Local Government Energy Audit Report

Central Office

August 29, 2019

Prepared for:

Ridgefield Public Schools
555 Chestnut Street
Ridgefield, New Jersey 07657

Prepared by:

TRC Energy Services
900 Route 9 North
Woodbridge, New Jersey 07095

Disclaimer

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

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

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

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. Please review all available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

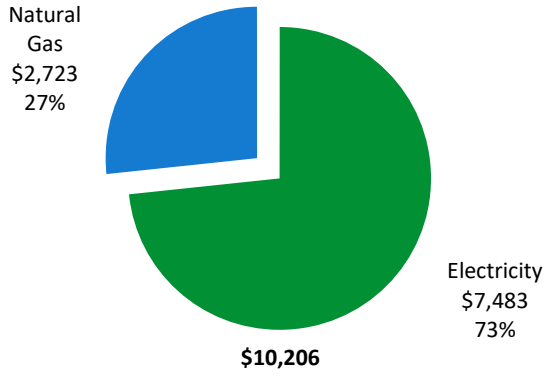
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

Table of Contents

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Central Office. This report provides you with information about the office's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in the office. 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 to help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $10,206 Electricity: 53,754 kWh Natural Gas: 2,719 Therms	
ENERGY STAR® Benchmarking Score	3 *(1-100 scale)*	This building performs at or below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

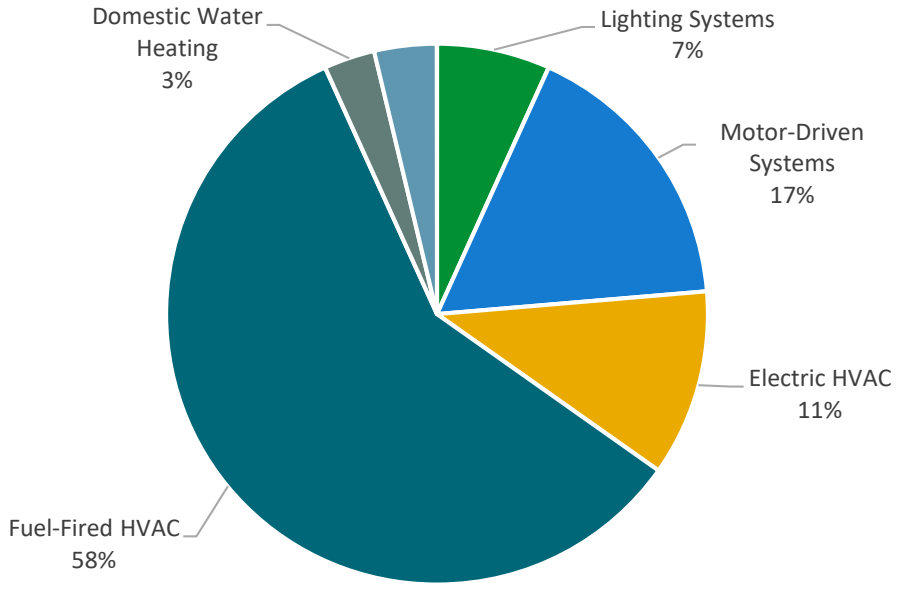


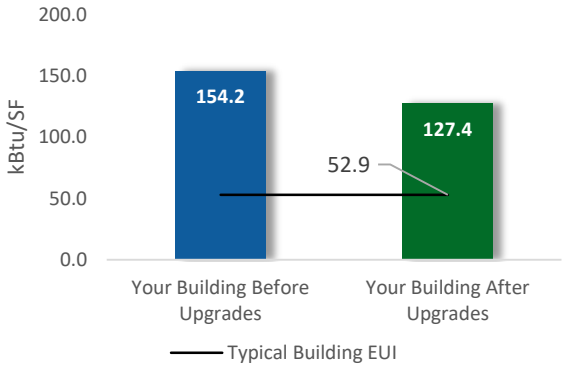
Figure 1 - Energy Use by System

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.

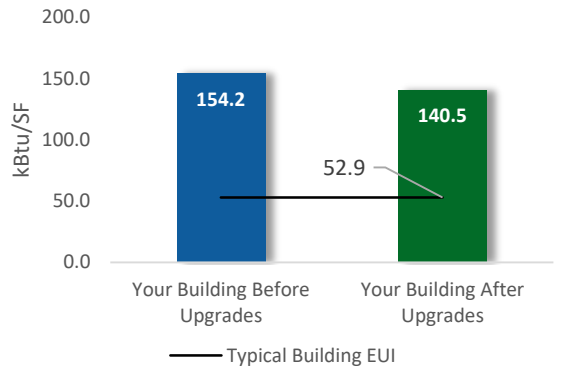
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$31,893
Potential Rebates & Incentives[1]	$1,060
Annual Cost Savings	$2,158
Annual Energy Savings	Electricity: 12,996 kWh Natural Gas: 348 Therms
Greenhouse Gas Emission Savings	9 Tons
Simple Payback	14.3 Years
Site Energy Savings (all utilities)	17%



Scenario 2: Cost Effective Package[2]

Installation Cost	$14,593
Potential Rebates & Incentives	$522
Annual Cost Savings	$1,485
Annual Energy Savings	Electricity: 10,285 kWh Natural Gas: 53 Therms
Greenhouse Gas Emission Savings	5 Tons
Simple Payback	9.5 Years
Site Energy Savings (all utilities)	9%



On-site Generation Potential

Photovoltaic	None
Combined Heat and Power	None

[1] Incentives are based on current SmartStart Prescriptive incentives. Other Program incentives may apply.

[2] 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 ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**261**	**0.0**	**0**	**$36**	**$179**	**$2**	**$177**	**4.9**	**258**
ECM 1	Retrofit Fixtures with LED Lamps	68	0.0	0	$10	$34	$2	$32	3.4	69
ECM 2	Install LED Exit Signs	193	0.0	0	$26	$145	$0	$145	5.5	189
Lighting Control Measures		**1,562**	**0.4**	**0**	**$214**	**$1,037**	**$120**	**$917**	**4.3**	**1,534**
ECM 3	Install Occupancy Sensor Lighting Controls	1,344	0.3	0	$184	$812	$120	$692	3.8	1,321
ECM 4	Install High/Low Lighting Controls	218	0.1	0	$30	$225	$0	$225	7.5	214
Variable Frequency Drive (VFD) Measures		**4,082**	**0.5**	**0**	**$568**	**$9,281**	**$0**	**$9,281**	**16.3**	**4,111**
ECM 5	Install VFDs on Chilled Water Pumps	2,102	0.4	0	$293	$3,261	$0	$3,261	11.1	2,117
ECM 6	Install VFDs on Heating Water Pumps	1,579	0.1	0	$220	$3,010	$0	$3,010	13.7	1,590
ECM 7	Install VFDs on Cooling Tower Fans	401	0.0	0	$56	$3,010	$0	$3,010	53.9	404
Electric Unitary HVAC Measures		**731**	**0.3**	**0**	**$102**	**$2,244**	**$138**	**$2,106**	**20.7**	**736**
ECM 8	Install High Efficiency Air Conditioning Units	731	0.3	0	$102	$2,244	$138	$2,106	20.7	736
Electric Chiller Replacement		**6,360**	**3.6**	**0**	**$885**	**$10,101**	**$400**	**$9,701**	**11.0**	**6,404**
ECM 9	Install High Efficiency Chillers	6,360	3.6	0	$885	$10,101	$400	$9,701	11.0	6,404
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**30**	**$296**	**$9,036**	**$400**	**$8,636**	**29.2**	**3,457**
ECM 10	Install High Efficiency Hot Water Boilers	0	0.0	30	$296	$9,036	$400	$8,636	29.2	3,457
Domestic Water Heating Upgrade		**0**	**0.0**	**6**	**$57**	**$14**	**$0**	**$14**	**0.3**	**667**
ECM 11	Install Low-Flow DHW Devices	0	0.0	6	$57	$14	$0	$14	0.3	667
TOTALS (COST EFFECTIVE MEASURES)		**10,285**	**4.4**	**5**	**$1,485**	**$14,593**	**$522**	**$14,071**	**9.5**	**10,980**
TOTALS (ALL MEASURES)		**12,996**	**4.8**	**35**	**$2,158**	**$31,893**	**$1,060**	**$30,833**	**14.3**	**17,167**

