Local Government Energy Audit Report

John Gaffney Green Tree Golf Course

April 30, 2024

Prepared for:
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Disclaimer

The goal of this audit report is to identify potential energy efficiency opportunities and help prioritize specific measures for implementation. 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 material and labor costs primarily on RS Means cost manuals as well as on our experience at similar facilities. This approach is based on standard cost estimating manuals and is vendor neutral. Cost estimates include material and labor pricing associated with one for one equipment replacements. Cost estimates do not include demolition or removal of hazardous waste. The actual implementation costs for energy savings projects are anticipated to be significantly higher based on the specific conditions at your site(s). We strongly recommend that you work with your design engineer or contractor to develop actual project costs for your specific scope of work for the installation of high efficiency equipment. We encourage you to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on selected products and installers. TRC and NJBPU do not guarantee cost estimates and shall in no event be held liable should actual installed costs vary from these material and labor estimates.

Incentive values provided in this report are estimated based on previously run state efficiency programs. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. Please review all available utility program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

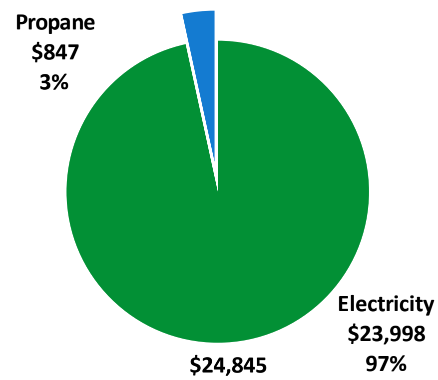
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state, and federal requirements.

Table of Contents

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for John Gaffney Green Tree Golf Course. 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: $24,845 Electricity: 135,973 kWh Propane: 366 Gallons	
ENERGY STAR® Benchmarking Score	N/A	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.

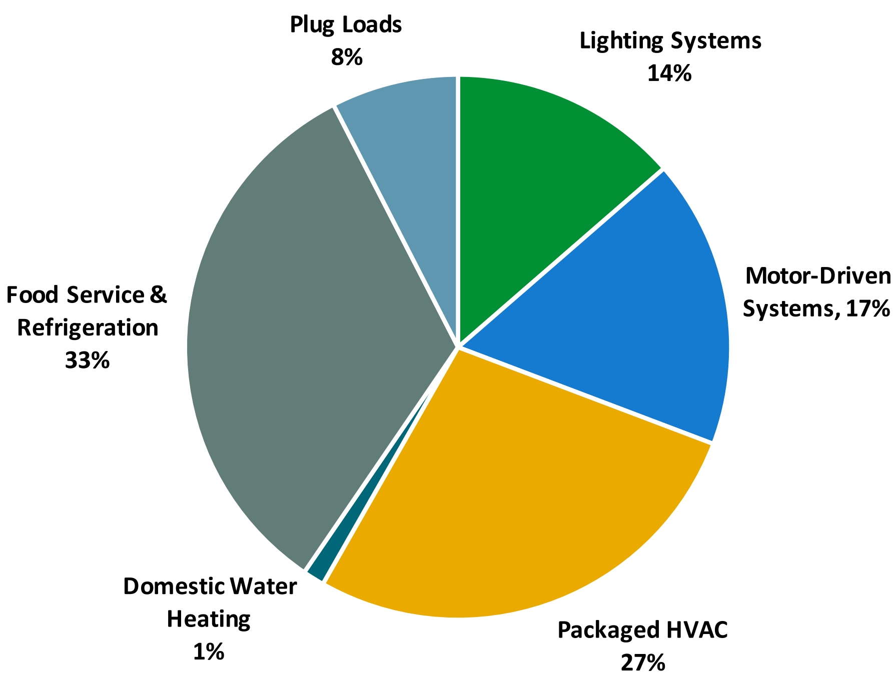


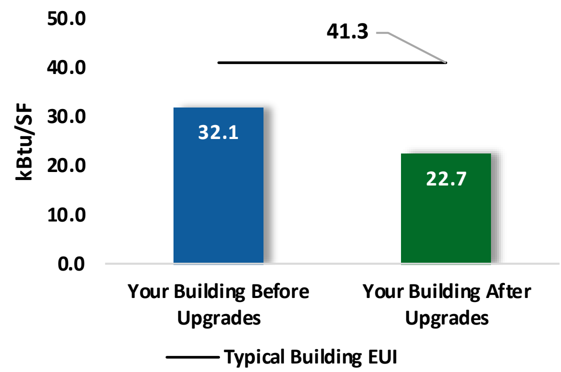
Figure 1 - Energy Use by System

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.

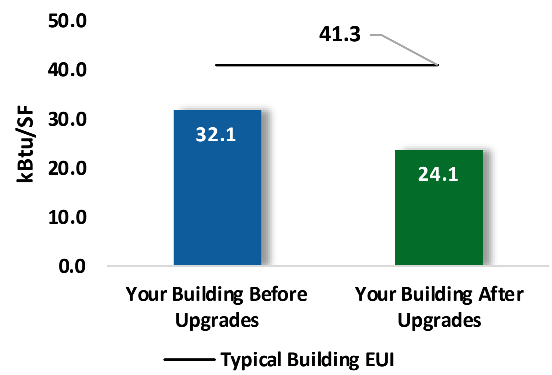
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$78,614
Potential Rebates & Incentives[1]	$4,350
Annual Cost Savings	$6,831
Annual Energy Savings	Electricity: 34,793 kWh Propane: 298 Gallons
Greenhouse Gas Emission Savings	19 Tons
Simple Payback	10.9 Years
Site Energy Savings (All Utilities)	29%



Scenario 2: Cost Effective Package[2]

Installation Cost	$32,787
Potential Rebates & Incentives	$2,002
Annual Cost Savings	$5,940
Annual Energy Savings	Electricity: 31,013 kWh Propane: 201 Gallons
Greenhouse Gas Emission Savings	17 Tons
Simple Payback	5.2 Years
Site Energy Savings (all utilities)	25%



