reduce the overall cost of fixture re-lamping and re-ballasting. Group re-lamping and re-ballasting maintains lighting levels and minimizes the number of site visits by a lighting technician or contractor, decreasing the overall cost of maintenance.

### **Lighting Controls**

As part of a lighting maintenance schedule, test lighting controls to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight and photocell sensors, maintenance involves cleaning sensor lenses and confirming that setpoints and sensitivity are configured properly.

### **AC System Evaporator/Condenser Coil Cleaning**

Dirty evaporator and condenser coils restrict air flow and restrict heat transfer. This increases the loads on the evaporator and condenser fan, and decreases overall cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

### **HVAC Filter Cleaning and Replacement**

Air filters should be checked regularly (often monthly) and cleaned or replaced when appropriate. Air filters reduce indoor air pollution, increase occupant comfort, and help keep equipment operating efficiently. If the building has a building management system, consider installing a differential pressure

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<sup>4</sup> <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager>

switch across filters to send an alarm about premature fouling or overdue filter replacement. Over time, filters become less and less effective as particulate buildup increases. Dirty filters also restrict air flow through the air conditioning or heat pump system, which increases the load on the distribution fans.

### **Boiler Maintenance**

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Boilers should be cleaned according to the manufacturer's instructions to remove soot and scale from the water side or fire side of the boiler.

### **Furnace Maintenance**

Preventative 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: check for gas / carbon monoxide leaks; change the air and fuel filters; check components for cracks, corrosion, dirt, or debris build-up; ensure the ignition system is working properly; test and adjust operation and safety controls; inspect electrical connections; and lubricate motors and bearings.

### **Water Heater Maintenance**

Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. At least once a year, follow manufacturer instructions to 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. Annual checks should include checks for:

- Leaks or heavy corrosion on the pipes and valves.
- 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 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 more than three years old, have a technician inspect the sacrificial anode annually.

### **Water Conservation**



Installing dual flush or low-flow toilets and low-flow/waterless urinals are ways to reduce water use. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and for flush valve toilets is 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

For more information regarding water conservation go to the EPA's WaterSense™ website<sup>5</sup> or download a copy of EPA's "WaterSense™ at Work: Best Management

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<sup>5</sup> <https://www.epa.gov/watersense>

Practices for Commercial and Institutional Facilities”<sup>6</sup> to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Water conservation devices that do not reduce hot water consumption will not provide energy savings at the site level, but they may significantly affect your water and sewer usage costs. 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.

If the facility has detached buildings with a master water meter for the entire campus, check for unnatural wet areas in the lawn or water seeping in the foundation at water pipe penetrations through the foundation. Periodically check overnight meter readings when the facility is unoccupied, and there is no other scheduled water usage.

Manage irrigation systems to use water more effectively outside the building. Adjust spray patterns so that water lands on intended lawns and plantings and not on pavement and walls. Consider installing an evapotranspiration irrigation controller that will prevent over-watering.

### **Procurement Strategies**

Purchasing efficient products reduces energy costs without compromising quality. Consider modifying your procurement policies and language to require ENERGY STAR® or WaterSense™ products where available.

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<sup>6</sup> <https://www.epa.gov/watersense/watersense-work-0>



## 6 ON-SITE GENERATION

You don't have to look far in New Jersey to see one of the thousands of solar electric systems providing clean power to homes, businesses, schools, and government buildings. On-site generation includes both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) technologies that generate power to meet all or a portion of the facility's electric energy needs. Also referred to as distributed generation, these systems contribute to greenhouse gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases reduction, which results in improved electric grid reliability through better use of transmission and distribution systems.

Preliminary screenings were performed to determine if an on-site generation measure could be a cost-effective solution for your facility. Before deciding to install an on-site generation system, we recommend conducting a feasibility study to analyze 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 Solar Photovoltaic

Photovoltaic (PV) panels convert sunlight into electricity. Individual panels are combined into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is then connected to the building's electrical distribution system.

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

This facility does appear not meet the minimum criteria for a cost-effective solar PV installation. 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.

The graphic below displays the results of the PV potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.