* - 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 2 – Evaluated Energy Improvements

For more detail on each evaluated energy improvement and a break out of cost-effective improvements, see **Section 4: Energy Conservation Measures**.

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	Retrofit Fixtures with LED Lamps	X	X	
ECM 2	Install LED Exit Signs		X	
ECM 3	Install Occupancy Sensor Lighting Controls		X	
ECM 4	Install High/Low Lighting Controls		X	
ECM 5	Install VFDs on Chilled Water Pumps		X	
ECM 6	Install VFDs on Hot Water Pumps		X	
ECM 7	Install VFDs on Cooling Tower Fans		X	
ECM 8	Install High Efficiency Electric AC	X	X	
ECM 9	Install High Efficiency Chillers	X		
ECM 10	Install High Efficiency Hot Water Boilers	X	X	
ECM 11	Install Low-Flow Domestic Hot Water Devices		X	

Figure 3 – Funding Options

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

	SmartStart Flexibility to install at your own pace	**Direct Install** Turnkey installation	**Pay for Performance** Whole building upgrades
Who should use it?	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.
How does it work?	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.
What are the Incentives?	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.
How do I participate?	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** 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 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 Central Office. This report provides information on how the office 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.

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

2.1 Site Overview

On April 10, 2019, TRC performed an energy audit at Central Office located in Ridgefield, New Jersey. TRC met with James Malaquias to review the office operations and help focus our investigation on specific energy-using systems.

Central Office is a one-story, 2,952 square foot building built in 1965. Spaces include offices, hallways, restrooms, storage spaces, and mechanical space.

Recent improvements include double-glazed windows and lighting fixtures changed to LED linear tubes.

2.2 Building Occupancy

The office is occupied year-round with an operating schedule as mentioned below. Typical weekday occupancy includes 11 full-time staff members.

Building Name	Weekday/Weekend	Operating Schedule
Central Office	Weekday	8:00 AM - 4:00 PM
	Weekend	No Operation

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel with a brick facade. The roof is pitched and covered with black membrane and in good condition.

Most of the windows are double-glazed with vinyl frames. The glass-to-frame seals are in good condition. The operable window weather seals are in good condition, showing no signs of air infiltration. Exterior doors have aluminum or aluminum framed glass and are in good condition.

Facade

Windows

Roof

Aluminum Exterior Doors

2.4 Lighting Systems

The primary interior lighting system uses 13- and 22-watt lamps in 2-, 3-, or 4-lamp LED linear tube fixtures. The lights are controlled partly using manual switches and occupancy sensors.

The exit signs are 16-watt fluorescent fixtures throughout the building. The facility has one exterior light fixture with 26-watt, 2-lamp compact fluorescent wall pack fixture controlled using photocells.

Interior lighting levels were generally sufficient.

Exterior Lighting Fixture

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators (UV) have supply fan motors, pneumatically controlled, and the system is original to the building. The UVs supply hot and chilled water to the zones.

Air Conditioners

The accounts payable office is cooled using a 1.5-ton split AC unit (York) with an EER of 9. The unit has passed its useful life and has been evaluated for replacement.

Split AC Unit

2.6 Heating Hot Water Systems

The site is heated by one gas-fired, non-condensing Weil McLain hot water boiler with an output capacity of 247 MBh and heating efficiency of 78%. The hot water from the boiler is circulated throughout the building using a constant speed 1 hp hot water pump and distributed to the zones by unit ventilators through a 2-pipe system.

The boiler is original to the building and has been evaluated for replacement. The temperature in the building is adjusted by the site contact between 68°F and 72°F.

Boiler

Heating Hot Water Pump

2.7 Chilled Water Systems

The building is cooled using an Acme water cooled chiller. The nameplate information was not available to the auditor. For analytical purposes, the capacity of the chiller is assumed to be 10-ton with a 1 hp cooling tower fan. The chilled water is circulated throughout the building using a constant speed 2 hp pump and distributed through the unit ventilators.

The chiller is old and original to the building, and it has been evaluated for replacement.

2.8 Domestic Hot Water

Hot water is produced with a 40-gallon 38 MBh gas-fired storage water heater with a 78% efficiency. Hot water is distributed to the end uses through a fractional horse power circulation pump. Installed in 2010, the unit is in good condition and well maintained.

Domestic Hot Water System

2.9 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume approximately 4% percent of total building energy use. This is lower than a typical building.

You seem to already be doing a great job managing your electrical plug loads. This report makes additional suggestions for ECMs in this area, as well as Energy Efficient Best Practices.

There are approximately 17 computer work stations throughout the office. Plug loads throughout the building include general café and office equipment.

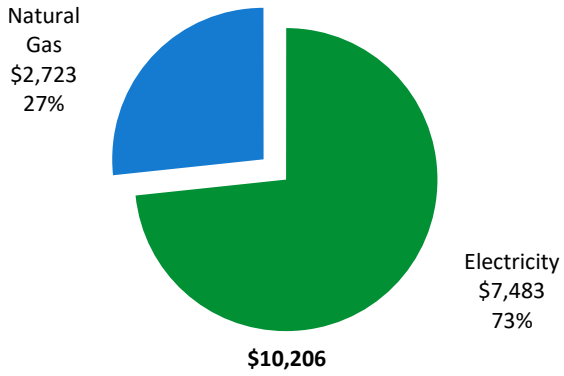
2.10 Water-Using Systems

Faucet flow rates are at 2.2 gallons per minute (gpm) or higher. Toilets are rated at 1.6 gallons per flush (gpf) and urinals are rated at 1.0 gpf. Two of the restrooms are evaluated for replacement of low-flow fixtures.

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	**Usage**	**Cost**
Electricity	53,754 kWh	$7,483
Natural Gas	2,719 Therms	$2,723
Total		**$10,206**



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.

