Local Government Energy Audit Report

Youth House

July 29, 2020

Prepared for:

Mercer County

1430 Parkside Ave

Ewing, New Jersey 08638

Prepared by:

TRC

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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 reviewed the energy conservation measures and estimates of energy savings 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. Cost estimates include material and labor pricing associated with installation of primary recommended equipment only. Cost estimates do not include demolition or removal of hazardous waste. 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.

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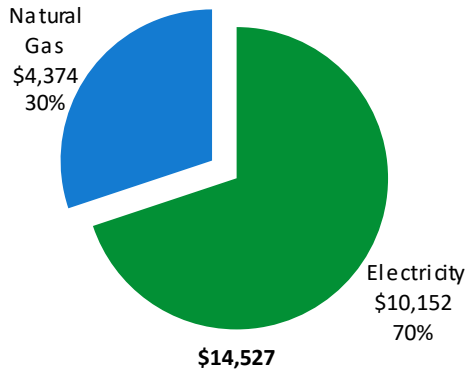
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Youth House. 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 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: $14,527 Electricity: 64,480 kWh Natural Gas: 4,599 Therms	
ENERGY STAR® Benchmarking Score	N/A *(1-100 scale)*	A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.

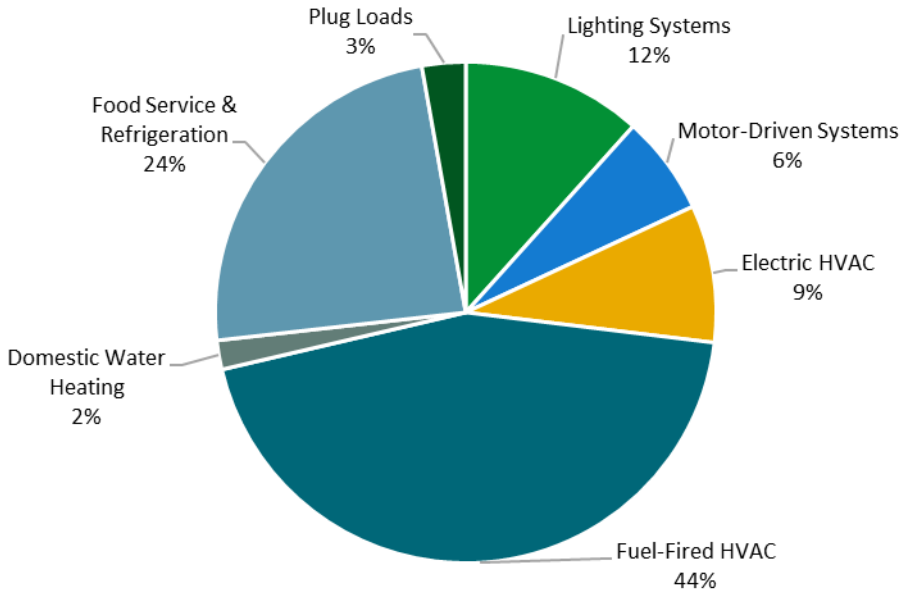


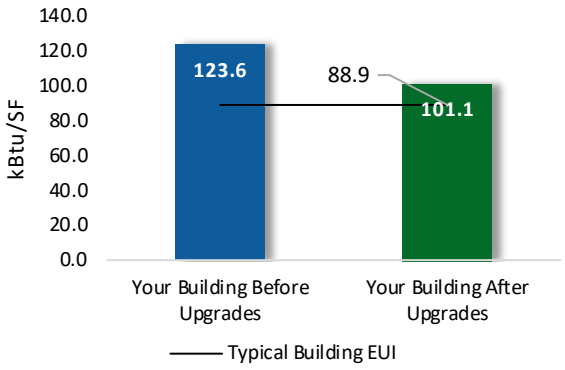
Figure 1 - Energy Use by System

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.

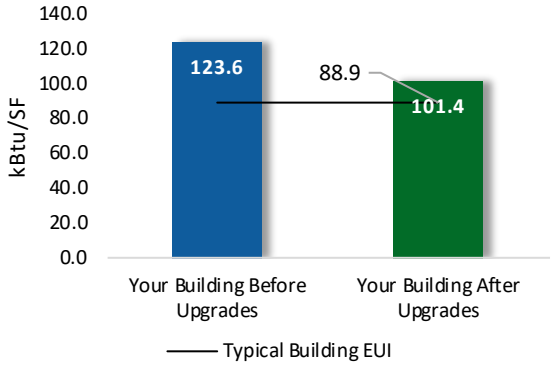
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$29,089
Potential Rebates & Incentives[1]	$8,991
Annual Cost Savings	$3,211
Annual Energy Savings	Electricity: 16,256 kWh Natural Gas: 685 Therms
Greenhouse Gas Emission Savings	12 Tons
Simple Payback	6.3 Years
Site Energy Savings (all utilities)	18%



Scenario 2: Cost-Effective Package[2]

Installation Cost	$17,704
Potential Rebates & Incentives	$7,612
Annual Cost Savings	$3,194
Annual Energy Savings	Electricity: 16,256 kWh Natural Gas: 667 Therms
Greenhouse Gas Emission Savings	12 Tons
Simple Payback	3.2 Years
Site Energy Savings (all utilities)	18%