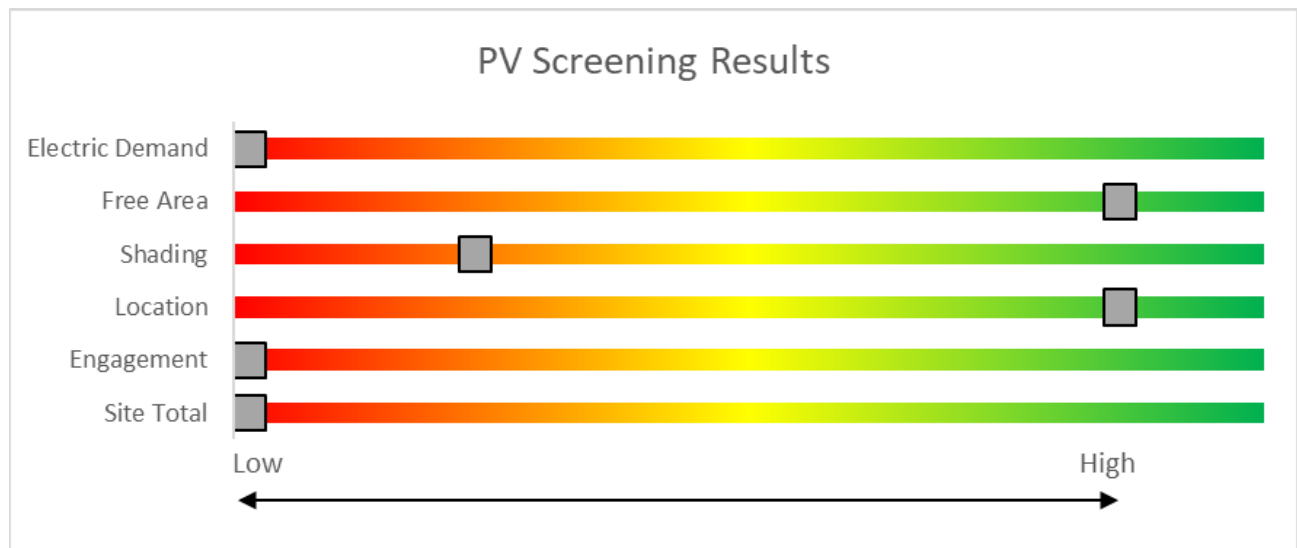


Figure 9 - Photovoltaic Screening

## Solar Renewable Energy Credit (SREC) Registration Program

Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SREC Registration Program before starting construction. Once your PV system is up and running, you periodically earn credits, which can then be sold on the open market for up to 15 years.

If you are considering installing solar photovoltaics on your building, visit [www.njcleanenergy.com/srec](http://www.njcleanenergy.com/srec) for more information about the SREC Registration Program.

Get more information about solar power in New Jersey or find a qualified solar installer who can help you decide if solar is right for your building:

- **Basic Info on Solar PV in NJ:** [www.njcleanenergy.com/whysolar](http://www.njcleanenergy.com/whysolar)
- **NJ Solar Market FAQs:** [www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/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:** [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) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for space cooling.

The key criteria used for screening is the amount of time that the CHP system would operate at full load and the facility's ability to use the recovered heat. Facilities with a continuous need 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 **low** potential for installing a cost-effective CHP system.

Based on a preliminary analysis, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation. Low or infrequent thermal load, and lack of space for siting the equipment are the most significant factors contributing to the lack of CHP potential.

The graphic below displays the results of the CHP potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.

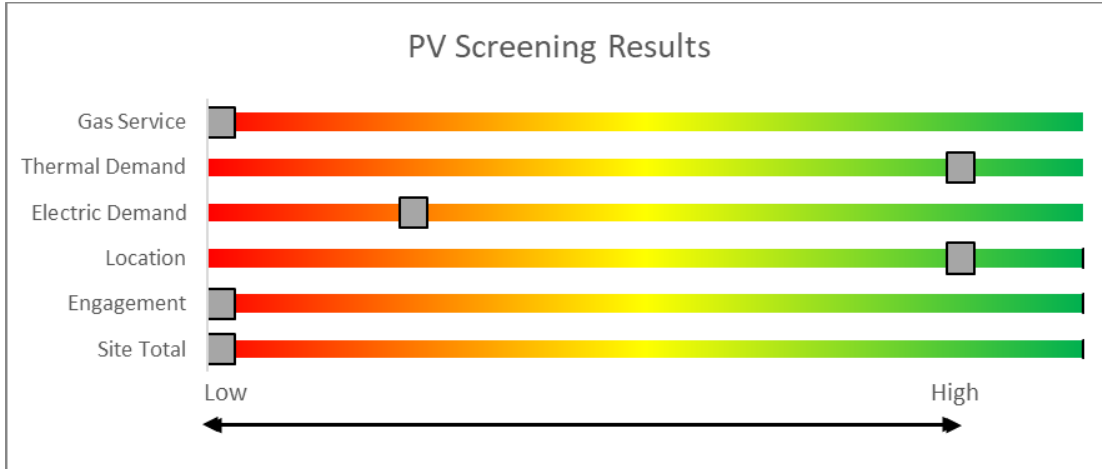


Figure 10 - Combined Heat and Power Screening

Find a qualified firm that specializes in commercial CHP cost assessment and installation:  
[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/)

## 7 PROJECT FUNDING AND INCENTIVES

Ready to improve your building’s performance? New Jersey’s Clean Energy Programs can help. Pick the program that works best for you. Incentive programs that may apply to this facility are identified in the Executive Summary. This section provides an overview of currently available New Jersey’s Clean Energy Programs.