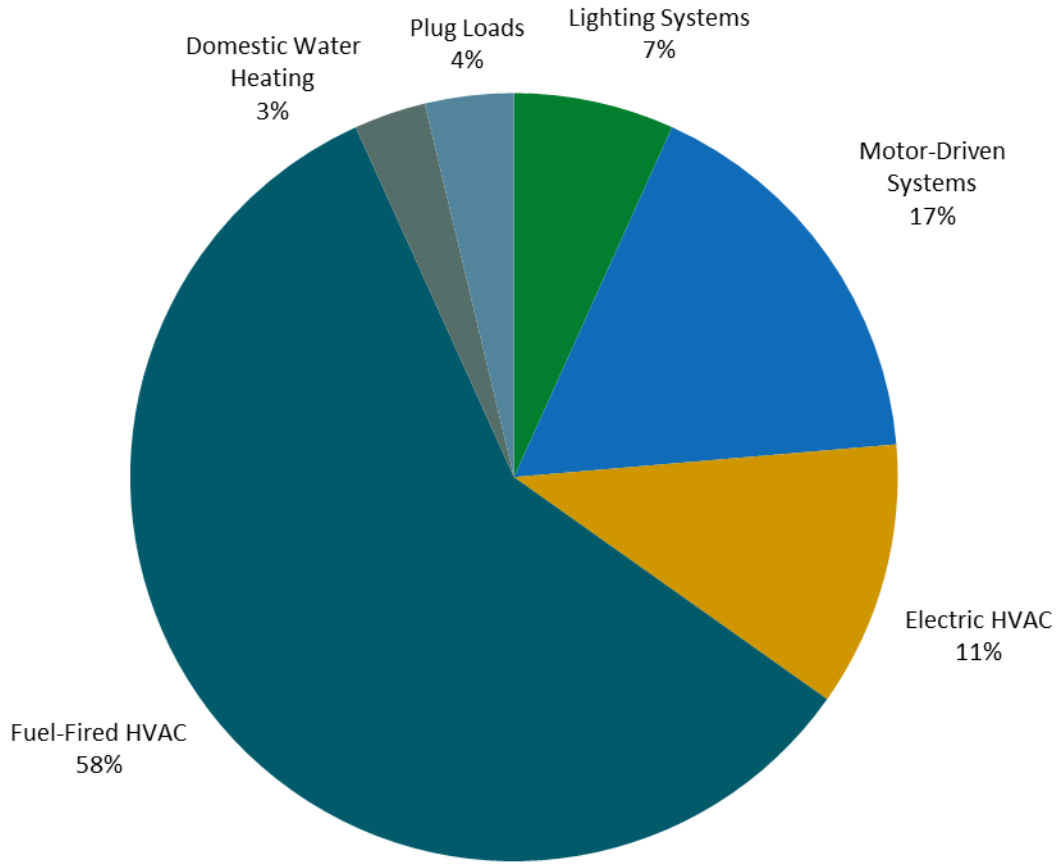
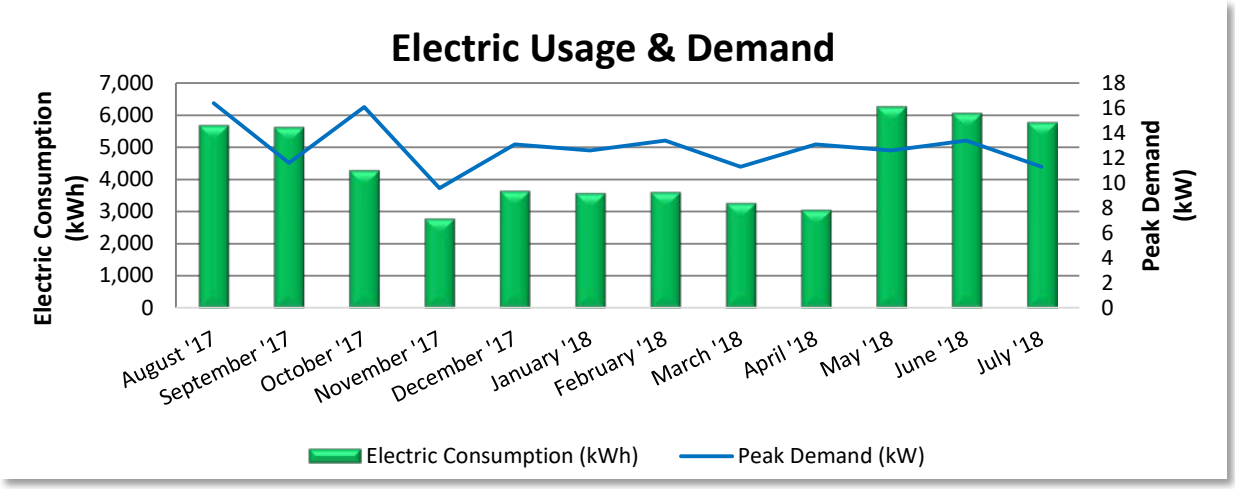


Figure 5 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class BPL, with electric production provided by Direct Energy, a third-party supplier.



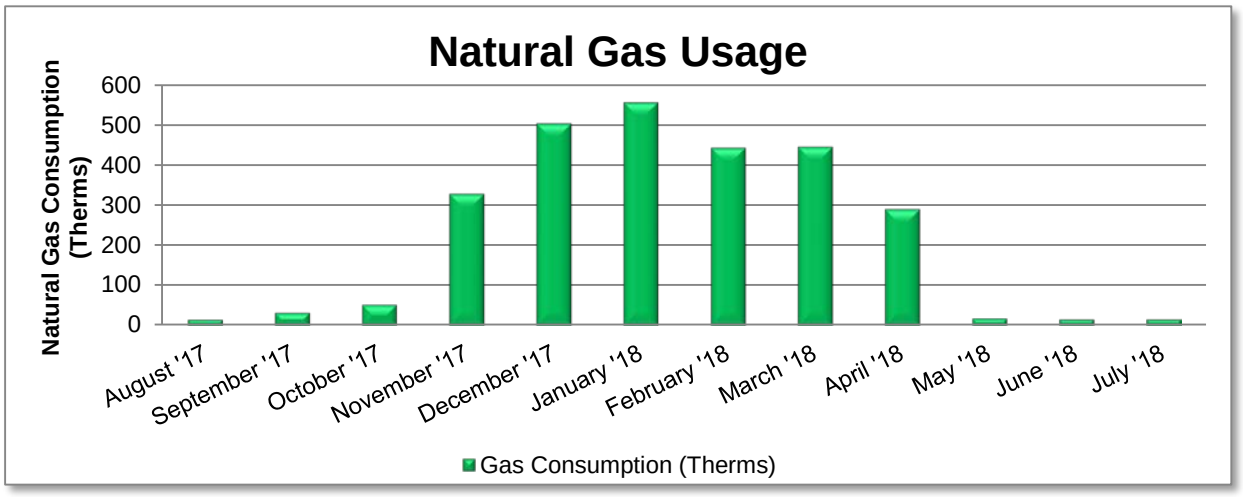
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
8/31/17	30	5,706	16	$74	$859
10/2/17	32	5,652	12	$53	$778
10/31/17	29	4,302	16	$74	$539
12/1/17	31	2,799	10	$44	$462
1/3/18	33	3,672	13	$60	$571
2/1/18	29	3,600	13	$58	$439
3/5/18	32	3,627	13	$61	$446
4/4/18	30	3,294	11	$52	$401
5/3/18	29	3,069	13	$60	$392
6/4/18	32	6,300	13	$58	$741
7/3/18	29	6,084	13	$61	$917
8/2/18	30	5,796	11	$52	$959
Totals	**366**	**53,901**	**16.4**	**$705**	**$7,503**
Annual	**365**	**53,754**	**16.4**	**$704**	**$7,483**