On-site Generation Potential

Photovoltaic	None
Combined Heat and Power	None

[1] Incentives are based on previously run state rebate programs. Contact your utility provider for current program incentives that 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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**6,755**	**1.6**	**-3**	**$1,118**	**$1,831**	**$427**	**$1,404**	**1.3**	**6,387**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	6,755	1.6	-3	$1,118	$1,831	$427	$1,404	1.3	6,387
Lighting Control Measures			**2,136**	**0.5**	**-1**	**$354**	**$2,572**	**$460**	**$2,112**	**6.0**	**2,020**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	2,136	0.5	-1	$354	$2,572	$460	$2,112	6.0	2,020
Motor Upgrades			**198**	**0.0**	**0**	**$35**	**$469**	**$0**	**$469**	**13.4**	**200**
ECM 3	Premium Efficiency Motors	Yes	198	0.0	0	$35	$469	$0	$469	13.4	200
Variable Frequency Drive (VFD) Measures			**1,573**	**0.0**	**20**	**$796**	**$2,667**	**$50**	**$2,617**	**3.3**	**4,484**
ECM 4	Install VFDs on Kitchen Hood Fan Motors	Yes	1,573	0.0	20	$796	$2,667	$50	$2,617	3.3	4,484
Unitary HVAC Measures			**4,249**	**2.2**	**0**	**$750**	**$33,752**	**$1,348**	**$32,405**	**43.2**	**4,279**
ECM 5	Install High Efficiency Heat Pumps	No	4,249	2.2	0	$750	$33,752	$1,348	$32,405	43.2	4,279
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**4**	**$97**	**$9,065**	**$1,000**	**$8,065**	**83.4**	**541**
ECM 6	Install High Efficiency Furnaces	No	0	0.0	4	$97	$9,065	$1,000	$8,065	83.4	541
HVAC System Improvements			**0**	**0.0**	**1**	**$13**	**$239**	**$40**	**$199**	**15.7**	**71**
ECM 7	Install Pipe Insulation	Yes	0	0.0	1	$13	$239	$40	$199	15.7	71
Domestic Water Heating Upgrade			**0**	**0.0**	**1**	**$34**	**$50**	**$25**	**$25**	**0.7**	**188**
ECM 8	Install Low-Flow DHW Devices	Yes	0	0.0	1	$34	$50	$25	$25	0.7	188
Food Service & Refrigeration Measures			**20,350**	**2.3**	**0**	**$3,592**	**$24,960**	**$1,000**	**$23,960**	**6.7**	**20,492**
ECM 9	Dishwasher Replacement	Yes	9,072	1.0	0	$1,601	$9,270	$700	$8,570	5.4	9,136
ECM 10	Replace Refrigeration Equipment	Yes	11,277	1.3	0	$1,990	$15,690	$300	$15,390	7.7	11,356
Custom Measures			**-469**	**0.0**	**5**	**$44**	**$3,010**	**$0**	**$3,010**	**68.4**	**236**
ECM 11	Replace Gas Fired Water Heater with Heat Pump Water Heater	No	-469	0.0	5	$44	$3,010	$0	$3,010	68.4	236
TOTALS (COST EFFECTIVE MEASURES)			**31,013**	**4.5**	**18**	**$5,940**	**$32,787**	**$2,002**	**$30,785**	**5.2**	**33,842**
TOTALS (ALL MEASURES)			**34,793**	**6.6**	**27**	**$6,831**	**$78,614**	**$4,350**	**$74,265**	**10.9**	**38,898**

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

** - 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

Utility-run energy efficiency programs and 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.

Options from Your Utility Company

Prescriptive and Custom Rebates

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 Prescriptive and Custom Rebates 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 may be required for some incentives. Contact your utility company for more details prior to project installation.

Direct Install

The Direct Install program provides turnkey installation of multiple measures through an authorized contractor. This program can provide incentives up to 70% or 80% of the cost of selected measures. A Direct Install contractor will assess and verify individual measure eligibility and perform the installation work. The Direct Install program is available to sites with an average peak demand of less than 200 kW.

Engineered Solutions

The Engineered Solutions program provides tailored energy-efficiency assistance and turnkey engineering services to municipalities, universities, schools, hospitals, and healthcare facilities (MUSH), non-profit entities, and multifamily buildings. The program provides all professional services from audit, design, construction administration, to commissioning and measurement and verification for custom whole-building energy-efficiency projects. Engineered Solutions 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.

For more details on these programs please contact your utility provider.

Options from New Jersey's Clean Energy Program

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 and Power (CHP)

The CHP program provides incentives for combined heat and power (i.e., 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.

Successor Solar Incentive Program (SuSI)

New Jersey is committed to supporting solar energy. Solar projects help the state reach the renewable goals outlined in the state's Energy Master Plan. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available, but certified solar projects are able to earn one SREC II (Solar Renewable Energy Certificates II) for each megawatt-hour of solar electricity produced from a qualifying solar facility.

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.

Large Energy User Program (LEUP)

LEUP is designed to promote self-investment in energy efficiency. It incentivizes owners/users of buildings to upgrade or install energy conserving measures in existing buildings to help offset the capital costs associated with the project. The efficiency upgrades are customized to meet the requirements of the customers' existing facilities, while advancing the State's energy efficiency, conservation, and greenhouse gas reduction goals.

For more details on these programs please visit [New Jersey's Clean Energy Program website](#) .

2 Existing Conditions

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for John Gaffney Green Tree Golf Course. 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.

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 May 26, 2023, TRC performed an energy audit at John Gaffney Green Tree Golf Course located in Egg Harbor Township, New Jersey. TRC met with Sherman Hartman to review the facility operations and help focus our investigation on specific energy-using systems.

The John Gaffney Green Tree Golf Course includes a three-story, 15,500 square foot building built in 1971. Spaces within the building include the pro shop (retail), bar/restaurant with some commercial kitchen equipment, offices, and storage.

Recent Improvements and Facility Concerns

The facility has not implemented significant energy upgrades over the last five years. There is a county-wide initiative to replace non-LED lighting fixtures with LED as they fail, which appears to be in progress at this facility.

2.2 Building Occupancy

The pro shop is open daily during the summer from 6:30 AM to 6:30 PM, and the bar/restaurant (Mac's All Sports Pub and Bar) is open every day from 11:00 AM to 7:00 PM. During the winter, the pro shop is occupied from 8:00 AM to 5:00 PM.

Typical occupancy is two or three staff in the pro shop and two or three staff in the bar/restaurant. At the time of the audit there were five total staff on duty.

Building Name	Weekday/Weekend	Operating Schedule
John Gaffney Green Tree Golf Course	Weekday	6:30 AM - 6:30 PM
	Weekend	6:30 AM - 6:30 PM

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

The pro shop area has wood frame residential-style construction with an asphalt shingle roof. The roof encloses conditioned space. The thermal barrier is at the roof. The restaurant walls are made of poured concrete with a gypsum drywall interior finish.

The pro shop and bar/restaurant both have double pane glazing however, the pro shop has vinyl frames while the bar/restaurant has aluminum frames. The glass-to-frame seals are in good condition. The operable window weather seals are in good condition, showing little evidence of excessive wear.

The pro shop exterior doors have vinyl frames while the bar/restaurant exterior doors are aluminum framed. The pro shop doors are in good condition with undamaged seals while the bar/restaurant doors are in good condition with slightly worn seals. Degraded window and door seals increase drafts and outside air infiltration.

Pro Shop Window

Building Exterior

Restaurant Window

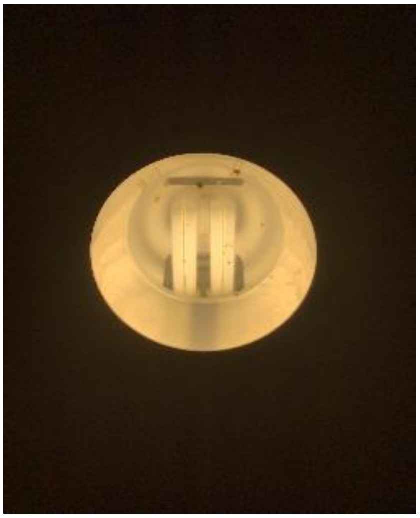
Exterior Door

2.4 Lighting Systems

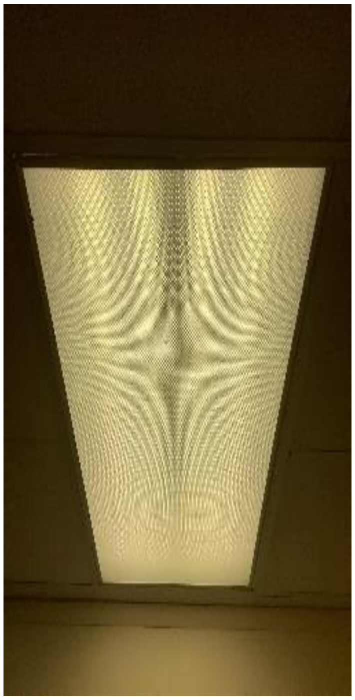
The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. Some of the linear fixtures have been converted to operate LED lamps. There are also recessed can fixtures with a mix of A-19 LED and plug-in type compact fluorescent lamps (CFL) in the dining area. Fixture types include 4-lamp recessed troffers, 1-lamp surface mount wraps, and recessed can fixtures.