	<b>SmartStart</b> <i>Flexibility to install at your own pace</i>	<b>Direct Install</b> <i>Turnkey installation</i>	<b>Pay for Performance</b> <i>Whole building upgrades</i>
<b>Who should use it?</b>	Buildings installing individual measures or small group of measures.	Small to mid-size facilities that can bundle multiple measures together.  Average peak demand should be below 200 kW.  Not suitable for significant building shell issues.	Mid to large size facilities looking to implement as many measures as possible at one time.  Peak demand should be over 200 kW.
<b>How does it work?</b>	Use in-house staff or your preferred contractor.	Pre-approved contractors pass savings along to you via reduced material and labor costs.	Whole-building approach to energy upgrades designed to reduce energy use by at least 15%. The more you save, the higher the incentives.
<b>What are the Incentives?</b>	Fixed incentives for specific energy efficiency measures.	Incentives pay up to 70% of eligible costs, up to \$125,000 per project.  You pay the remaining 30% directly to the contractor.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
<b>How do I participate?</b>	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified Partner to develop your Energy Reduction Plan and set your energy savings targets.
<p>Take the next step by visiting <a href="http://www.njcleanenergy.com">www.njcleanenergy.com</a> for program details, applications, and to contact a qualified contractor.</p>			

## 7.1 SmartStart



SmartStart offers incentives for installing prescriptive and custom energy efficiency measures at your facility. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades. This program serves most common equipment types and sizes.

SmartStart routinely 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*

### **Incentives**

The SmartStart Prescriptive program provides fixed incentives for specific energy efficiency measures. Prescriptive incentives vary by equipment type.

SmartStart Custom provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentives. Custom incentives are calculated at \$0.16/kWh and \$1.60/therm based on estimated annual savings. Incentives are 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**

Submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. You can work with your preferred contractor or use internal staff to install measures.

Visit [www.njcleanenergy.com/SSB](http://www.njcleanenergy.com/SSB) for a detailed program description, instructions for applying, and applications.

## 7.2 Direct Install



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 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.

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

## 7.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. 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. Annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive for the life of the contract.

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 described above can also be used to help further reduce the total project cost of eligible measures.

## How to Participate

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 used 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. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program descriptions and application can be found at: [www.njcleanenergy.com/ESIP](http://www.njcleanenergy.com/ESIP).

*ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you can use NJCEP incentive programs to help further reduce costs when developing the energy savings plan. Refer to the ESIP guidelines at the link above for further information and guidance on next steps.*

## 8 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

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### 8.1 Retail Electric Supply Options

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 already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party electric suppliers is available at the NJBPU website<sup>7</sup>.

### 8.1 Retail Natural Gas Supply Options

The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate monthly. 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 typically depends on whether a customer prefers 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 does not already purchase natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility already purchases natural gas from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party natural gas suppliers is available at the NJBPU website<sup>8</sup>.

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<sup>7</sup> [www.state.nj.us/bpu/commercial/shopping.html](http://www.state.nj.us/bpu/commercial/shopping.html).