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	Cost Effective?	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			**12,742**	**2.8**	**-2**	**$1,986**	**$9,589**	**$2,900**	**$6,689**	**3.4**	**12,580**
ECM 1	Install LED Fixtures	Yes	2,663	0.0	0	$419	$4,167	$820	$3,347	8.0	2,682
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,162	0.4	0	$181	$838	$160	$678	3.8	1,142
ECM 3	Retrofit Fixtures with LED Lamps	Yes	8,916	2.4	-2	$1,386	$4,584	$1,920	$2,664	1.9	8,756
Lighting Control Measures			**2,322**	**0.6**	**0**	**$361**	**$3,060**	**$1,460**	**$1,600**	**4.4**	**2,280**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	971	0.3	0	$151	$2,160	$560	$1,600	10.6	954
ECM 5	Install High/Low Lighting Controls	Yes	1,350	0.2	0	$210	$900	$900	$0	0.0	1,326
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**47**	**$451**	**$3,625**	**$3,200**	**$425**	**0.9**	**5,546**
ECM 6	Install High Efficiency Furnaces	Yes	0	0.0	47	$451	$3,625	$3,200	$425	0.9	5,546
HVAC System Improvements			**1,193**	**0.0**	**20**	**$382**	**$1,319**	**$0**	**$1,319**	**3.5**	**3,590**
ECM 7	Install Programmable Thermostats	Yes	1,193	0.0	20	$382	$1,319	$0	$1,319	3.5	3,590
Domestic Water Heating Upgrade			**0**	**0.0**	**2**	**$15**	**$111**	**$52**	**$59**	**3.8**	**190**
ECM 8	Install Low-Flow DHW Devices	Yes	0	0.0	2	$15	$111	$52	$59	3.8	190
TOTALS (COST EFFECTIVE MEASURES)			**16,256**	**3.4**	**67**	**$3,194**	**$17,704**	**$7,612**	**$10,093**	**3.2**	**24,185**
TOTALS (ALL MEASURES)			**16,256**	**3.4**	**67**	**$3,194**	**$17,704**	**$7,612**	**$10,093**	**3.2**	**24,185**

* - 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	Install LED Fixtures	x	x	
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x	x	
ECM 3	Retrofit Fixtures with LED Lamps	x	x	
ECM 4	Install Occupancy Sensor Lighting Controls	x	x	
ECM 5	Install High/Low Lighting Controls	x	x	
ECM 6	Install High Efficiency Furnaces	x	x	
ECM 7	Install Programmable Thermostats		x	
ECM 8	Install Low-Flow DHW Devices	x	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 Youth House. 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 January 16, 2020, TRC performed an energy audit at the Youth House located in Ewing, New Jersey. TRC met with Karl Thomas to review the facility operations and help focus our investigation on specific energy-using systems.

The Youth House is a 1-story, 5,500 square foot building built in 1995. The facility provides short term residential services to youth in Mercer County. Spaces include bedrooms, a cafeteria, mechanical rooms, hallways, a lobby, a game room, offices, janitor's closets, restrooms, and a TV room.

Facility concerns include exterior door seals.

2.2 Building Occupancy

The facility is occupied year-round. Typical weekday occupancy is 25 staff.

Building Name	Weekday/Weekend	Operating Schedule
Youth House	Weekday	24 Hours
	Weekend	24 Hours

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are made of concrete masonry units (CMUs) with a decorative CMU veneer and plaster and painted CMU interior finish.

Wood trusses support a pitched roof with a wood deck, covered with asphalt shingles. Roof encloses unconditioned space. The thermal barrier is between this space and the conditioned space below.

Most of the windows are single glazed and have aluminum frames without a thermal break. The glass-to-frame seals are in good condition. The operable window weather seals are in good condition, showing little evidence of excessive wear. Exterior doors have aluminum frames and are in fair condition with worn door seals. Degraded window and door seals increase drafts and outside air infiltration.

Exterior Door

Typical Window

Building Façade

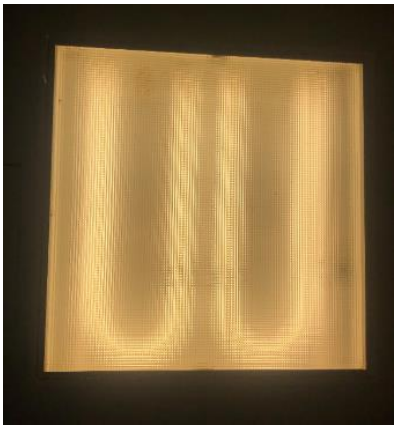
Building Facade

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also several 40-Watt T12 fixtures. Additionally, there are LED general purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts, and T12 fluorescent lamps use magnetic ballasts.

Fixture types include 2- or 4-lamp, 4-foot long surface-mounted fixtures and 2-foot fixtures with U-bend tube lamps. All exit signs are LED. Most fixtures are in good condition and controlled manually, the remainder by occupancy sensors. Interior lighting levels were generally sufficient.

Exterior fixtures include wall packs and canopy lights with high intensity discharge (HID) lamps. Exterior fixtures are photocell controlled.



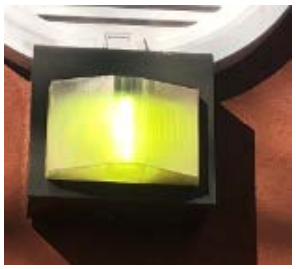
Typical 2-foot Fixture

Typical Hallway Lighting

4-foot 2-lamp Fixture

Pendant Fixture

Typical Canopy Fixtures



Typical Wall-Pack

2.5 Heating and Cooling Systems

The Youth House is served with four Ducane gas-fired furnace and direct expansion (DX) coil in ductwork. The units cooling coils are connected to exterior Aero-flo condensing units (AC1, 2, 3, 4) that vary in capacity from 2.5- to 4-tons. The units are in good condition and have an efficiency of 13 SEER. Each furnace has a 40 MBh heating capacity with 80% combustion efficiency. They have been evaluated for replacement with high-efficiency condensing furnace units. Heating and cooling systems are controlled via local thermostats.

Gas-Fired Furnaces

Outdoor Condensing Units and Local Thermostat

They are not ENERGY STAR® labeled. Each unit is paired with a gas furnace rated at 80% annual fuel utilization efficiency.

2.6 Domestic Hot Water

Hot water is produced by a 100-gallon 197 MBh gas-fired storage water heater with an efficiency rating of 80%. One 1/6 hp circulation pump distributes water to end uses. The circulation pump operates continuously. The domestic hot water pipes are partially insulated, and the insulation is in poor condition.

Building Domestic Water Heater

DHW Recirculation Pump

2.7 Food Service Equipment

The kitchen has gas equipment that is used to prepare meals for residents. Most cooking is done using a gas-fired oven. Equipment is not high-efficiency and is in fair condition.

Our analysis determined that this building's food service equipment accounts for a fairly high proportion of overall energy use. While cost-effective opportunities to replace equipment are limited at this time, we recommend that you work with your food service equipment suppliers to maintain equipment in a way that minimizes energy use. This may include cleaning air intakes and exhausts or other methods of keeping your existing equipment operating in top shape. When food service equipment is eventually replaced, consider installing high-efficiency or ENERGY STAR® labeled equipment.