All exit signs are LED units.

Most fixtures are in good condition. Interior lighting levels were generally sufficient. One of the 4-lamp troffers was observed to have two lamps burnt out, however, this issue did not appear to be widespread.



Pro Shop LED A19 Recessed Can *Interior CFL Recessed Can*



Interior 2-foot x 4-foot T8 *Interior Surface Mounted T8 Wrap*

Most lighting fixtures are controlled manually.

Exterior fixtures include LED wall packs, floodlights and canopy lights. The pole mounted flood fixtures that illuminate the parking lot are outside the scope of this report because they are not operated by the county.

Exterior light fixtures are controlled by timers. The front exterior lighting has its own timer, separate from the rear exterior lighting. At the time of the field survey, the rear timer was set to operate the lights from 5:00 PM through 11:00 PM while the front was set to operate lighting from 7:00 PM until 5:00 AM.


LED Bollard *LED Recessed Can*


LED A19 Area Light *Timer for Front of Building Lights*

2.5 Air Handling Systems

Air Handling Units

Two air handling units (AHUs) located in the mechanical room serve most of the building. The AHUs are served by air source heat pump outdoor condensing units and propane-fired forced hot air furnaces.

According to the Building Automation System (BAS), the first stage of heating is provided by the heat pumps while secondary heating is provided by the propane furnace. The heating systems are interlocked with a switchover temperature of 65°F. Cooling is provided by the air source heat pumps.

All HVAC equipment appears to be original to the building construction and is operating beyond its useful service life. The units are in fair condition. Atlantic County provides ongoing and preventative maintenance for the HVAC equipment on site.

Unitary Electric HVAC Equipment

One through-the-wall packaged unit serves the third-floor office space. The unit is in good condition and is estimated at 2 tons with code-compliant heating and cooling efficiencies. It was unclear at the time of the audit if the unit is conventional air conditioning with electric resistance heat (PTAC) or a packaged heat pump providing both heating and cooling (PTHP) because the nameplate was not accessible

Pro Shop Outdoor Condensing Unit

Office Area Through-the-Wall Unit

Propane Forced Air Furnace

Air handling Unit Nameplate

The BAS controls the air handling units, heat pumps, and furnaces. The pro shop heat pump and restaurant heat pump are both represented with a BAS screen which is accessed to control and monitor space temperatures, economizer position, and heating and cooling settings.

The occupied and unoccupied setpoints are the same for both spaces. The occupied heating setpoint is 68°F while unoccupied heating sets back to 60°F. The occupied cooling setpoint is 71°F while unoccupied cooling sets back to 75°F.

The through-the-wall packaged unit is controlled locally.

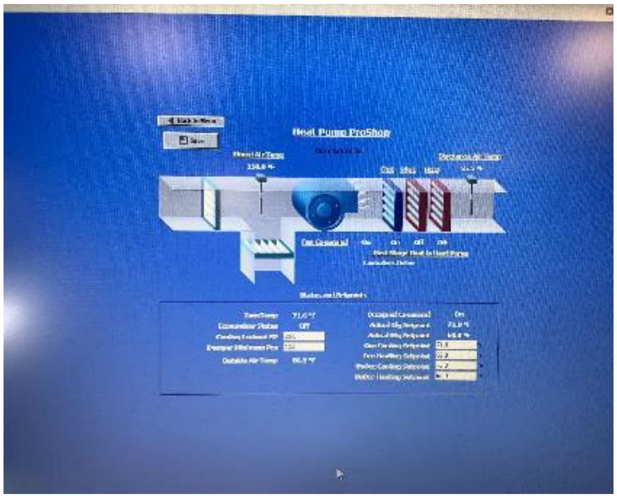
Exhaust Fans

The facility has exhaust fans that serve the kitchen and bathrooms. All exhaust fans are manually controlled by wall switches. The bathroom exhaust turns on with the bathroom lights, all on one switch. The kitchen exhaust is operated during the restaurant business hours and is turned off manually at the end of the night. The exhaust fan motors operate at constant speed.

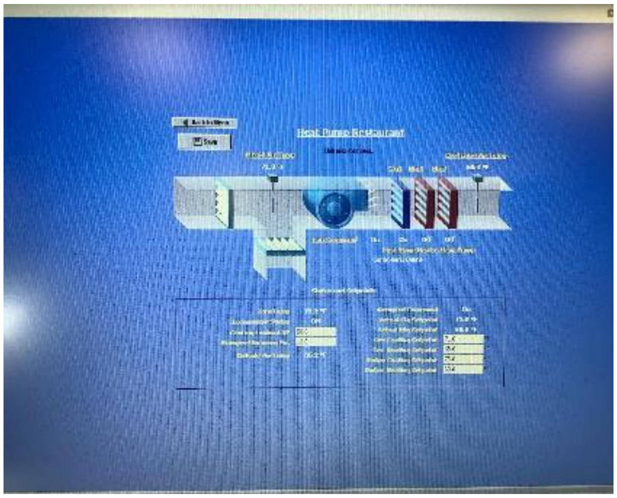
Rooftop Exhaust Fans

2.6 Building Automation System (BAS)

A county-wide BAS controls the HVAC equipment, furnaces, heat pumps, and air handlers. The BAS provides equipment scheduling control and monitors and controls space temperatures and supply air temperatures.



Pro Shop BAS Screen



Restaurant BAS Screen

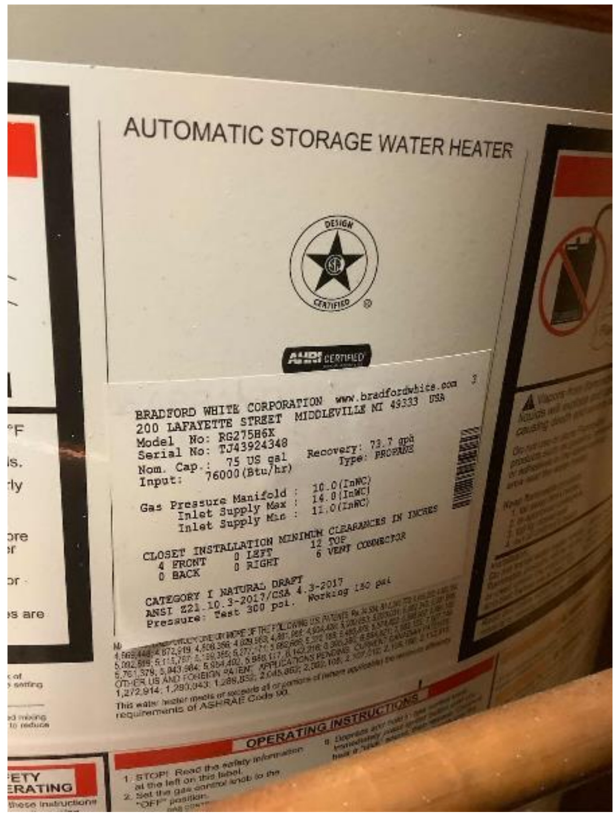
2.7 Domestic Hot Water

Hot water is produced by a 75-gallon, 76 MBh, propane-fired storage water heater with an 80% thermal efficiency.