<sup>8</sup> [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

		Existing Conditions						Proposed Conditions						Energy Impact & Financial Analysis							
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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
Ext Men Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	s	62	2,750	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,750	0.0	100	0	\$16	\$37	\$10	1.7
Ext Men Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	s	32	2,750	2	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,750	0.0	106	0	\$17	\$37	\$10	1.6
Wall Pack	6	High-Pressure Sodium: (1) 400W Lamp	Timeclock	s	465	3,000	1	Fixture Replacement	No	6	LED - Fixtures: 120 Watt LED - 1L	Timeclock	120	3,000	1.4	6,210	0	\$1,011	\$210	\$0	0.2
Ext Women Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	s	62	2,750	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,750	0.0	100	0	\$16	\$37	\$10	1.7
Ext Women Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	s	32	2,750	2	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,750	0.0	106	0	\$17	\$37	\$10	1.6
Wall Pack	1	LED Screw-In Lamps: 55 Watt - 1L	Timeclock		55	2,860		None	No	1	LED Screw-In Lamps: 55 Watt - 1L	Timeclock	55	2,860	0.0	0	0	\$0	\$0	\$0	0.0
Wall Pack	1	LED Screw-In Lamps: 9 Watt - 1L	Timeclock		9	2,860		None	No	1	LED Screw-In Lamps: 9 Watt - 1L	Timeclock	9	2,860	0.0	0	0	\$0	\$0	\$0	0.0
Wall Pack	3	Metal Halide: (1) 100W Lamp	Timeclock		128	3,000	1	Fixture Replacement	No	3	LED - Fixtures: 30 Watt LED - 1L	Timeclock	30	3,000	0.2	882	0	\$144	\$110	\$0	0.8
N/A	3	Halogen Incandescent: 90 Watt - 1L	Wall Switch		90	2,750	2	Fixture Replacement	No	3	LED Screw-In Lamps: LED - 1L	Wall Switch	14	2,750	0.2	627	0	\$102	\$110	\$0	1.1



### 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?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Restroom	2	Exhaust Fan	0.1	69.5%	No		2,745		No	69.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Roof	Hallways	2	Exhaust Fan	0.3	69.5%	No		2,745		No	69.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Boiler Room	Furnace	1	Heating Hot Water Pump	0.3	69.5%	No		2,745		No	69.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Boiler Room	Boilers	4	Heating Hot Water Pump	0.3	69.5%	No		2,745		No	69.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Boiler Room	Furnace	3	Supply Fan	3.0	89.5%	No		2,745	5, 6	Yes	89.5%	Yes	3	2.6	7,722	0	\$1,258	\$11,437	\$720	8.5
Boiler Room	Furnace	2	Supply Fan	2.0	86.5%	No		2,745	5, 6	Yes	86.5%	Yes	2	1.1	3,551	0	\$578	\$7,246	\$320	12.0
Roof	PAC unit	1	Supply Fan	2.0	86.5%	No		2,745	5, 6	Yes	86.5%	Yes	1	0.6	1,776	0	\$289	\$3,623	\$160	12.0
Roof	PAC unit-RTU 8	1	Supply Fan	0.8	81.1%	No	W	2,745		No	81.1%	No		0.0	0	0	\$0	\$0	\$0	0.0
Roof	PAC unit-RTU 8	1	Supply Fan	0.3	69.5%	No	W	2,745		No	69.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Roof	PAC unit	1	Supply Fan	2.0	86.5%	No		2,745	5, 6	Yes	86.5%	Yes	1	0.6	1,776	0	\$289	\$3,623	\$160	12.0
Roof	PAC unit-RTU 7 & RTU6 & RTU5 & 1	4	Supply Fan	0.2	69.5%	No	W	2,745		No	69.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Roof	PAC unit-RTU 7 & RTU6 & RTU5 & 1	6	Supply Fan	0.5	78.2%	No	W	2,745		No	78.2%	No		0.0	0	0	\$0	\$0	\$0	0.0

### 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 (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Misc	1	Packaged Air-Source HP	1.00	14.00		NR	Yes	1	Packaged Air-Source HP	1.00	14.00	14.00	3.80	0.2	466	0	\$76	\$2,269	\$92	28.7
Roof	Transportation Office/Lunch Room	1	Packaged AC	5.00			NR	Yes	1	Packaged AC	5.00		14.00		0.9	1,234	0	\$201	\$11,345	\$460	54.1
Roof	Various-RTU8	1	Packaged AC	4.00		W		No						0.0	0	0	\$0	\$0	\$0	0.0	
Roof	Various	1	Packaged AC	6.00			NR	Yes	1	Packaged AC	6.00		11.50		1.0	1,383	0	\$225	\$10,693	\$438	45.5
Roof	Various	1	Packaged Air-Source HP	0.75	10.00		NR	Yes	1	Packaged Air-Source HP	0.75	10.00	14.00	3.80	0.2	344	0	\$56	\$1,702	\$69	29.1
Roof	Various-RTU7 & RTU6 & RTU5 & 1	6	Packaged AC	3.00		W		No						0.0	0	0	\$0	\$0	\$0	0.0	
Roof	PAC-AC	1	Packaged AC	3.50		W		No						0.0	0	0	\$0	\$0	\$0	0.0	