Notes:

- Peak demand of 16 kW occurred in both August and October of '17.
- The average electric cost over the past 12 months was $0.139/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

PSE&G delivers natural gas under rate class GSG (HTG), with natural gas supply provided by Direct Energy, a third-party supplier.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
8/31/17	30	15	$25
10/2/17	32	32	$52
10/31/17	29	52	$57
12/1/17	31	329	$323
1/3/18	33	506	$506
2/1/18	29	559	$544
3/5/18	32	445	$469
4/4/18	30	447	$431
5/3/18	29	291	$251
6/4/18	32	18	$27
7/3/18	29	16	$25
8/2/18	30	16	$22
Totals	**366**	**2,726**	**$2,731**
Annual	**365**	**2,719**	**$2,723**

Notes:

- The average gas cost for the past 12 months is $1.002/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.

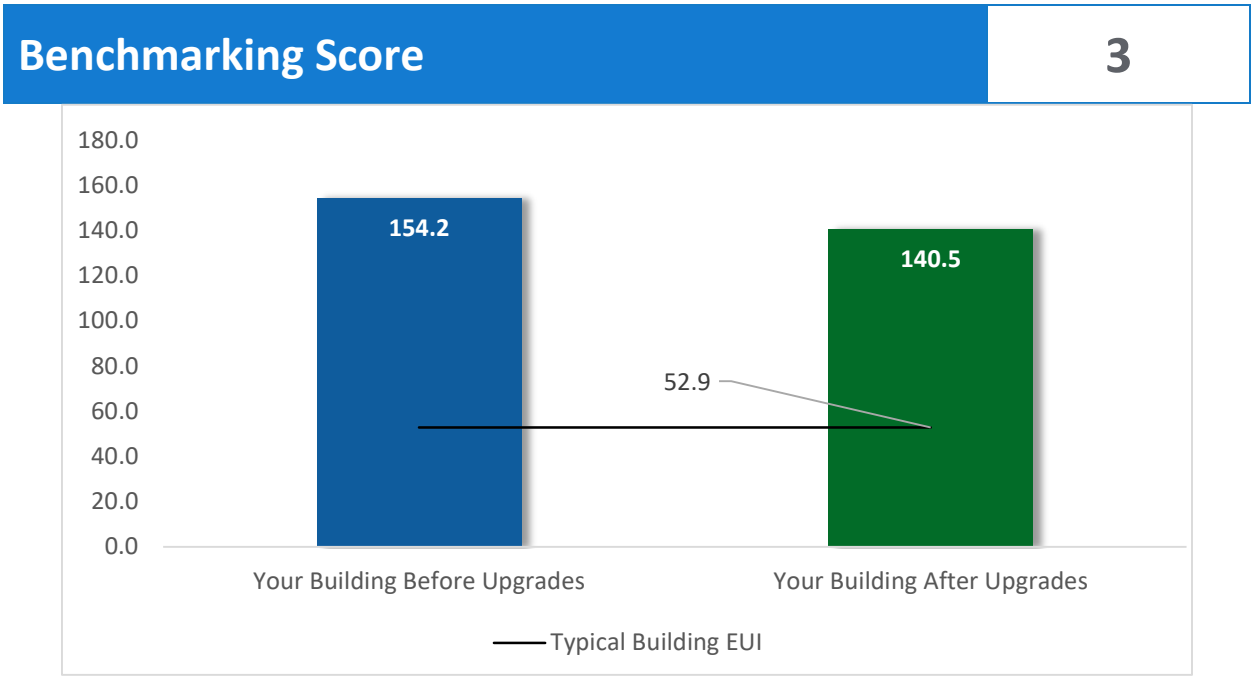


Figure 6 - Energy Use Intensity Comparison

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 as 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[3].

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

4 ENERGY CONSERVATION MEASURES

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 *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*, which is 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.

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.

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**261**	**0.0**	**0**	**$36**	**$179**	**$2**	**$177**	**4.9**	**258**
ECM 1	Retrofit Fixtures with LED Lamps	68	0.0	0	$10	$34	$2	$32	3.4	69
ECM 2	Install LED Exit Signs	193	0.0	0	$26	$145	$0	$145	5.5	189
Lighting Control Measures		**1,562**	**0.4**	**0**	**$214**	**$1,037**	**$120**	**$917**	**4.3**	**1,534**
ECM 3	Install Occupancy Sensor Lighting Controls	1,344	0.3	0	$184	$812	$120	$692	3.8	1,321
ECM 4	Install High/Low Lighting Controls	218	0.1	0	$30	$225	$0	$225	7.5	214
Variable Frequency Drive (VFD) Measures		**4,082**	**0.5**	**0**	**$568**	**$9,281**	**$0**	**$9,281**	**16.3**	**4,111**
ECM 5	Install VFDs on Chilled Water Pumps	2,102	0.4	0	$293	$3,261	$0	$3,261	11.1	2,117
ECM 6	Install VFDs on Heating Water Pumps	1,579	0.1	0	$220	$3,010	$0	$3,010	13.7	1,590
ECM 7	Install VFDs on Cooling Tower Fans	401	0.0	0	$56	$3,010	$0	$3,010	53.9	404
Electric Unitary HVAC Measures		**731**	**0.3**	**0**	**$102**	**$2,244**	**$138**	**$2,106**	**20.7**	**736**
ECM 8	Install High Efficiency Air Conditioning Units	731	0.3	0	$102	$2,244	$138	$2,106	20.7	736
Electric Chiller Replacement		**6,360**	**3.6**	**0**	**$885**	**$10,101**	**$400**	**$9,701**	**11.0**	**6,404**
ECM 9	Install High Efficiency Chillers	6,360	3.6	0	$885	$10,101	$400	$9,701	11.0	6,404
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**30**	**$296**	**$9,036**	**$400**	**$8,636**	**29.2**	**3,457**
ECM 10	Install High Efficiency Hot Water Boilers	0	0.0	30	$296	$9,036	$400	$8,636	29.2	3,457
Domestic Water Heating Upgrade		**0**	**0.0**	**6**	**$57**	**$14**	**$0**	**$14**	**0.3**	**667**
ECM 11	Install Low-Flow DHW Devices	0	0.0	6	$57	$14	$0	$14	0.3	667
TOTALS		**12,996**	**4.8**	**35**	**$2,158**	**$31,893**	**$1,060**	**$30,833**	**14.3**	**17,167**