One circulation pump distributes water to end uses. The pump is estimated to be 1/6 hp and operates continuously.

The domestic hot water pipes are not insulated. TRC recommends insulating the domestic hot water piping per current energy code requirements.

Domestic Hot Water Tank



Domestic Hot Water Nameplate

2.8 Food Service Equipment

The kitchen has a mix of propane-fired and electric equipment that is used to prepare meals for customers. Most cooking is done using a convection electric oven. Bulk prepared foods are held in several electric holding cabinets. Most equipment is not high efficiency and is in fair condition.

The dishwasher is a non-ENERGY STAR high temperature, door type unit. There is an undercounter electric booster heater. The nameplate of the booster heater was obscured at the time of the audit.

Our analysis determined that this building's food service equipment accounts for a relatively 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.

Electric Convection Oven

Electric Fryers

High Temperature Dishwasher

Gas Fryer

2.9 Refrigeration

The kitchen has several stand-up refrigerators with glass doors. There is also an energy efficient stand-up solid door refrigerator. There are two freezer chests and one refrigerator chest. Most equipment is standard efficiency and in fair condition.

Our analysis determined that this building's refrigeration equipment accounts for a relatively 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 refrigeration suppliers to maintain equipment in a way that minimizes energy use. When refrigeration equipment does need to be 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.

Solid Door Refrigerator

Residential Style Refrigerator

2.10 Plug Load and Vending Machines

The location is doing a great job managing the electrical plug loads. This report makes additional suggestions for ECMs in this area as well as energy efficient best practices.

There are six computer workstations throughout the facility. Plug loads include general cafe and office equipment.

There are several residential-style refrigerators and microwaves in the kitchen to support the bar/restaurant.

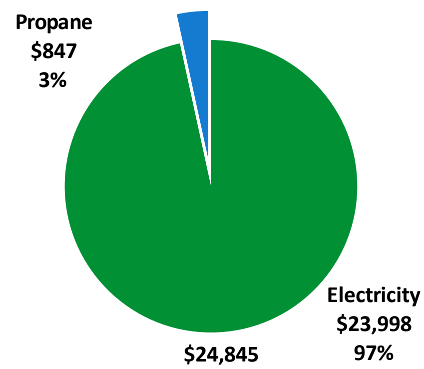
2.11 Water-Using Systems

There are locker rooms and restrooms with toilets, urinals, and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm) or higher. Toilets are rated at 1.6 gallons per flush (gpf) and urinals are rated at 1.0 gpf.

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	135,973 kWh	$23,998
Propane	366 Gallons	$847
Total		**$24,845**



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.

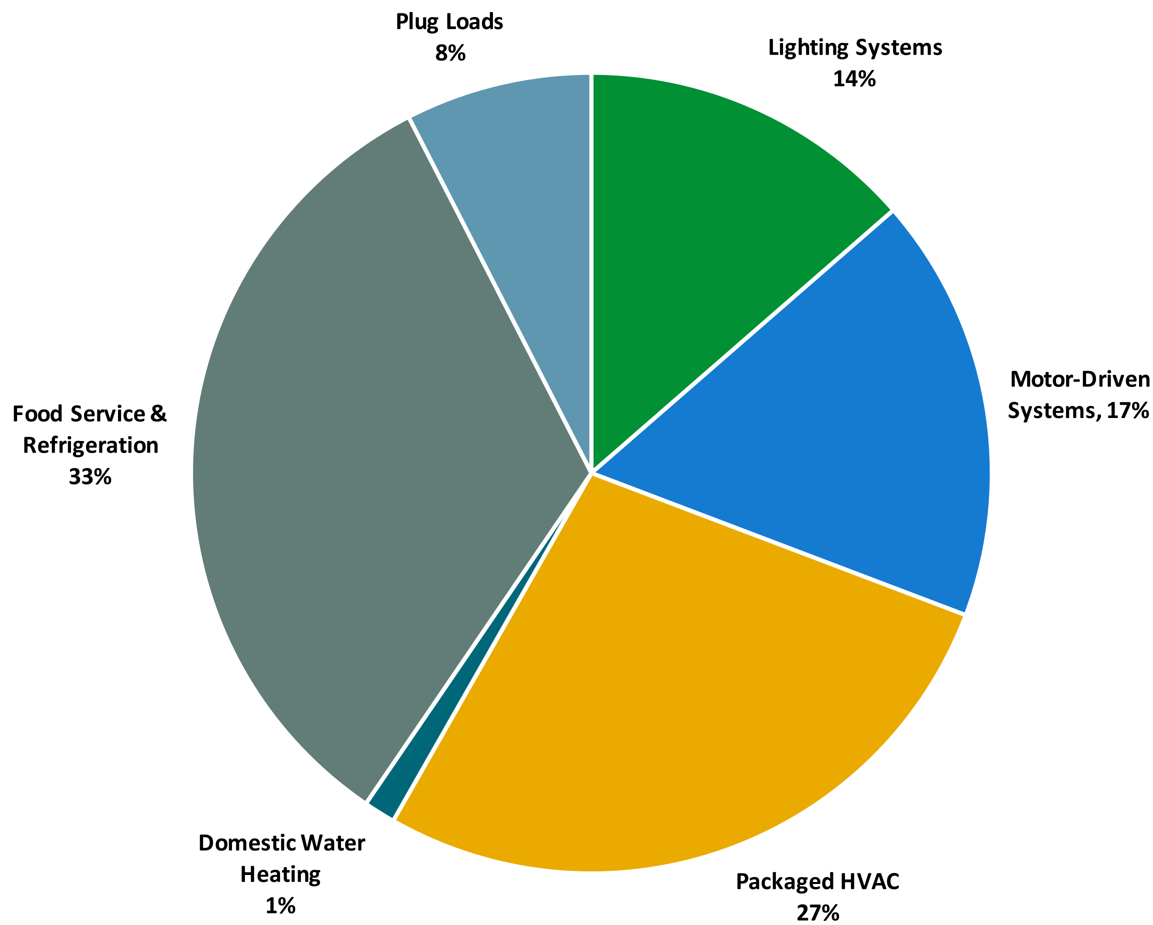
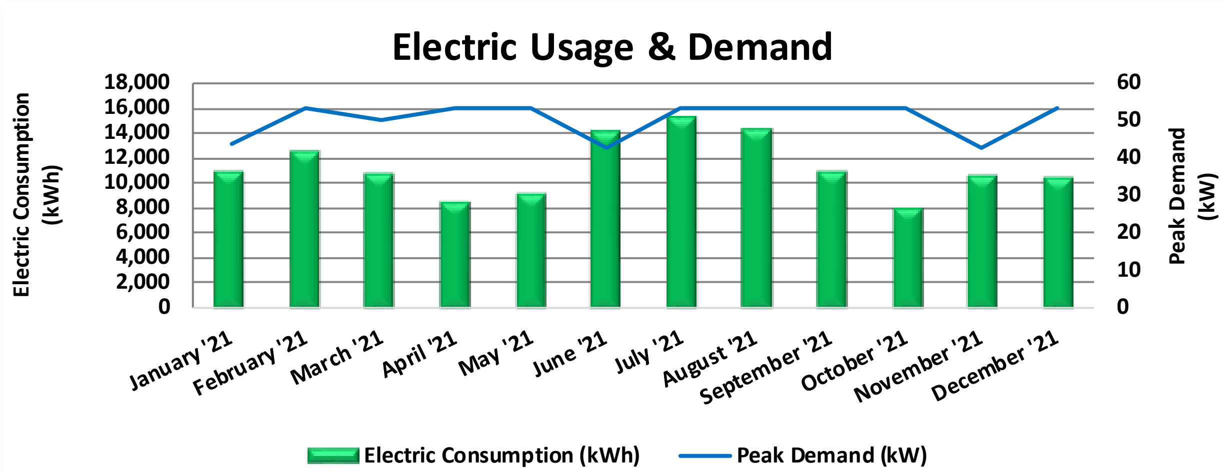