### 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)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Various	2	Non-Condensing Hot Water Boiler	810.00	w		No						0.0	0	0	\$0	\$0	\$0	0.0
Roof	Garage	1	Furnace	#####	w		No						0.0	0	0	\$0	\$0	\$0	0.0
Roof	Various-RTU7 & RTU6 & RTU5 & 1	6	Warm Air Unit Heater	51.50	w		No						0.0	0	0	\$0	\$0	\$0	0.0
Roof	Various-RTU8	1	Warm Air Unit Heater	51.50	w		No						0.0	0	0	\$0	\$0	\$0	0.0
Roof	Various	5	Warm Air Unit Heater	240.00	w		No						0.0	0	0	\$0	\$0	\$0	0.0
Garage	Bay Door	1	Infrared Unit Heater	50.00	w		No						0.0	0	0	\$0	\$0	\$0	0.0
Roof	Leonnex PAC	1	Warm Air Unit Heater	125.00	w		No						0.0	0	0	\$0	\$0	\$0	0.0

### DHW Inventory & Recommendations

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

### Plug Load Inventory

Location	Existing Conditions			
	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Offices	32	Computers	120.0	No
Various	6	Copy Machine	335.0	No
Various	19	Printer	13.0	No
Various	2	Wall TV	150.0	No
Various	4	Microwave	800.0	No
Various	5	Coffee Maker	900.0	No
Various	3	Refrigerator	1,200.0	No
Various	3	Water Cooler	100.0	No
Various	1	Misc Shop Equipment	1,500.0	No

# APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

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.

## ENERGY STAR® Statement of Energy Performance

LEARN MORE AT [energystar.gov](http://energystar.gov)

# 15

ENERGY STAR®  
Score<sup>1</sup>

### Administration Building

Primary Property Type: Office  
Gross Floor Area (ft<sup>2</sup>): 25,200  
Built: 2003

For Year Ending: September 30, 2017  
Date Generated: November 28, 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		
<b>Property Address</b> Administration Building 2369 Morris Avenue, Union, New Jersey 07083	<b>Property Owner</b> _____	<b>Primary Contact</b> _____
	( ) -	( ) -
<b>Property ID:</b> 6629677		

Energy Consumption and Energy Use Intensity (EUI)			
<b>Site EUI</b> 115.6 kBtu/ft <sup>2</sup>	<b>Annual Energy by Fuel</b>		<b>National Median Comparison</b>
	Natural Gas (kBtu)	2,396,709 (82%)	National Median Site EUI (kBtu/ft <sup>2</sup> )
	Electric - Grid (kBtu)	515,507 (18%)	National Median Source EUI (kBtu/ft <sup>2</sup> )
			72.3
			98.3
			60%
<b>Source EUI</b> 157.1 kBtu/ft <sup>2</sup>			<b>Annual Emissions</b>
			Greenhouse Gas Emissions (Metric Tons CO <sub>2</sub> /year)
			180

### Signature & Stamp of Verifying Professional

I \_\_\_\_\_ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Licensed Professional

\_\_\_\_\_  
( ) -  
\_\_\_\_\_



Professional Engineer Stamp  
(if applicable)

## APPENDIX C: GLOSSARY

TERM	DEFINITION
<b>Blended Rate</b>	Used to calculate financial savings. The blended rate is calculated by dividing the amount of your bill by the total energy use. For example, if your bill is \$22,217.22, and you used 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
<b>BTU</b>	A British thermal unit is the amount of heat required to increase the temperature of one pound water by one-degree Fahrenheit. Commonly used to measure natural gas consumption.
<b>Demand Response</b>	Demand response reduces or shifts electricity usage at or among participating buildings/sites during peak energy use periods in response to time-based rates or other forms of financial incentives.
<b>Energy Efficiency</b>	Reducing the amount of energy necessary to provide comfort and service to a building/area. Achieved through the installation of new equipment and/or optimizing energy management systems.
<b>Generation</b>	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
<b>HVAC</b>	Heating, ventilation, and air conditioning.
<b>kW</b>	Kilowatt. Equal to 1,000 Watts.
<b>Load</b>	The total amount of power used by a building system at any given time.
<b>Measure</b>	A single activity, or installation of a single type of equipment, that is implemented in a building system to reduce total energy consumption.
<b>MMBtu</b>	One million British thermal units.
<b>psig</b>	Pounds per square inch.
<b>Plug Load</b>	Refers to the amount of energy used in a space by products that are powered by means of an ordinary AC plug.
<b>Simple Payback</b>	The amount of time needed to recoup the funds expended in an investment, or to reach the break-even point.
<b>Temperature Setpoint</b>	The temperature at which a temperature regulating device (thermostat, for example) has been set.
<b>Turnkey</b>	Provision of a complete product or service that is ready for immediate use.
<b>Watt (W)</b>	Unit of power commonly used to measure electricity use.