Visit https://www.energystar.gov/products/commercial_food_service_equipment for the latest information on high-efficiency food service equipment.

Commercial Oven and Dishwasher

2.8 Refrigeration

The kitchen has two stand-up refrigerators with solid doors. There is also an energy efficient stand-up solid door freezer, as well a freezer chest. All equipment is high-efficiency and in good condition.

Visit https://www.energystar.gov/products/commercial_food_service_equipment for the latest information on high-efficiency food service equipment.

Stand-Up Refrigerator and Freezer

Freezer Chest

2.9 Plug Load & Vending Machines

There is one computer workstation throughout the facility. Plug loads throughout the building include general café and office equipment.

There are two residential style refrigerators throughout the building that are used to store staff food. These vary in condition and efficiency. Additionally, there two electric washing and drying machines that are used by the occupants.

Washing Machines and Copier

2.10 Water-Using Systems

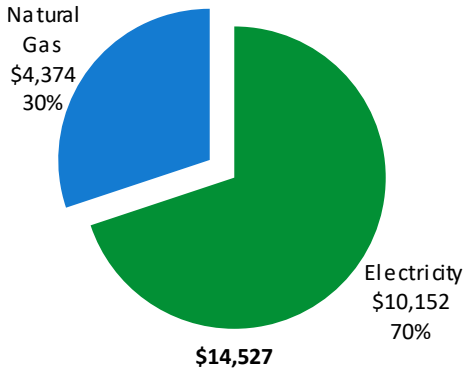
There are several restrooms with toilets, urinals, and sinks. Faucet flow rates are at 1.5 gallons per minute (gpm) or higher. Toilets are rated at 3 gallons per flush (gpf) and urinals are rated at 1.5 gpf. There are restrooms with showerheads that are rated at 2.5 gallon per minute (gpm).

Typical Faucets and Showerhead

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	64,480 kWh	$10,152
Natural Gas	4,599 Therms	$4,374
Total		**$14,527**



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.

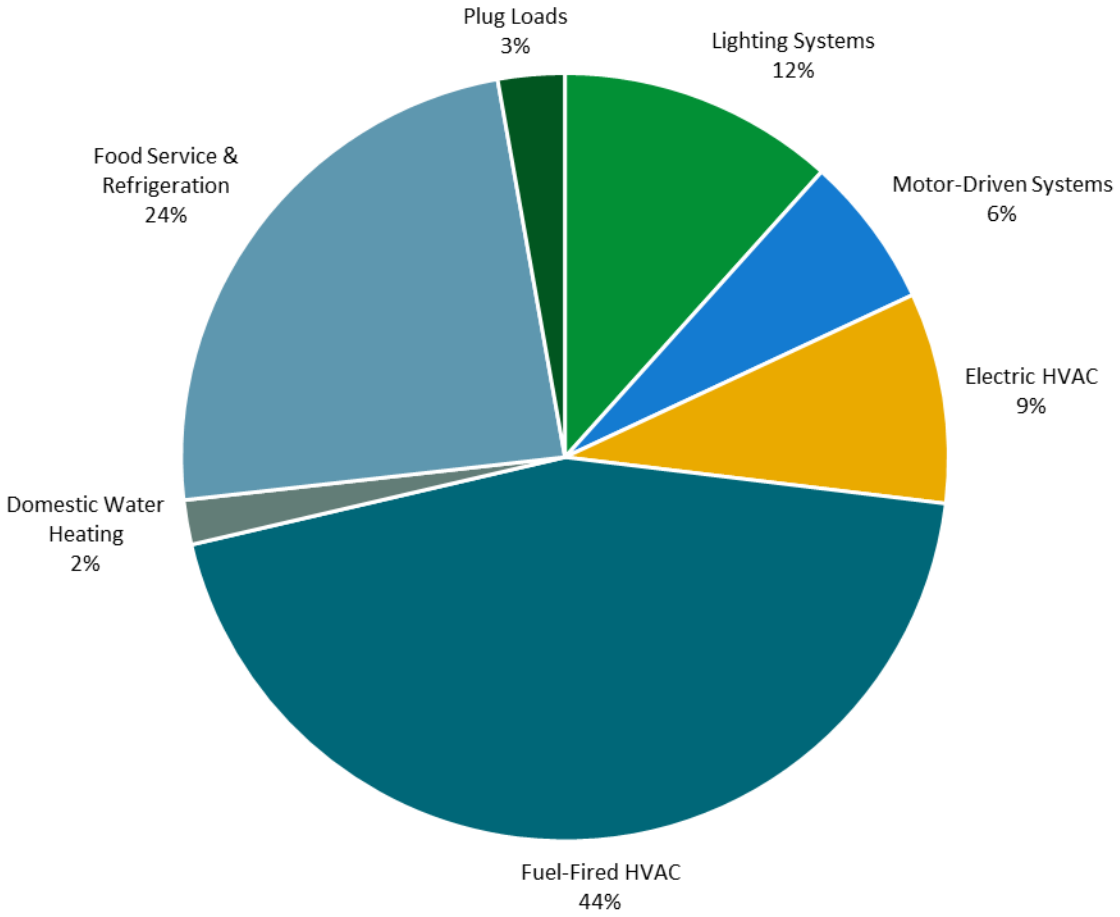
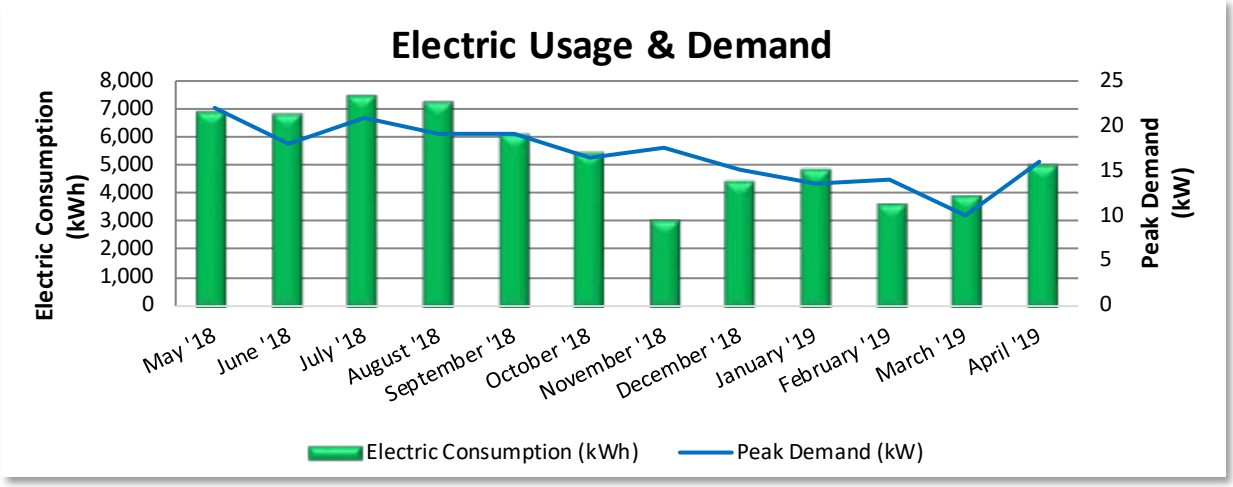