Figure 4 - Energy Balance

3.1 Electricity

Atlantic City Electric delivers electricity under rate class Annual General Service Secondary, with electric production provided by Constellation, a third-party supplier.



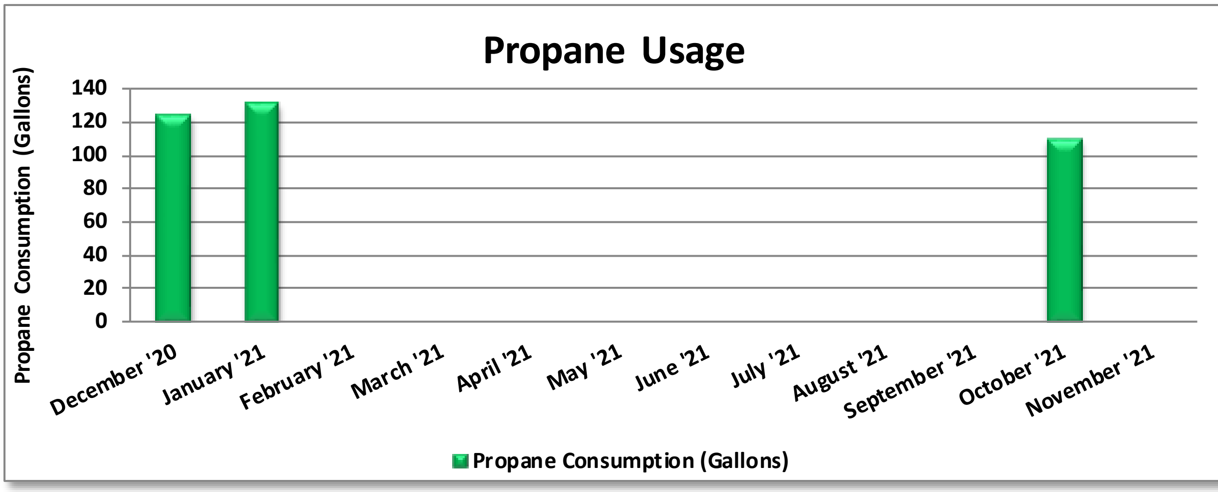
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
2/5/21	27	10,880	44	$462	$1,765
3/4/21	27	12,480	54	$543	$2,015
4/6/21	33	10,800	50	$625	$1,969
5/7/21	31	8,560	54	$608	$1,701
6/4/21	28	9,120	54	$588	$1,736
7/8/21	34	14,080	43	$552	$2,297
8/9/21	32	15,280	54	$649	$2,523
9/9/21	31	14,320	54	$629	$2,394
10/8/21	29	10,960	54	$588	$1,978
11/5/21	28	8,000	54	$569	$1,627
12/7/21	32	10,640	43	$521	$1,914
1/8/22	32	10,480	54	$667	$2,012
Totals	**364**	**135,600**	**54**	**$7,001**	**$23,932**
Annual	**365**	**135,973**	**54**	**$7,020**	**$23,998**

Notes:

- Peak demand of 54 kW occurred in February '21.
- Average demand over the past 12 months was 51 kW.
- The average electric cost over the past 12 months was $0.176/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Propane

Suburban Propane delivers propane to the project site.



Propane Billing Data			
Period Ending	**Days in Period**	**Propane Usage (Gallons)**	**Fuel Cost**
1/1/21	31	124	$237
2/1/21	31	131	$316
3/1/21	28	0	$0
4/1/21	31	0	$0
5/1/21	30	0	$0
6/1/21	31	0	$0
7/1/21	30	0	$0
8/1/21	31	0	$0
9/1/21	31	0	$0
10/1/21	30	0	$0
11/1/21	31	110	$294
12/1/21	30	0	$0
Totals	**365**	**366**	**$847**
Annual	**365**	**366**	**$847**

Notes:

- The average propane cost for the past 12 months is $2.318/Gallon, which is the blended rate used throughout the analysis.
- Fuel deliveries do not necessarily correspond to periods of use.

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.

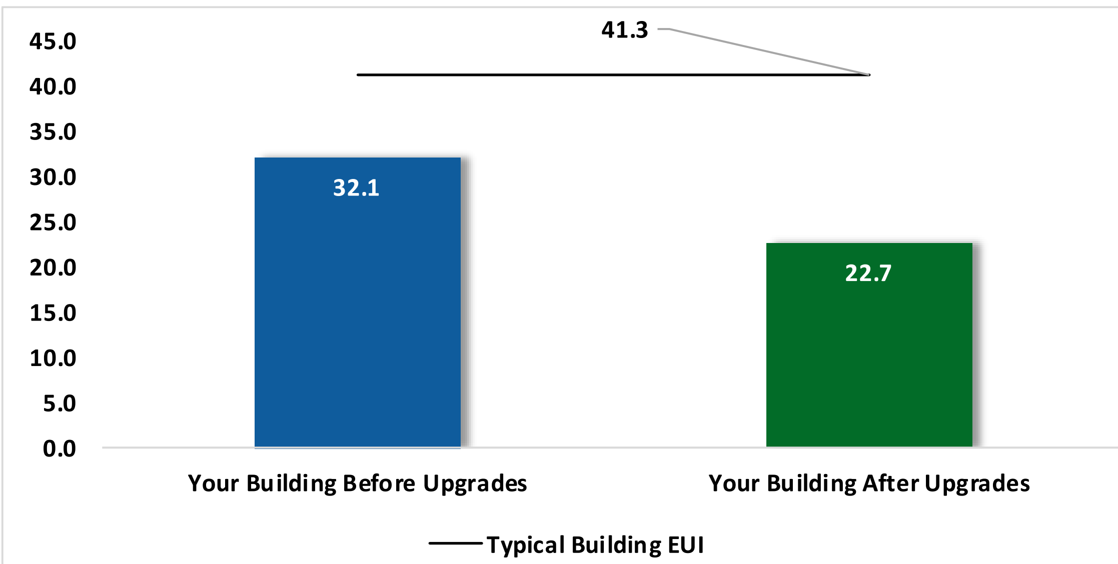


Figure 5 - Energy Use Intensity Comparison[3]

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. Several factors can cause a building to vary from 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 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 Energy Conservation Measures

The goal of this audit report is to identify and evaluate potential energy efficiency improvements and provide information about the cost effectiveness of those improvements. Most energy conservation measures have received preliminary analysis of feasibility, which identifies expected ranges of savings. 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 in this report are based on the previously run state rebate program SmartStart, which has been retired. Now, all investor-owned gas and electric utility companies are offering complementary energy efficiency programs directly to their customers. Some measures and proposed upgrades may be eligible for higher incentives than those shown below. The incentives in the summary tables should be used for high-level planning purposes. To verify incentives, reach out to your utility provider or visit the NJCEP website for more information.