* - 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 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_2e Emissions Reduction (lbs)
Lighting Upgrades		**261**	**0.0**	**0**	**$36**	**$179**	**$2**	**$177**	**4.9**	**258**
ECM 1	Retrofit Fixtures with LED Lamps	68	0.0	0	$10	$34	$2	$32	3.4	69
ECM 2	Install LED Exit Signs	193	0.0	0	$26	$145	$0	$145	5.5	189
Lighting Control Measures		**1,562**	**0.4**	**0**	**$214**	**$1,037**	**$120**	**$917**	**4.3**	**1,534**
ECM 3	Install Occupancy Sensor Lighting Controls	1,344	0.3	0	$184	$812	$120	$692	3.8	1,321
ECM 4	Install High/Low Lighting Controls	218	0.1	0	$30	$225	$0	$225	7.5	214
Variable Frequency Drive (VFD) Measures		**2,102**	**0.4**	**0**	**$293**	**$3,261**	**$0**	**$3,261**	**11.1**	**2,117**
ECM 5	Install VFDs on Chilled Water Pumps	2,102	0.4	0	$293	$3,261	$0	$3,261	11.1	2,117
Electric Chiller Replacement		**6,360**	**3.6**	**0**	**$885**	**$10,101**	**$400**	**$9,701**	**11.0**	**6,404**
ECM 9	Install High Efficiency Chillers	6,360	3.6	0	$885	$10,101	$400	$9,701	11.0	6,404
Domestic Water Heating Upgrade		**0**	**0.0**	**6**	**$57**	**$14**	**$0**	**$14**	**0.3**	**667**
ECM 11	Install Low-Flow DHW Devices	0	0.0	6	$57	$14	$0	$14	0.3	667
TOTALS		**10,285**	**4.4**	**5**	**$1,485**	**$14,593**	**$522**	**$14,071**	**9.5**	**10,980**

* - 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_2e Emissions Reduction (lbs)
Lighting Upgrades		**261**	**0.0**	**0**	**$36**	**$179**	**$2**	**$177**	**4.9**	**258**
ECM 1	Retrofit Fixtures with LED Lamps	68	0.0	0	$10	$34	$2	$32	3.4	69
ECM 2	Install LED Exit Signs	193	0.0	0	$26	$145	$0	$145	5.5	189

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 is proposed, we suggest converting all fixtures of a specific lighting type (e.g. linear fluorescent) to LED lamps to minimize the number of lamp types in use at the office, which should help reduce future maintenance costs.

ECM 1: Retrofit Fixtures with LED Lamps

Replace CFL 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 while providing 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: exterior light fixture.

ECM 2: Install LED Exit Signs

Replace compact fluorescent exit signs with LED exit signs. LED exit signs require virtually no maintenance and have life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output. Maintenance savings and improved reliability may also be achieved, as the longer-lasting LED lamps will not need to be replaced as often as the existing lamps.

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_2e Emissions Reduction (lbs)
Lighting Control Measures		**1,562**	**0.4**	**0**	**$214**	**$1,037**	**$120**	**$917**	**4.3**	**1,534**
ECM 3	Install Occupancy Sensor Lighting Controls	1,344	0.3	0	$184	$812	$120	$692	3.8	1,321
ECM 4	Install High/Low Lighting Controls	218	0.1	0	$30	$225	$0	$225	7.5	214

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 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, 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: offices.

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.

The controller lowers the light level by dimming the fixture output. Therefore, the controlled fixtures need to have a dimmable ballast or driver. This will need to be taken into account when selecting retrofit lamps and bulbs for the areas proposed for high/low control.

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

Affected building areas: hallways.

4.3 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_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**4,082**	**0.5**	**0**	**$568**	**$9,281**	**$0**	**$9,281**	**16.3**	**4,111**
ECM 5	Install VFDs on Chilled Water Pumps	2,102	0.4	0	$293	$3,261	$0	$3,261	11.1	2,117
ECM 6	Install VFDs on Heating Water Pumps	1,579	0.1	0	$220	$3,010	$0	$3,010	13.7	1,590
ECM 7	Install VFDs on Cooling Tower Fans	401	0.0	0	$56	$3,010	$0	$3,010	53.9	404

Variable frequency drives (VFDs) 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.

ECM 5: Install VFDs on Chilled Water Pumps

Install VFDs to control the chilled water pump. Two-way valves must serve the chilled water coils being served and the chilled water loop must have a differential pressure sensor installed. If a bypass leg or three-way valves are used in the chilled water distribution, they will need to be modified when this measure is implemented. As the chilled water valves close, the differential pressure increases, and the VFD modulates the pump speed to maintain a differential pressure setpoint.

For systems with variable chilled water flow through the chiller, the minimum flow to prevent the chiller from tripping off will need to be determined during the final project design. The control system should be programmed to maintain the minimum flow through the chiller and to prevent pump cavitation.

Energy savings result from reducing the pump motor speed (and power) as chilled water valves close. The magnitude of energy savings is based on the estimated amount of time that the system operates at reduced loads.

Affected pumps: two 2 hp chilled water pump.

ECM 6: Install VFDs on Heating Water Pumps

Install VFDs to control the heating water pump. Two-way valves must serve the hot water coils and the hot water loop must have a differential pressure sensor installed. If a bypass leg or three-way valves are used in the hot water distribution, they will need to be modified when this measure is implemented. As the hot water valves close, the differential pressure increases, and the VFD modulates the pump speed to maintain a differential pressure setpoint.

Energy savings result from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

Affected pumps: 1 hp hot water pump.

ECM 7: Install VFDs on Cooling Tower Fans

Install a VFD to control the cooling tower fan motor. The VFD will allow the cooling tower fan to operate at the minimum speed necessary to maintain the temperature of the condenser water returning to the chiller.

Energy savings result from reducing fan speed (and power) when there is a reduced load on the chiller and outside air wet bulb temperatures are depressed. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.4 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_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**731**	**0.3**	**0**	**$102**	**$2,244**	**$138**	**$2,106**	**20.7**	**736**
ECM 8	Install High Efficiency Air Conditioning Units	731	0.3	0	$102	$2,244	$138	$2,106	20.7	736

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 the office 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 split AC unit serving the accounts payable office is eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 8: Install High-Efficiency Air Conditioning Units

Replace standard efficiency split system air conditioning unit with a high-efficiency unit. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high-efficiency unit, average cooling load, and estimated annual operating hours.

4.5 Electric Chillers

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Chiller Replacement		**6,360**	**3.6**	**0**	**$885**	**$10,101**	**$400**	**$9,701**	**11.0**	**6,404**
ECM 9	Install High Efficiency Chillers	6,360	3.6	0	$885	$10,101	$400	$9,701	11.0	6,404

ECM 9: Install High-Efficiency Chillers

Replace the older inefficient electric chiller with a new high-efficiency chiller. The type of chiller to be installed depends on the magnitude of the cooling load and variability of the cooling load profile, for example:

- Positive displacement chillers are usually under 600 tons of cooling capacity and centrifugal chillers generally start at 150 tons of cooling capacity.
- Constant speed chillers should be used to meet cooling loads with little or no variation while variable speed chillers are more efficient for variable cooling load profiles.
- Water cooled chillers are more efficient than air cooled chillers but require cooling towers and additional pumps to circulate the cooling water.
- In any given size range, variable speed chillers tend to have better partial load efficiency, but lower full load efficiency than constant speed chillers.