Figure 5 - Energy Balance

3.1 Electricity

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



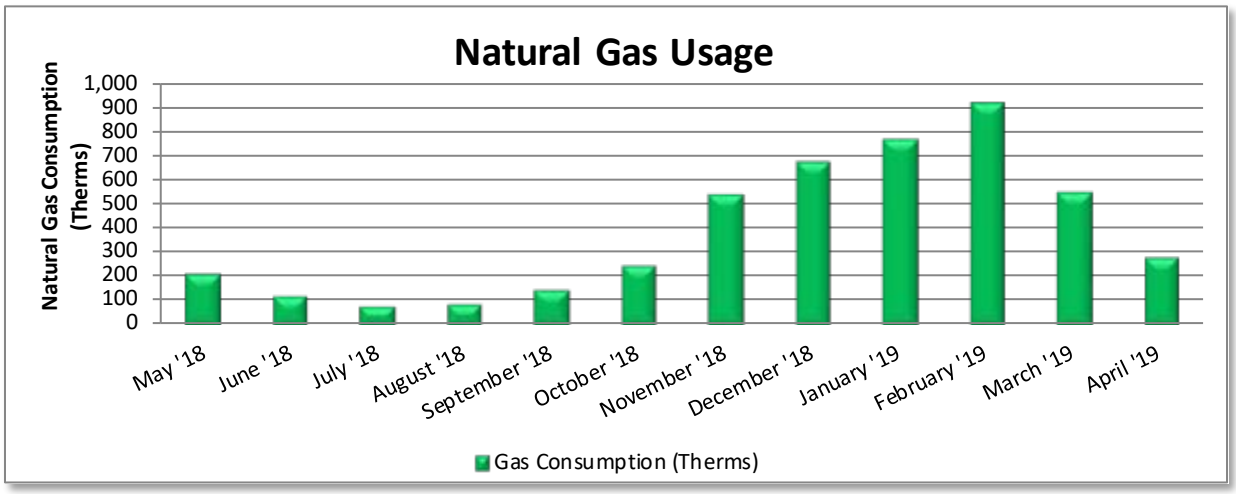
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
6/1/18	30	6,800	22	$95	$902
7/2/18	31	6,760	18	$222	$1,069
8/1/18	30	7,400	21	$257	$1,184
8/31/18	30	7,200	19	$237	$1,139
10/1/18	31	6,080	19	$237	$1,088
10/31/18	30	5,400	16	$71	$757
11/30/18	30	3,040	18	$69	$476
1/2/19	33	4,440	15	$60	$653
1/31/19	29	4,840	14	$53	$735
3/4/19	32	3,600	14	$55	$691
4/2/19	29	3,920	10	$39	$669
5/2/19	30	5,000	16	$63	$790
Totals	**365**	**64,480**	**22**	**$1,460**	**$10,152**
Annual	**365**	**64,480**	**22**	**$1,460**	**$10,152**

Notes:

- Peak demand of 22 kW occurred in May '18.
- Average demand over the past 12 months was 17 kW.
- The average electric cost over the past 12 months was $0.157/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.
- The building has several electric resistant heaters, which account for the higher usage during winter months.

3.2 Natural Gas

PSE&G delivers natural gas under rate class GSG, with natural gas supply provided by Constellation, a third-party supplier.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
6/1/18	30	213	$187
7/2/18	31	119	$111
8/1/18	30	80	$79
8/31/18	30	89	$110
10/1/18	31	141	$132
10/31/18	30	245	$219
11/30/18	30	539	$501
1/2/19	33	670	$621
1/31/19	29	767	$791
3/4/19	32	912	$868
4/2/19	29	547	$516
5/2/19	30	277	$240
Totals	**365**	**4,599**	**$4,374**
Annual	**365**	**4,599**	**$4,374**

Notes:

- The average gas cost for the past 12 months is $0.951/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 country, 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.

Benchmarking Score	N/A

Due to its unique characteristics, this building type is not able to receive a benchmarking score. This report contains suggestions about how to improve building performance and reduce energy costs.