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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**6,755**	**1.6**	**-3**	**$1,118**	**$1,831**	**$427**	**$1,404**	**1.3**	**6,387**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	6,755	1.6	-3	$1,118	$1,831	$427	$1,404	1.3	6,387
Lighting Control Measures			**2,136**	**0.5**	**-1**	**$354**	**$2,572**	**$460**	**$2,112**	**6.0**	**2,020**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	2,136	0.5	-1	$354	$2,572	$460	$2,112	6.0	2,020
Motor Upgrades			**198**	**0.0**	**0**	**$35**	**$469**	**$0**	**$469**	**13.4**	**200**
ECM 3	Premium Efficiency Motors	Yes	198	0.0	0	$35	$469	$0	$469	13.4	200
Variable Frequency Drive (VFD) Measures			**1,573**	**0.0**	**20**	**$796**	**$2,667**	**$50**	**$2,617**	**3.3**	**4,484**
ECM 4	Install VFDs on Kitchen Hood Fan Motors	Yes	1,573	0.0	20	$796	$2,667	$50	$2,617	3.3	4,484
Unitary HVAC Measures			**4,249**	**2.2**	**0**	**$750**	**$33,752**	**$1,348**	**$32,405**	**43.2**	**4,279**
ECM 5	Install High Efficiency Heat Pumps	No	4,249	2.2	0	$750	$33,752	$1,348	$32,405	43.2	4,279
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**4**	**$97**	**$9,065**	**$1,000**	**$8,065**	**83.4**	**541**
ECM 6	Install High Efficiency Furnaces	No	0	0.0	4	$97	$9,065	$1,000	$8,065	83.4	541
HVAC System Improvements			**0**	**0.0**	**1**	**$13**	**$239**	**$40**	**$199**	**15.7**	**71**
ECM 7	Install Pipe Insulation	Yes	0	0.0	1	$13	$239	$40	$199	15.7	71
Domestic Water Heating Upgrade			**0**	**0.0**	**1**	**$34**	**$50**	**$25**	**$25**	**0.7**	**188**
ECM 8	Install Low-Flow DHW Devices	Yes	0	0.0	1	$34	$50	$25	$25	0.7	188
Food Service & Refrigeration Measures			**20,350**	**2.3**	**0**	**$3,592**	**$24,960**	**$1,000**	**$23,960**	**6.7**	**20,492**
ECM 9	Dishwasher Replacement	Yes	9,072	1.0	0	$1,601	$9,270	$700	$8,570	5.4	9,136
ECM 10	Replace Refrigeration Equipment	Yes	11,277	1.3	0	$1,990	$15,690	$300	$15,390	7.7	11,356
Custom Measures			**-469**	**0.0**	**5**	**$44**	**$3,010**	**$0**	**$3,010**	**68.4**	**236**
ECM 11	Replace Gas Fired Water Heater with Heat Pump Water Heater	No	-469	0.0	5	$44	$3,010	$0	$3,010	68.4	236
TOTALS			**34,793**	**6.6**	**27**	**$6,831**	**$78,614**	**$4,350**	**$74,265**	**10.9**	**38,898**

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 6 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**6,755**	**1.6**	**-3**	**$1,118**	**$1,831**	**$427**	**$1,404**	**1.3**	**6,387**
ECM 1	Retrofit Fixtures with LED Lamps	6,755	1.6	-3	$1,118	$1,831	$427	$1,404	1.3	6,387
Lighting Control Measures		**2,136**	**0.5**	**-1**	**$354**	**$2,572**	**$460**	**$2,112**	**6.0**	**2,020**
ECM 2	Install Occupancy Sensor Lighting Controls	2,136	0.5	-1	$354	$2,572	$460	$2,112	6.0	2,020
Motor Upgrades		**198**	**0.0**	**0**	**$35**	**$469**	**$0**	**$469**	**13.4**	**200**
ECM 3	Premium Efficiency Motors	198	0.0	0	$35	$469	$0	$469	13.4	200
Variable Frequency Drive (VFD) Measures		**1,573**	**0.0**	**20**	**$796**	**$2,667**	**$50**	**$2,617**	**3.3**	**4,484**
ECM 4	Install VFDs on Kitchen Hood Fan Motors	1,573	0.0	20	$796	$2,667	$50	$2,617	3.3	4,484
HVAC System Improvements		**0**	**0.0**	**1**	**$13**	**$239**	**$40**	**$199**	**15.7**	**71**
ECM 7	Install Pipe Insulation	0	0.0	1	$13	$239	$40	$199	15.7	71
Domestic Water Heating Upgrade		**0**	**0.0**	**1**	**$34**	**$50**	**$25**	**$25**	**0.7**	**188**
ECM 8	Install Low-Flow DHW Devices	0	0.0	1	$34	$50	$25	$25	0.7	188
Food Service & Refrigeration Measures		**20,350**	**2.3**	**0**	**$3,592**	**$24,960**	**$1,000**	**$23,960**	**6.7**	**20,492**
ECM 9	Dishwasher Replacement	9,072	1.0	0	$1,601	$9,270	$700	$8,570	5.4	9,136
ECM 10	Replace Refrigeration Equipment	11,277	1.3	0	$1,990	$15,690	$300	$15,390	7.7	11,356
TOTALS		**31,013**	**4.5**	**18**	**$5,940**	**$32,787**	**$2,002**	**$30,785**	**5.2**	**33,842**

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 7 – 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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**6,755**	**1.6**	**-3**	**$1,118**	**$1,831**	**$427**	**$1,404**	**1.3**	**6,387**
ECM 1	Retrofit Fixtures with LED Lamps	6,755	1.6	-3	$1,118	$1,831	$427	$1,404	1.3	6,387

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: Retrofit Fixtures with LED Lamps

Replace fluorescent or incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies. Be sure to specify replacement lamps that are compatible with existing dimming controls, where applicable. In some circumstances, you may need to upgrade your dimming system for optimum performance.

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, incandescent lamps, and CFLs

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**2,136**	**0.5**	**-1**	**$354**	**$2,572**	**$460**	**$2,112**	**6.0**	**2,020**
ECM 2	Install Occupancy Sensor Lighting Controls	2,136	0.5	-1	$354	$2,572	$460	$2,112	6.0	2,020

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 2: Install Occupancy Sensor Lighting Controls

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

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

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

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

Affected Building Areas: offices, locker rooms, restrooms, and storage rooms

4.3 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**198**	**0.0**	**0**	**$35**	**$469**	**$0**	**$469**	**13.4**	**200**
ECM 3	Premium Efficiency Motors	198	0.0	0	$35	$469	$0	$469	13.4	200

ECM 3: Premium Efficiency Motors

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

Affected Motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Exterior	Kitchen Hood Exhaust Fan	1	Kitchen Hood Exhaust Fan	0.5	

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

4.4 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**1,573**	**0.0**	**20**	**$796**	**$2,667**	**$50**	**$2,617**	**3.3**	**4,484**
ECM 4	Install VFDs on Kitchen Hood Fan Motors	1,573	0.0	20	$796	$2,667	$50	$2,617	3.3	4,484

Variable frequency drives control motors for fans, pumps, and process equipment based on the actual output required of the driven equipment. Energy savings result from more efficient control of motor energy usage when equipment operates at partial load. The magnitude of energy savings depends on the estimated amount of time that the motor would operate at partial load. For equipment with proposed VFDs, we have included replacing the controlled motor with a new inverter duty rated motor to conservatively account for the cost of an inverter duty rated motor.