Energy savings result from the improvement in chiller efficiency and matching the right type of chiller to the cooling load. The energy savings are calculated based on the cooling capacity of the new chiller, improvement in efficiency compared with the base case equipment, cooling load profile, and estimated annual operating hours of the chiller before and after the upgrade.

For the purposes of this analysis, we evaluated the replacement of the chiller on a one-for-one basis with equipment of the same capacity. We recommend that you work with your design team to select chillers that are sized appropriately for the cooling load at the office. In some cases, the plant energy use can be reduced by selecting multiple chillers that match the facility load profile rather than one or two large chillers. This can also improve the chiller plant reliability through increased redundancy. Energy savings are maximized by proper selection of new equipment based on the cooling load profile.

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_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**30**	**$296**	**$9,036**	**$400**	**$8,636**	**29.2**	**3,457**
ECM 10	Install High Efficiency Hot Water Boilers	0	0.0	30	$296	$9,036	$400	$8,636	29.2	3,457

ECM 10: Install High-Efficiency Hot Water Boilers

Replace the older inefficient hot water boiler with a high-efficiency hot water boiler. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

The most notable efficiency improvement would be condensing hydronic boilers, which can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high-efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130°F. Therefore, condensing hydronic boilers are evaluated when the return water temperature is less than 130°F during most of the operating hours.

For the purposes of this analysis, we evaluated the replacement of the boiler on a one-for-one basis with equipment of the same capacity. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load at the office. In many cases, installing multiple modular boilers rather than one or two large boilers will result in higher overall plant efficiency while providing additional system redundancy.

Replacing the boiler has a long payback and may not be justifiable based simply on energy considerations. However, the boiler has reached the end of normal useful life. Typically, the marginal cost of purchasing high-efficiency boilers can be justified by the marginal savings from the improved efficiency. When the boiler is eventually replaced, consider purchasing boilers that exceed the minimum efficiency required by building codes. We also recommend working with your mechanical design team to determine whether the heating system can operate with return water temperatures below 130°F, which would allow the use of condensing boilers.

4.7 Domestic Water 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_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**6**	**$57**	**$14**	**$0**	**$14**	**0.3**	**667**
ECM 11	Install Low-Flow DHW Devices	0	0.0	6	$57	$14	$0	$14	0.3	667

ECM 11: Install Low-Flow DHW Devices

Install low-flow devices to reduce overall hot water demand. The following low-flow devices are recommended to reduce hot water usage:

Device	Flow Rate
Faucet aerators (lavatory)	0.5 gpm
Faucet aerator (kitchen)	1.5 gpm
Showerhead	2.0 gpm
Pre-rinse spray valve (kitchen)	1.28 gpm

Low-flow devices reduce the overall water flow from the fixture while still providing adequate pressure for washing. Pre-rinse spray valves (PRSVs)—often used in commercial and institutional kitchens—remove food waste from dishes prior to dishwashing.

Additional cost savings may result from reduced water usage.

5 ENERGY EFFICIENT BEST PRACTICES

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.[4] Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Thermostat Schedules and Temperature Resets

Use thermostat setback temperatures and schedules to reduce heating and cooling energy use during periods of low or no occupancy. 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 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.

Chiller Maintenance

Service chillers regularly to keep them operating properly. Chillers are responsible for a substantial portion of a commercial building's overall energy usage and when they do not work well, there is usually a noticeable increase in energy bills and increased occupant complaints. Regular diagnostics and service can save five to ten percent of the cost of operating your chiller. If you already have a maintenance contract in place, your existing service company should be able to provide these services.

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.

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

[4] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager

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 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[5] or download a copy of EPA's "WaterSense™ at Work: Best Management Practices for Commercial and Institutional Facilities"[6] 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 office 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.

[5] https://www.epa.gov/watersense

[6] 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 office'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, 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 the office. 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.

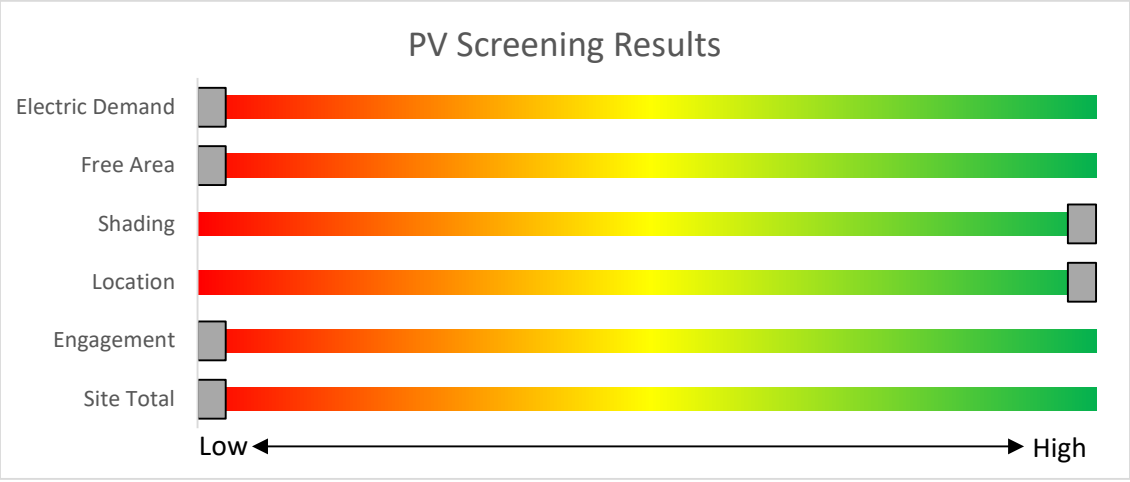
6.1 Solar Photovoltaic

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 office's electric demand, size and location of free area, and shading elements shows that the facility has no potential for installing a PV array.

This facility does not appear to 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 sustained electric demand and sufficient 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.



Potential	None	
System Potential	13	kW DC STC
Electric Generation	15,488	kWh/yr
Displaced Cost	$2,160	/yr
Installed Cost	$33,800	

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 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 New Jersey**: www.njcleanenergy.com/whysolar
- **New Jersey Solar Market FAQs**: www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the New Jersey Market**: 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 office 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.