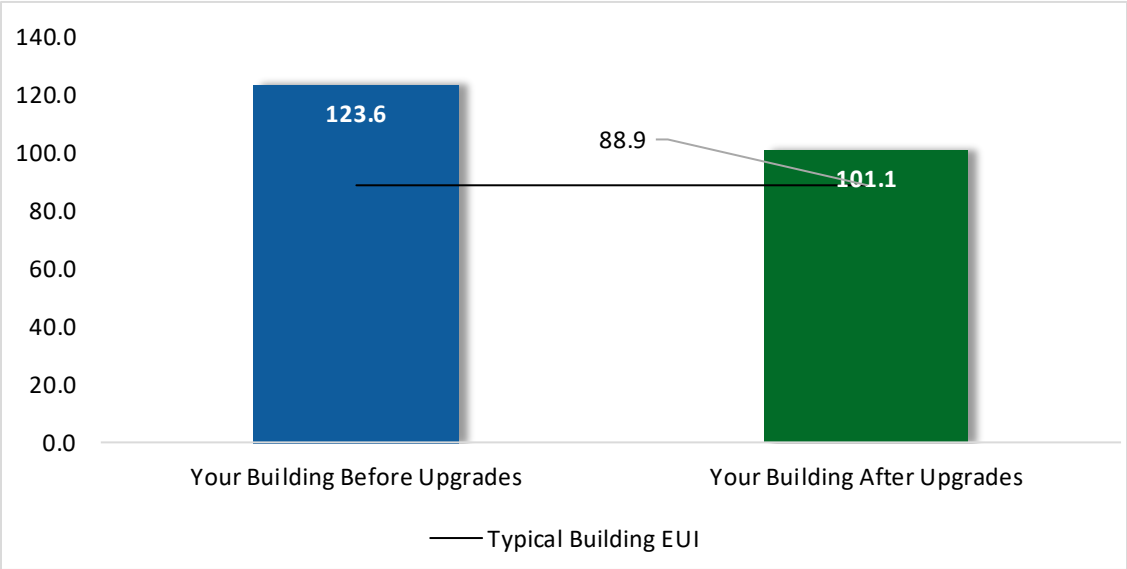


Figure 6 - Energy Use Intensity Comparison[3]

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.

[3] Based on all evaluated ECMs

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[4].

[4] 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 the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the NJBPU. 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 locations and recommended energy conservation measures for all inventoried equipment, see **Appendix A: Equipment Inventory & Recommendations.**

#	Energy Conservation Measure	Cost Effective?	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			**12,742**	**2.8**	**-2**	**$1,986**	**$9,589**	**$2,900**	**$6,689**	**3.4**	**12,580**
ECM 1	Install LED Fixtures	Yes	2,663	0.0	0	$419	$4,167	$820	$3,347	8.0	2,682
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,162	0.4	0	$181	$838	$160	$678	3.8	1,142
ECM 3	Retrofit Fixtures with LED Lamps	Yes	8,916	2.4	-2	$1,386	$4,584	$1,920	$2,664	1.9	8,756
Lighting Control Measures			**2,322**	**0.6**	**0**	**$361**	**$3,060**	**$1,460**	**$1,600**	**4.4**	**2,280**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	971	0.3	0	$151	$2,160	$560	$1,600	10.6	954
ECM 5	Install High/Low Lighting Controls	Yes	1,350	0.2	0	$210	$900	$900	$0	0.0	1,326
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**47**	**$451**	**$3,625**	**$3,200**	**$425**	**0.9**	**5,546**
ECM 6	Install High Efficiency Furnaces	Yes	0	0.0	47	$451	$3,625	$3,200	$425	0.9	5,546
HVAC System Improvements			**1,193**	**0.0**	**20**	**$382**	**$1,319**	**$0**	**$1,319**	**3.5**	**3,590**
ECM 7	Install Programmable Thermostats	Yes	1,193	0.0	20	$382	$1,319	$0	$1,319	3.5	3,590
Domestic Water Heating Upgrade			**0**	**0.0**	**2**	**$15**	**$111**	**$52**	**$59**	**3.8**	**190**
ECM 8	Install Low-Flow DHW Devices	Yes	0	0.0	2	$15	$111	$52	$59	3.8	190
TOTALS			**16,256**	**3.4**	**67**	**$3,194**	**$17,704**	**$7,612**	**$10,093**	**3.2**	**24,185**

* - 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		**12,742**	**2.8**	**-2**	**$1,986**	**$9,589**	**$2,900**	**$6,689**	**3.4**	**12,580**
ECM 1	Install LED Fixtures	2,663	0.0	0	$419	$4,167	$820	$3,347	8.0	2,682
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,162	0.4	0	$181	$838	$160	$678	3.8	1,142
ECM 3	Retrofit Fixtures with LED Lamps	8,916	2.4	-2	$1,386	$4,584	$1,920	$2,664	1.9	8,756
Lighting Control Measures		**2,322**	**0.6**	**0**	**$361**	**$3,060**	**$1,460**	**$1,600**	**4.4**	**2,280**
ECM 4	Install Occupancy Sensor Lighting Controls	971	0.3	0	$151	$2,160	$560	$1,600	10.6	954
ECM 5	Install High/Low Lighting Controls	1,350	0.2	0	$210	$900	$900	$0	0.0	1,326
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**47**	**$451**	**$3,625**	**$3,200**	**$425**	**0.9**	**5,546**
ECM 6	Install High Efficiency Furnaces	0	0.0	47	$451	$3,625	$3,200	$425	0.9	5,546
HVAC System Improvements		**1,193**	**0.0**	**20**	**$382**	**$1,319**	**$0**	**$1,319**	**3.5**	**3,590**
ECM 7	Install Programmable Thermostats	1,193	0.0	20	$382	$1,319	$0	$1,319	3.5	3,590
Domestic Water Heating Upgrade		**0**	**0.0**	**2**	**$15**	**$111**	**$52**	**$59**	**3.8**	**190**
ECM 8	Install Low-Flow DHW Devices	0	0.0	2	$15	$111	$52	$59	3.8	190
TOTALS		**16,256**	**3.4**	**67**	**$3,194**	**$17,704**	**$7,612**	**$10,093**	**3.2**	**24,185**

* - 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		**12,742**	**2.8**	**-2**	**$1,986**	**$9,589**	**$2,900**	**$6,689**	**3.4**	**12,580**
ECM 1	Install LED Fixtures	2,663	0.0	0	$419	$4,167	$820	$3,347	8.0	2,682
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,162	0.4	0	$181	$838	$160	$678	3.8	1,142
ECM 3	Retrofit Fixtures with LED Lamps	8,916	2.4	-2	$1,386	$4,584	$1,920	$2,664	1.9	8,756

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 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 Fluorescent Fixtures with LED Lamps and Drivers

Retrofit fluorescent fixtures by removing the fluorescent tubes and ballasts and replacing them with LED tubes and LED drivers (if necessary), which are designed to be used in retrofitted fluorescent fixtures.

The measure uses the existing fixture housing but replaces the electric components with more efficient lighting technology, which uses less power than other lighting technologies while providing equivalent lighting output. Maintenance savings may also be achieved since LED tubes last longer than fluorescent tubes and therefore do not need to be replaced as often.