ECM 4: Install VFDs on Kitchen Hood Fan Motors

Install VFDs and sensors to control the kitchen hood fan motor(s). The air flow of the hood is varied based on two key inputs: temperature and smoke/cooking fumes. The VFD controls the amount of exhaust (and kitchen make-up air) based on temperature—the lower the temperature the lower the flow. If the optic sensor is triggered by smoke or cooking fumes, the speed of the fan ramps up to 100%.

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

4.5 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**4,249**	**2.2**	**0**	**$750**	**$33,752**	**$1,348**	**$32,405**	**43.2**	**4,279**
ECM 5	Install High Efficiency Heat Pumps	4,249	2.2	0	$750	$33,752	$1,348	$32,405	43.2	4,279

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

ECM 5: Install High Efficiency Heat Pumps

We evaluated replacing standard efficiency heat pumps with high efficiency heat pumps. A higher EER or SEER rating indicates a more efficient cooling system, and a higher HSPF rating indicates more efficient heating mode. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average heating and cooling loads, and the estimated annual operating hours.

This measure is not cost effective and has relatively high paybacks.

Affected Units: pro shop and bar/restaurant heat pumps units

4.6 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**4**	**$97**	**$9,065**	**$1,000**	**$8,065**	**83.4**	**541**
ECM 6	Install High Efficiency Furnaces	0	0.0	4	$97	$9,065	$1,000	$8,065	83.4	541

ECM 6: Install High Efficiency Furnaces

We evaluated replacing 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 require proper drainage.

This measure is not cost effective and has relatively high paybacks.

Affected Units: Pro shop and bar/restaurant warm air furnaces

4.7 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**0**	**0.0**	**1**	**$13**	**$239**	**$40**	**$199**	**15.7**	**71**
ECM 7	Install Pipe Insulation	0	0.0	1	$13	$239	$40	$199	15.7	71

ECM 7: Install Pipe Insulation

Install insulation on domestic hot water system piping. Distribution system losses are dependent on system fluid temperature, the size of the distribution system, and the level of insulation of the piping. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is exposed to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Affected Systems: domestic hot water piping

4.8 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**1**	**$34**	**$50**	**$25**	**$25**	**0.7**	**188**
ECM 8	Install Low-Flow DHW Devices	0	0.0	1	$34	$50	$25	$25	0.7	188

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
Faucet aerator (kitchen)	1.5 gpm
Showerhead	2.0 gpm
Pre-rinse spray valve (kitchen)	1.28 gpm

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. Additional cost savings may result from reduced water usage.

4.9 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**20,350**	**2.3**	**0**	**$3,592**	**$24,960**	**$1,000**	**$23,960**	**6.7**	**20,492**
ECM 9	Dishwasher Replacement	9,072	1.0	0	$1,601	$9,270	$700	$8,570	5.4	9,136
ECM 10	Replace Refrigeration Equipment	11,277	1.3	0	$1,990	$15,690	$300	$15,390	7.7	11,356

ECM 9: Dishwasher Replacement

Replace existing dishwashers with new energy-efficient dishwashers. New high efficiency models often use an average of 40% less energy and water, compared to current standard efficiency equipment.

ECM 10: Replace Refrigeration Equipment

Replace existing refrigerators and freezers with new ENERGY STAR rated equipment. The energy savings associated with this measure come from reduced energy usage, due to more efficient technology, and reduced run times.

4.10 Custom Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Custom Measures		**-469**	**0.0**	**5**	**$44**	**$3,010**	**$0**	**$3,010**	**68.4**	**236**
ECM 11	Replace Gas Fired Water Heater with Heat Pump Water Heater	-469	0.0	5	$44	$3,010	$0	$3,010	68.4	236

ECM 11: Replace Propane Fired Water Heater with Heat Pump Water Heater

A gas (or propane) fired water heater uses a burner to heat water. Air source heat pump water heaters (HPWH) use a refrigeration cycle to transfer heat from the surrounding air to the domestic water. Water heater efficiency is rated by the uniform energy factor (UEF). For a relative comparison of water heater UEFs, the criteria for certifying a water heater in the ENERGY STAR program are provided below. These values indicate that HPWH heaters are significantly more efficient than gas fired water heaters.

There are two types of HPWH: those integrated with the heat pump and storage tank in the same unit, and those that are split into two sections (with the storage tank separate from the heat pump). The measure considers an integrated HPWH.

ENERGY STAR Uniform Energy Factor (UEF) Criteria for Certified Water Heaters *

Water Heater Type	Minimum UEF	Other
Integrated HPWH	3.3	
Integrated HPWH	2.2	120 Volt, 15 Amp circuit
Split System HPWH	2.2	
Gas Fired Storage	0.64	≤ 55-gal, Medium Draw Pattern
Gas Fired Storage	0.68	≤ 55-gal, High Draw Pattern
Gas Fired Storage	0.78	> 55-gal, Medium Draw Pattern
Gas Fired Storage	0.80	> 55-gal, High Draw Pattern
Gas Fired Storage	0.80	Residential Duty
Gas Fired Instantaneous	0.87	

** Note: Uniform Energy Factor (UEF): The newest measure of water heater overall efficiency. The higher the UEF value is, the more efficient the water heater. UEF is determined by the Department of Energy's test method outlined in 10 CFR Part 430, Subpart B, Appendix E.*[4]

[4] https://www.energy.gov/sites/prod/files/2014/06/f17/rwh_tp_final_rule.pdf

HPWH reject cold air. As such, they need to be installed in an unconditioned space of about 750 cubic feet with good ventilation[5]. Ideal locations are garages, large enclosed, unconditioned storage areas, or areas with excess heat such as a furnace or boiler room. The HPWH will also produce condensate so accommodations for draining the condensate need to be provided.

Most HPWH operate effectively down to an air temperature of 40 °F. Below that temperature, an electric resistance booster heater is typically required to achieve full heating capacity. It is critical that the HPWH controls are set up so that the electric resistance heat only engages when the air temperature is too cold for the HPWH to extract heat from it. HPWHs have a slow recovery. During periods of high demand, the electric resistance heating element, if enabled, may be energized to maintain set point, thus reducing the overall efficiency of the unit. It is recommended that a careful analysis of the hot water demand be conducted to determine if the application makes economic sense, and the HPWH heating capacity and storage are properly sized.

HPWH operate most effectively when the temperature difference between the incoming and outgoing water is high. Generally, this means that cold make-up water should be piped to the bottom of the tank and return water should be piped to the top of the tank in order to maintain stratification within the storage tank. Water should be drawn from the bottom of the tank to be heated. If there is a DHW recirculation pump, it should only be operated during high hot water demand periods.