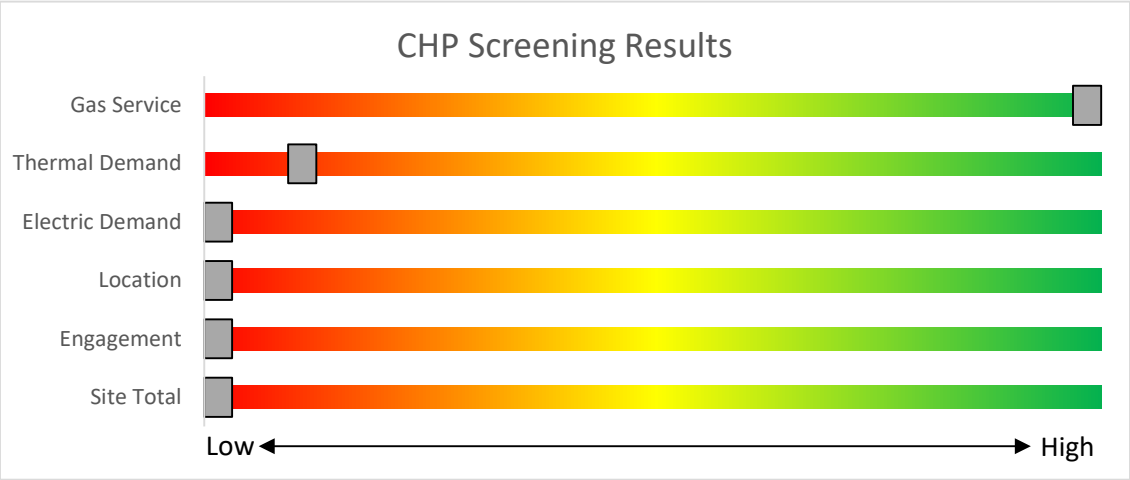
CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be 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 ofice'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 no 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. The lack of gas service, 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.



Potential	None	
System Type	None	
System Potential	0	kW
Electric Generation	2,146	kWh/yr
Thermal Generation	53,006	MBtu/yr
Displaced Cost	-$142	/yr
Installed Cost	$4,000	

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/

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.

	SmartStart *Flexibility to install at your own pace*	**Direct Install** *Turnkey installation*	**Pay for Performance** *Whole building upgrades*
Who should use it?	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.
How does it work?	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.
What are the Incentives?	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.
How do I participate?	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** for program details, applications, and to contact a qualified contractor.			

7.1 SmartStart

SmartStart offers incentives for installing prescriptive and custom energy efficiency measures at the office. 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 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 Direct Install website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

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

7.3 Pay for Performance - Existing Buildings

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 that results in at least 15% source energy savings, and lighting cannot make up the majority of the savings. P4P is a generally a good option for medium-to-large sized facilities looking to implement as many measures as possible under a single project to achieve deep energy savings. This program has an added benefit of addressing measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program loan also use this program.

The scope of work presented in this audit report does not quite meet the requirements of the current P4P program. However, due to the size of the facility and existing conditions, should additional measures be identified at a later point in time, for example through further evaluation or the Energy Savings Improvement Program process, this facility could potentially meet the requirements necessary to participate in the P4P program.

Incentives

Incentives are based on estimated and achieved energy savings ranging from $0.18-$0.22/kWh and $1.80-$2.50/therm, capped at the lesser of 50% total project cost, or $1 million per electric account and $1 million per natural gas account, per fiscal year, not to exceed $2 million per project. An incentive of $0.15/square foot is also available to offset the cost of developing the Energy Reduction Plan (see below) contingent on the project moving forward with measure installation.

How to Participate

Contact one of the pre-approved consultants and contractors (“Partners”). Under direct contract to you, they will help further evaluate the measures identified in this report through development of the energy reduction plan), assist you in implementing selected measures, and verify actual savings one year after the installation. Your Partner will also help you apply for incentives.

Approval of the final scope of work is required by the program prior to installation. Installation can be done by the contractor of your choice (some P4P Partners are also contractors) or by internal staff, but the Partner remains involved throughout construction to ensure compliance with the program requirements.

Detailed program descriptions, instructions for applying, applications and list of Partners can be found at: www.njcleanenergy.com/P4P.

7.4 Combined Heat and Power

The Combined Heat & Power (CHP) program provides incentives for eligible CHP or waste heat to power (WHP) projects. Eligible CHP or WHP projects must achieve an annual system efficiency of at least 65% (lower heating value, or LHV), based on total energy input and total utilized energy output. Mechanical energy may be included in the efficiency evaluation.

Incentives

Eligible Technologies	Size (Installed Rated Capacity)[1]	Incentive ($/kW)	% of Total Cost Cap per Project[3]	$ Cap per Project[3]
Powered by non-renewable or renewable fuel source[4]	≤500 kW	$2,000	30-40%[2]	$2 million
Gas Internal Combustion Engine	>500 kW - 1 MW	$1,000		
Gas Combustion Turbine	> 1 MW - 3 MW	$550	30%	$3 million
Microturbine Fuel Cells with Heat Recovery	>3 MW	$350		
Waste Heat to Power*	<1 MW	$1,000	30%	$2 million
	> 1MW	$500		$3 million

*Waste Heat to Power: Powered by non-renewable fuel source, heat recovery or other mechanical recovery from existing equipment utilizing new electric generation equipment (e.g. steam turbine).

Check the NJCEP website for details on program availability, current incentive levels, and requirements.

How to Participate

You work with a qualified developer or consulting firm to complete the CHP application. Once the application is approved the project can be installed. Information about the CHP program can be found at: www.njcleanenergy.com/CHP.

7.5 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.

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.

7.6 SREC Registration Program

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

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

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

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar Renewable Portfolio Standard. Purchasing SRECs can help them meet those requirements. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period fluctuates depending on supply and demand.

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

8 Energy Purchasing and Procurement Strategies

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[7].

8.2 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[8].

[7] www.state.nj.us/bpu/commercial/shopping.html.

[8] 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
Lobby/Entry	3	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	S	26	3,575		None	No	3	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	3,575	0.0	0	0	$0	$0	$0	0.0
Copy room	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	S	26	2,467		None	No	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	2,467	0.0	0	0	$0	$0	$0	0.0
Storage	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,575	3	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,467	0.0	141	0	$19	$116	$0	6.0
Office 1	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,575	3	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,467	0.0	106	0	$15	$116	$20	6.6
Office 2	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	S	58	2,467		None	No	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,467	0.0	0	0	$0	$0	$0	0.0
Office 3	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,575	3	None	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,467	0.1	424	0	$58	$116	$20	1.7
Office 3	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	S	26	3,575		None	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	3,575	0.0	0	0	$0	$0	$0	0.0
Ladies room	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	2,467		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,467	0.0	0	0	$0	$0	$0	0.0
Men's room	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	2,467		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,467	0.0	0	0	$0	$0	$0	0.0
Hallway	7	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	S	26	3,575	4	None	Yes	7	LED - Linear Tubes: (3) 2' Lamps	High/Low Control	26	2,467	0.1	218	0	$30	$225	$0	7.5
Payroll	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	3,575	3	None	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,467	0.0	159	0	$22	$116	$20	4.4
IT room	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	3,575	3	None	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,467	0.1	283	0	$39	$116	$20	2.5
Superintendent	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	S	58	2,467		None	No	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,467	0.0	0	0	$0	$0	$0	0.0
Superintendent	8	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	S	34	2,467		None	No	8	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	2,467	0.0	0	0	$0	$0	$0	0.0
Secretary	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	S	58	2,467		None	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,467	0.0	0	0	$0	$0	$0	0.0
Office	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	S	26	3,575	3	None	Yes	4	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	2,467	0.0	124	0	$17	$116	$20	5.6
Office	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	3,575	3	None	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,467	0.0	106	0	$15	$116	$20	6.6
Exit	2	Exit Signs: Fluorescent	None		16	8,760	2	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	193	0	$26	$145	$0	5.5
Boiler room	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	3,575		None	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,575	0.0	0	0	$0	$0	$0	0.0
Exterior	1	Compact Fluorescent: Screw-in 2 Lamps	Photocell		52	4,380	1	Relamp	No	1	LED Lamps: Screw-in 2 lamps	Photocell	36	4,380	0.0	68	0	$10	$34	$2	3.4