Affected building areas: TV room.

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent 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 direct replacements 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: all areas with fluorescent fixtures with T8 tubes.

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		**2,322**	**0.6**	**0**	**$361**	**$3,060**	**$1,460**	**$1,600**	**4.4**	**2,280**
ECM 4	Install Occupancy Sensor Lighting Controls	971	0.3	0	$151	$2,160	$560	$1,600	10.6	954
ECM 5	Install High/Low Lighting Controls	1,350	0.2	0	$210	$900	$900	$0	0.0	1,326

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 4: 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, 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: bedrooms, lobby, game room, offices, and TV room.

ECM 5: 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 code requirements for egress. 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 considered 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: cafeteria and hallways.

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 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**	**47**	**$451**	**$3,625**	**$3,200**	**$425**	**0.9**	**5,546**
ECM 6	Install High Efficiency Furnaces	0	0.0	47	$451	$3,625	$3,200	$425	0.9	5,546

ECM 6: Install High-Efficiency Furnaces

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

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

Affected units: AC-1 through AC-4.

4.4 HVAC Improvements

#	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)
HVAC System Improvements		**1,193**	**0.0**	**20**	**$382**	**$1,319**	**$0**	**$1,319**	**3.5**	**3,590**
ECM 7	Install Programmable Thermostats	1,193	0.0	20	$382	$1,319	$0	$1,319	3.5	3,590

ECM 7: Install Programmable Thermostats

Replace manual thermostats with programmable thermostats that provide energy savings by reducing heating and cooling energy usage when a room is unoccupied. Manual thermostats are generally adjusted to a single heating and cooling setpoint and left at that setting regardless of occupancy, and they provide the same level of heating and cooling regardless of whether the space is being used. Programmable thermostats can maintain different temperature settings for different times of day and different days of the week. By reducing heating temperature setpoints and raising cooling temperature setpoints when spaces are unoccupied, the operation of the heating, ventilation, and air conditioning (HVAC) equipment is reduced while maintaining comfortable space temperatures for building usage

Affected units: AC-1 through AC-4.

4.5 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**	**2**	**$15**	**$111**	**$52**	**$59**	**3.8**	**190**
ECM 8	Install Low-Flow DHW Devices	0	0.0	2	$15	$111	$52	$59	3.8	190

ECM 8: 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
Showerhead	2.0 gpm

Low-flow devices reduce the overall water flow from the fixture while still providing adequate pressure for washing. Pre-rinse spray valves — 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[5] . Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Weatherization

Caulk or weather strip leaky doors and windows to reduce drafts and loss of heated or cooled air. Sealing cracks and openings can reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. Materials used may include caulk, polyurethane foam, and other weather-stripping materials. There is an energy savings opportunity by reducing the uncontrolled air exchange between the outside and inside of the building. Blower door assisted comprehensive building air sealing will reduce the amount of air exchange which will in turn reduce the load on the buildings heating and cooling equipment and thus providing energy savings and increased occupant comfort.

Doors and Windows

Close exterior doors and windows in heated and cooled areas. Leaving doors and windows open leads to a loss of heat during the winter and chilled air during the summer. Reducing air changes per hour (ACH) can lead to increased occupant comfort as well as heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Window Treatments/Coverings

Use high-reflectivity films or cover windows with shades or shutters to reduce solar heat gain and reduce the load on cooling and heating systems. Older, single pane windows and east or west-facing windows are especially prone to solar heat gain. In addition, use shades or shutters at night during cold weather to reduce heat loss.

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

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. Adjust exterior lighting time clock controls seasonally as needed to match your lighting requirements.

Motor Controls

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Whenever possible, use automatic devices such as twist timers or occupancy sensors to turn off motors when they are not needed.

Motor Maintenance

Motors have many moving parts. As these parts degrade over time, the efficiency of the motor is reduced. Routine maintenance prevents damage to motor components. Routine maintenance should include cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Fans to Reduce Cooling Load

Install ceiling fans to supplement your cooling system. Thermostat settings can typically be increased by 4°F with no change in overall occupant comfort due to the wind chill effect of moving air.

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 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.

Duct Sealing

Duct leakage in commercial buildings can account for five to twenty-five percent of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building wasting conditioned air. Check ductwork for leakage. Distribution system losses are dependent on air system temperature, the size of the distribution system, and the level of insulation of the ductwork. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is missing or worn, the system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system. Eliminating duct leaks can improve ventilation system performance and reduce heating and cooling system operation.

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.

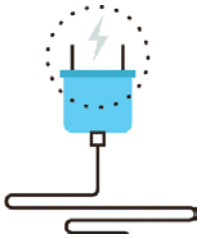
Water Heater Maintenance

The lower the supply water temperature that is used for hand washing sinks, the less energy is needed to heat the water. Reducing the temperature results in energy savings and the change is often unnoticeable to users. Be sure to review the domestic water temperature requirements for sterilizers and dishwashers as you investigate reducing the supply water temperature.

Also, 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.

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips[6]. Your local utility may offer incentives or rebates for this equipment.

Computer Monitor Replacement

ENERGY STAR® labeled computer monitors can be up to 25% more efficient than standard monitors. ENERGY STAR® rated monitors have power consumption requirements for different operating modes such as on, idle, and sleep.

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[7] or download a copy of EPA's "WaterSense® at Work: Best Management Practices for Commercial and Institutional Facilities"[8] 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.

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[6] For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

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

[8] https://www.epa.gov/watersense/watersense-work-0.

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.

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, 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 no potential for installing a PV array.

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.

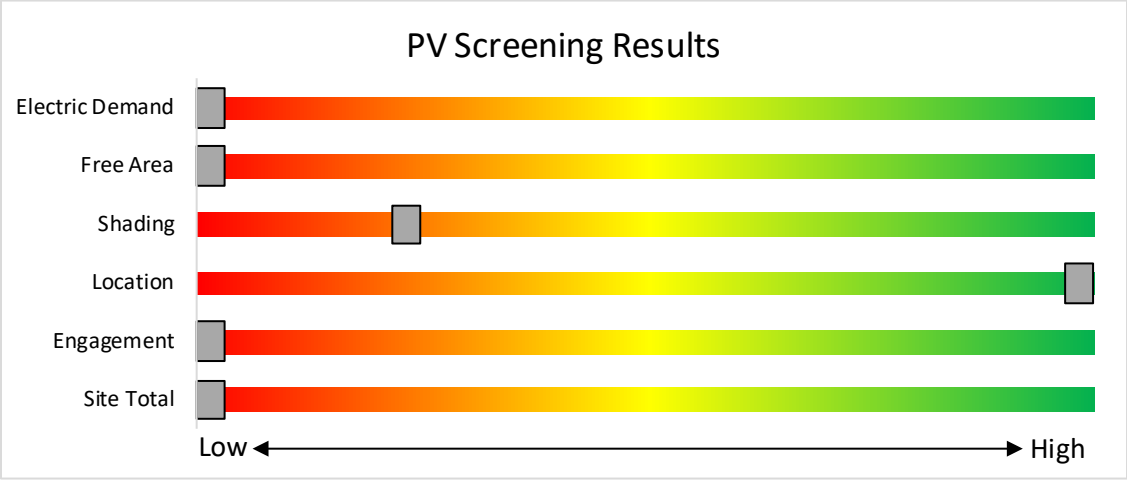

Figure 9 - Photovoltaic Screening

Solar Renewable Energy Certificate (SREC) Registration Program (SRP)

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) generate 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 no potential for installing a cost-effective CHP system.

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.

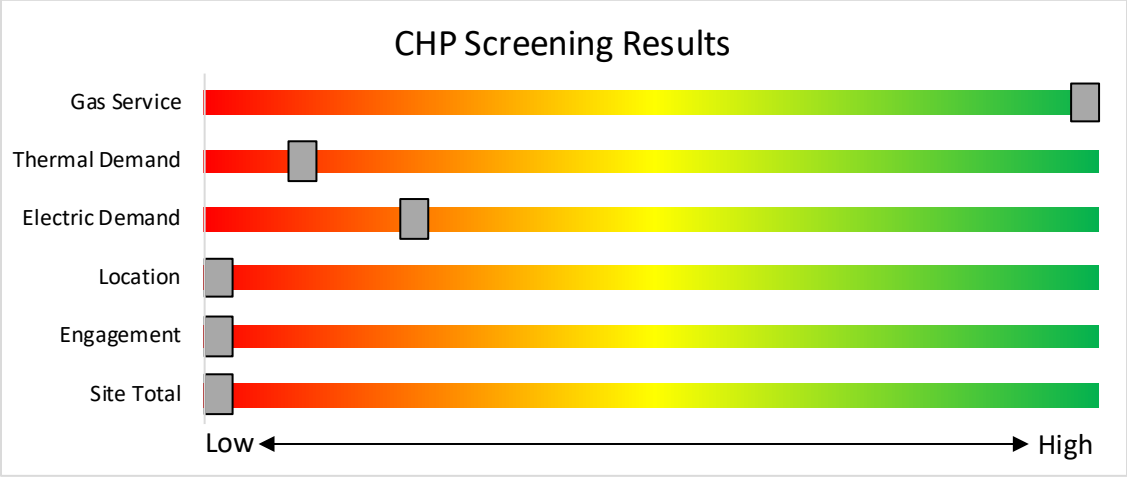

Figure 10 - Combined Heat and Power Screening

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/

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 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 efficient 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.

Based on the site building and utility data provided, the facility does not meet the requirements of the current 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] Gas Internal Combustion Engine	≤500 kW	$2,000	30-40%[2]	$2 million
	>500 kW - 1 MW	$1,000		
Gas Combustion Turbine Microturbine Fuel Cells with Heat Recovery	> 1 MW - 3 MW	$550	30%	$3 million
	>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 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects *must* register their projects 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[9].

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[10].

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

[10] 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
Boiler Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,095	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,095	0.1	78	0	$12	$73	$40	2.7
Cafeteria	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3, 5	Relamp	Yes	8	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	1,688	0.3	829	0	$129	$1,030	$610	3.3
Rm 133	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,446	3, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,688	0.1	391	0	$61	$416	$150	4.4
Storage Room	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	1,095		None	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,095	0.0	0	0	$0	$0	$0	0.0
Hallway	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	5,840		None	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	5,840	0.0	0	0	$0	$0	$0	0.0
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	5,840	3, 5	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	4,030	0.3	1,866	0	$290	$517	$385	0.5
Hallway	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Lobby	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,688	0.1	415	0	$64	$560	$150	6.4
Lobby	2	LED Lamps: Screw-in LED	Wall Switch	S	18	2,446	4	None	Yes	2	LED Lamps: Screw-in LED	Occupancy Sensor	18	1,688	0.0	29	0	$5	$270	$70	43.6
Lobby	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Main Entrance	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	5,840	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	5,840	0.0	183	0	$28	$72	$20	1.8
Main Entrance	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Game Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,446	3, 4	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,688	0.3	782	0	$122	$562	$230	2.7
Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,446	3, 4	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,688	0.2	586	0	$91	$489	$190	3.3
Rm 136	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,446	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,446	0.0	148	0	$23	$73	$40	1.4
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,446	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,446	0.0	148	0	$23	$73	$40	1.4
Janitorial	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,095	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,095	0.0	66	0	$10	$73	$40	3.2
Rm 103	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,446	3, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,688	0.1	391	0	$61	$416	$150	4.4
Storage Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,095	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,095	0.0	39	0	$6	$37	$20	2.7
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,688	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,688	0.0	53	0	$8	$72	$20	6.4
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,446	3, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,688	0.1	391	0	$61	$416	$150	4.4
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,446	0.0	77	0	$12	$72	$20	4.4
Storage Room	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,095	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,095	0.0	34	0	$5	$72	$20	9.8
Storage Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,095	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,095	0.0	66	0	$10	$73	$40	3.2
Closet	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,095	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,095	0.0	34	0	$5	$72	$20	9.8