Motor Inventory & Recommendations

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	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
Various spaces	Various spaces	15	Supply Fan	0.2	60.0%	No	B	4,000		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Grounds	Chiller	1	Cooling Tower Fan	1.0	80.0%	No	B	2,745	7	No	85.5%	Yes	1	0.0	401	0	$56	$3,010	$0	53.9
Boiler room	Boiler	1	Heating Hot Water Pump	1.0	82.5%	No	B	4,380	6	No	85.5%	Yes	1	0.1	1,579	0	$220	$3,010	$0	13.7
Boiler room	Chiller	1	Chilled Water Pump	2.0	84.0%	No	B	3,000	5	No	86.5%	Yes	1	0.4	2,102	0	$293	$3,261	$0	11.1
Roof	Central office	3	Exhaust Fan	0.3	60.0%	No		4,000		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0

Electric HVAC Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (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
Grounds	Accounts payable	1	Split-System AC	1.50		B	8	Yes	1	Split-System AC	1.50		14.00		0.3	731	0	$102	$2,244	$138	20.7

Electric Chiller Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Remaining Useful Life	ECM #	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	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
Grounds	All building	1	Water-Cooled Screw Chiller	10.00	B	9	Yes	1	Water-Cooled Screw Chiller	Variable	10.00	0.78	0.49	3.6	6,360	0	$885	$10,101	$400	11.0

Fuel Heating Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	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	Boiler room	1	Non-Condensing Hot Water Boiler	247.00	B	10	Yes	1	Non-Condensing Hot Water Boiler	247.00	85.00%	AFUE	0.0	0	30	$296	$9,036	$400	29.2

DHW Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	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	Restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	11	2	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	6	$57	$14	$0	0.3

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Central office	17	Desktop Computer	145.0	Yes
Central office	3	Printer - Small	60.0	Yes
Central office	2	Printer - medium	80.0	Yes
Central office	1	Printer - large	200.0	Yes
Central office	1	Smart board	5.0	Yes

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

3

ENERGY STAR® Score[1]

Central Office

Primary Property Type: Office
Gross Floor Area (ft²): 2,952
Built: 1965

For Year Ending: July 31, 2018
Date Generated: May 20, 2019

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Central Office 555 Chestnut Street Ridgefield, New Jersey 07657	Ridgefield Board of Education 555 Chestnut Street Bergen, NJ 7657 (____)____-_____	Julyana Ortiz 555 Chestnut Street Bergen, NJ 7657 201-945-7747 JOrtiz@ridgefieldschools.com

Property ID: 6787872

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
191.2 kBtu/ft²

Source EUI
373.6 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	272,604 (48%)
Electric - Grid (kBtu)	291,682 (52%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	82.8
National Median Source EUI (kBtu/ft²)	161.9
% Diff from National Median Source EUI	131%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	44

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
Blended Rate	Used to calculate fiscal savings associated with measures. 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.
Btu	*British thermal unit*: a unit of energy equal to the amount of heat required to increase the temperature of one pound of water by one-degree Fahrenheit.
CHP	*Combined heat and power*. Also referred to as cogeneration.
COP	*Coefficient of performance*: a measure of efficiency in terms of useful energy delivered divided by total energy input.
Demand Response	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.
DCV	*Demand control ventilation*: a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
US DOE	*United States Department of Energy*
EC Motor	*Electronically commutated motor*
ECM	*Energy conservation measure*
EER	*Energy efficiency ratio*: a measure of efficiency in terms of cooling energy provided divided by electric input.
EUI	*Energy Use Intensity:* measures energy consumption per square foot and is a standard metric for comparing buildings' energy performance.
Energy Efficiency	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 the operation of energy use systems. Unlike conservation, which involves some reduction of service, energy efficiency provides energy reductions without sacrifice of service.
ENERGY STAR®	ENERGY STAR® is the government-backed symbol for energy efficiency. The ENERGY STAR® program is managed by the EPA.
EPA	*United States Environmental Protection Agency*
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
GHG	*Greenhouse gas:* gases that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.
gpf	*Gallons per flush*

gpm	*Gallon per minute*
HID	*High intensity discharge:* high-output lighting lamps such as high-pressure sodium, metal halide, and mercury vapor.
hp	*Horsepower*
HPS	*High-pressure sodium*: a type of HID lamp.
HSPF	*Heating seasonal performance factor:* a measure of efficiency typically applied to heat pumps. Heating energy provided divided by seasonal energy input.
HVAC	*Heating, ventilating, and air conditioning*
IHP 2014	US DOE Integral Horsepower rule. The current ruling regarding required electric motor efficiency.
IPLV	*Integrated part load value:* a measure of the part load efficiency usually applied to chillers.
kBtu	One thousand British thermal units
kW	*Kilowatt*: equal to 1,000 Watts.
kWh	*Kilowatt-hour*: 1,000 Watts of power expended over one hour.
LED	*Light emitting diode*: a high-efficiency source of light with a long lamp life.
LGEA	*Local Government Energy Audit*
Load	The total power a building or system is using at any given time.
Measure	A single activity, or installation of a single type of equipment, that is implemented in a building system to reduce total energy consumption.
MH	*Metal halide*: a type of HID lamp.
MBh	*Thousand Btu per hour*
MBtu	*One thousand British thermal units*
MMBtu	*One million British thermal units*
MV	*Mercury Vapor:* a type of HID lamp.
NJBPU	*New Jersey Board of Public Utilities*
NJCEP	*New Jersey's Clean Energy Program:* NJCEP is a statewide program that offers financial incentives, programs and services for New Jersey residents, business owners and local governments to help them save energy, money and the environment.
psig	Pounds per square inch gauge
Plug Load	Refers to the amount of power used in a space by products that are powered by means of an ordinary AC plug.
PV	*Photovoltaic:* refers to an electronic device capable of converting incident light directly into electricity (direct current).

SEER	*Seasonal energy efficiency ratio:* a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	*Statement of energy performance:* a summary document from the ENERGY STAR® Portfolio Manager®.
Simple Payback	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
SREC	*Solar renewable energy credit*: a credit you can earn from the state for energy produced from a photovoltaic array.
T5, T8, T12	A reference to a linear lamp diameter. The number represents increments of 1/8th of an inch.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
therm	100,000 Btu. Typically used as a measure of natural gas consumption.
tons	A unit of cooling capacity equal to 12,000 Btu/hr.
Turnkey	Provision of a complete product or service that is ready for immediate use
VAV	*Variable air volume*
VFD	*Variable frequency drive*: a controller used to vary the speed of an electric motor.
WaterSense™	The symbol for water efficiency. The WaterSense™ program is managed by the EPA.
Watt (W)	Unit of power commonly used to measure electricity use.