	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
Mech Rm	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,095	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,095	0.0	34	0	$5	$72	$20	9.8
TV Rm	8	U-Bend Fluorescent - T12: U T12 (40W) - 2L	Wall Switch	S	88	2,446	2, 4	Relamp & Reballast	Yes	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,688	0.5	1,379	0	$214	$1,108	$230	4.1
Janitorial	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,095	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,095	0.0	39	0	$6	$37	$20	2.7
Back Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	5,840	3, 5	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	4,030	0.4	2,800	-1	$435	$663	$465	0.5
Back Hallway	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,095	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,095	0.0	39	0	$6	$37	$20	2.7
Rm 115	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,446	0.0	77	0	$12	$72	$20	4.4
Rm 116	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,446	0.0	77	0	$12	$72	$20	4.4
Rm 117	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,446	0.0	77	0	$12	$72	$20	4.4
Rm 118	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,446	0.0	77	0	$12	$72	$20	4.4
Rm 119	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,446	0.0	77	0	$12	$72	$20	4.4
Rm 120	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,446	0.0	77	0	$12	$72	$20	4.4
Rm 121	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,446	0.0	77	0	$12	$72	$20	4.4
Rm 122	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,446	0.0	77	0	$12	$72	$20	4.4
Rm 123	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,446	0.0	77	0	$12	$72	$20	4.4
Rm 124	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,446	0.0	87	0	$14	$37	$20	1.2
Women Rest	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,446	0.1	174	0	$27	$73	$40	1.2
Women Rest	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,446	0.1	153	0	$24	$145	$40	4.4
Women Rest	2	LED Lamps: Screw-in LED	Wall Switch	S	18	2,446		None	No	2	LED Lamps: Screw-in LED	Wall Switch	18	2,446	0.0	0	0	$0	$0	$0	0.0
Laundry Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,446	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,446	0.0	148	0	$23	$73	$40	1.4
Men Rest	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,446	0.1	174	0	$27	$73	$40	1.2
Men Rest	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,446	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,446	0.0	77	0	$12	$72	$20	4.4
Men Rest	2	LED Lamps: Screw-in LED	Wall Switch	S	18	2,446		None	No	2	LED Lamps: Screw-in LED	Wall Switch	18	2,446	0.0	0	0	$0	$0	$0	0.0
Exterior Main Entrance	2	High-Pressure Sodium: (1) 100W Lamp	Photocell		138	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Downlight Recessed	Photocell	30	4,380	0.0	946	0	$149	$304	$20	1.9
Wall Pack	4	Metal Halide: (1) 100W Lamp	Photocell		128	4,380	1	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	30	4,380	0.0	1,717	0	$270	$3,864	$800	11.3

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
Janitor	Heating Hot Water Pump	1	Heating Hot Water Pump	0.2	65.0%	No	W	8,760		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Kitchen Exhaust	1	Exhaust Fan	0.8	75.0%	No	W	2,745		No	75.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Restroom Exhaust	2	Exhaust Fan	0.3	65.0%	No	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Mech & Boiler	Building	4	Supply Fan	0.3	78.0%	No	W	8,760		No	78.0%	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
Office	Office	2	Electric Resistance Heat		3.41	W		No							0.0	0	0	$0	$0	$0	0.0
Main Entrance	Main Entrance	1	Electric Resistance Heat		36.51	W		No							0.0	0	0	$0	$0	$0	0.0
Ground Floor	AC-1	1	Split-System AC	4.00		W		No							0.0	0	0	$0	$0	$0	0.0
Ground Floor	AC-2	1	Split-System AC	2.50		W		No							0.0	0	0	$0	$0	$0	0.0
Ground Floor	AC-3	1	Split-System AC	3.50		W		No							0.0	0	0	$0	$0	$0	0.0
Ground Floor	AC-4	1	Split-System AC	3.50		W		No							0.0	0	0	$0	$0	$0	0.0

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	Building Heating	2	Furnace	40	W	6	Yes	2	Furnace	40	95.00%	AFUE	0.0	0	24	$225	$1,813	$1,600	0.9
Mechanical Room	Building Heating	2	Furnace	40	W	6	Yes	2	Furnace	40	95.00%	AFUE	0.0	0	24	$225	$1,813	$1,600	0.9

Programmable Thermostat Recommendations

		Recommendation Inputs					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Thermostat Quantity	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	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
Youth House	AC-1	7	1.00	4.00	0.00	40.00	0.0	353	5	$104	$330	$0	3.2
Youth House	AC-2	7	1.00	2.50	0.00	40.00	0.0	221	5	$83	$330	$0	4.0
Youth House	AC-3	7	1.00	3.50	0.00	40.00	0.0	309	5	$97	$330	$0	3.4
Youth House	AC-4	7	1.00	3.50	0.00	40.00	0.0	309	5	$97	$330	$0	3.4

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
Janitorial	Whole Building	1	Storage Tank Water Heater (> 50 Gal)	B		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommendation 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
Restroom	9	3	Faucet Aerator (Lavatory)	1.50	0.50	0.0	0	1	$8	$22	$22	0.0
Bathroom	9	1	Showerhead	2.50	1.50	0.0	0	1	$7	$89	$30	8.0

Commercial Refrigerator/Freezer Inventory & Recommendations

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

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Rack Oven (Single)	No		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified ?
Youth House	1	Water Cooler	500	
Youth House	2	Refrigerator	600	
Youth House	1	Microwave	1,000	
Youth House	1	Desktop Computer	75	
Youth House	1	Copy Machine	515	
Youth House	2	TV	120	
Youth House	2	Washing Machine	900	
Youth House	2	Drying Machine	1,600	

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.

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ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

Mercer House / Youth House

Primary Property Type: Other - Lodging/Residential
Gross Floor Area (ft²): 5,500
Built: 1995

For Year Ending: April 30, 2019
Date Generated: February 20, 2020

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
Mercer House / Youth House 1430 Parkside Avenue Ewing, New Jersey 08638	Mercer County 640 South Broad Street PO Box 8068 Trenton, NJ 08650 (609) 989-6464	Leslie Floyd 640 South Broad Street PO Box 8068 Trenton, NJ 08650 (609) 989-6545 jbenner@mercercounty.org

Property ID: 8387359

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
123.9 kBtu/ft²

Source EUI
200.1 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	461,228 (68%)
Electric - Grid (kBtu)	220,026 (32%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	88.9
National Median Source EUI (kBtu/ft²)	143.6
% Diff from National Median Source EUI	39%

Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	47

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.