Switching from a gas fired water heater to a HPWH has the potential to reduce the sites overall greenhouse gas emissions. If the electricity for the HPWH is provided by an on-site photovoltaic (PV) system then there are essentially no greenhouse gas (GHG) emissions. A 2016 study conducted at Cornell [6]calculated the kg of methane (CH_4) and carbon dioxide (CO_2) produced per GJ of water heated. The study compared HPWH to gas and electric fired, storage and tankless water heaters. The study also considered electricity produced from natural gas and coal fired electric plants. In all cases the study found that HPWHs produced less methane than all of the other water heaters. The study also found that HPWH produced less carbon dioxide than electric resistance water heaters but more carbon dioxide than tankless gas water heaters and about the same amount of carbon dioxide as storage gas water heaters. The summary tables provide the reduction in CO2 equivalent emissions based on the typical New Jersey electric utility.

Affected Units: gas-fired domestic hot water heater

[5] https://basc.pnnl.gov/code-compliance/heat-pump-water-heaters-code-compliance-brief#:~:text=HPWH%20must%20have%20unrestricted%20airflow,depending%20on%20size%20of%20system

[6] Greenhouse gas emissions from domestic hot water: Heat pumps compared to most commonly used systems. Bongghi Hong, Robert W. Howarth. Department of Ecology and Evolutionary Biology, Cornell University. Energy Science and Engineering 2016.

4.11 Measures for Future Consideration

There are additional opportunities for improvement that Atlantic County may wish to consider. These potential upgrades typically require further analysis, involve substantial capital investment, and/or include significant system reconfiguration. These measure(s) are therefore beyond the scope of this energy audit. These measure(s) are described here to support a whole building approach to energy efficiency and sustainability.

Atlantic County may wish to consider the Energy Savings Improvement Program (ESIP) or other whole building approach. With interest in implementing comprehensive, largescale and/or complex system wide projects, these measures may be pursued during development of a future energy savings plan. We recommend that you work with your energy service company (ESCO) and/or design team to:

- Evaluate these measures further.
- Develop firm costs.
- Determine measure savings.
- Prepare detailed implementation plans.

Other modernization or capital improvement funds may be leveraged for these types of refurbishments. As you plan for capital upgrades, be sure to consider the energy impact of the building systems and controls being specified.

Retro-Commissioning Study

Due to the complexity of today's HVAC systems and controls, a thorough analysis and rebalance of heating, ventilation, and cooling systems should periodically be conducted. There are indications at this site that systems may not be operating correctly or as efficiently as they could be. One important tool available to building operators to ensure proper system operation is retro-commissioning.

Retro-commissioning is a common practice recommended by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) to be implemented every few years. We recommend that you contact a reputable engineering firm that specializes in energy control systems and retro-commissioning. Ask them to propose a scope of work and an outline of the procedures and processes to be implemented, including a schedule and the roles of all responsible parties.

Once goals and responsibilities are established, the objective of the investigation process is to understand how the building is currently operating, identify the issues, and determine the most cost-effective way to improve performance. The retro-commissioning agent will review building documentation, interview building occupants, and inspect and test the equipment. Information is then compiled into a report and shared with facility staff, who will select which recommendations to implement after reviewing the findings.

The implementation phase puts the selected processes into place. Typical measures may include sensor calibration, equipment schedule changes, damper linkage repair and similar relatively low-cost adjustments—although more expensive sophisticated programming and building control system upgrades may be warranted. Approved measures may be implemented by the agent, the building staff, or by subcontractors. Typically, a combination of these individuals makes up the retro-commissioning team.

After the approved measures are implemented, the team will verify that the changes are working as expected. Baseline and post-case measurements will allow building staff to monitor equipment and ensure that the benefits are maintained.

Upgrade to a Heat Pump System

Electric resistance heating units work by passing an electric current through wires to heat them. The system is 100% efficient since for every unit of electricity consumed, one unit of heat is produced.

But there is a way to convert electricity to create heat at better than a 1:1 ratio. Heat pumps operate on a more efficient principle, the refrigeration cycle. Instead of directly converting electricity to heat, electricity does the work, via a compressor, of moving refrigerant through a system that transfers heat from a cooler place to a warmer place. That system can move three to five as much energy as is available using electric resistance heating methods. Heat pumps work in a similar manner to an air conditioner, except they reverse the cooling process to circulate warm air instead of cold air. Also, heat pumps are generally capable of dispensing refrigerated air as they can typically be operated in air conditioning mode.

Electric resistance heat, including electric furnaces and baseboard heaters, can be inexpensive to install but often expensive to run. Facilities with these systems can save substantial energy at a moderate cost by installing a heat pump when they replace a central air conditioner.

Even in buildings without central air-conditioning, there are opportunities to save energy when an existing electric furnace needs to be replaced, as well as opportunities to install ductless electric heat pumps in buildings with baseboard electric heaters and electric fan coils. Unit ventilators with built-in electric resistance heaters can be replaced with unit ventilators with integrated heat pumps.

Electric heat pumps have high coefficient of performance (COP) ratings and are substantially more efficient than traditional electric heating systems. Further investigation is required to determine whether installing a heat pump system is a cost-effective solution when replacing existing electrical heating systems.

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.

Operation and maintenance (O&M) plans enhance the operational efficiency of HVAC and other energy intensive systems and could save 5% –20% of the energy usage in your building without substantial capital investment. A successful plan includes your records of energy usage trends and costs, building equipment lists, current maintenance practices, and planned capital upgrades, and it incorporates your ideas for improved building operation. Your plan will address goals for energy-efficient operation, provide detail on how to reach the goals, and outline procedures for measuring and reporting whether goals have been achieved.

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 cannot manage what you do not 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[7]. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

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 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.

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.

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

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 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.

Economizer Maintenance

Economizers can significantly reduce cooling system load. A malfunctioning economizer can increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air. Common economizer malfunctions include broken outdoor thermostat or enthalpy control or dampers that are stuck or improperly adjusted.

Periodic inspection and maintenance will keep economizers working in sync with the heating and cooling system. This maintenance should be part of annual system maintenance, and it should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position.

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.

Ductwork Maintenance

Duct maintenance has two primary goals: keep the ducts clean to avoid air quality problems and seal leaks to save energy. Check for cleanliness, obstructions that block airflow, water damage, and leaks. Ducts should be inspected at least every two years.

The biggest symptoms of clogged air ducts are differing temperatures throughout the building and areas with limited airflow from supply registers. If a particular air duct is clogged, then air flow will only be cut off to some rooms in the building—not all of them. The reduced airflow will make it more difficult for those areas to reach the temperature setpoint, which will cause the HVAC system to run longer to cool or heat that area properly. If you suspect clogged air ducts, ensure that all areas in front of supply registers are clear of items that may block or restrict air flow, and you should check for fire dampers or balancing dampers that have failed closed.

Duct leakage in commercial buildings can account for 5%–25% 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. Eliminating duct leaks can improve ventilation system performance and reduce heating and cooling system operation.

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.

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.

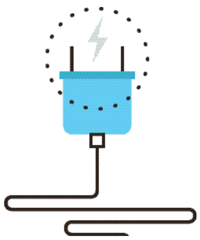
Water Heater Maintenance

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[8]. Your local utility may offer incentives or rebates for this equipment.

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[9] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[10] 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.

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

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

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

Procurement Strategies

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

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.

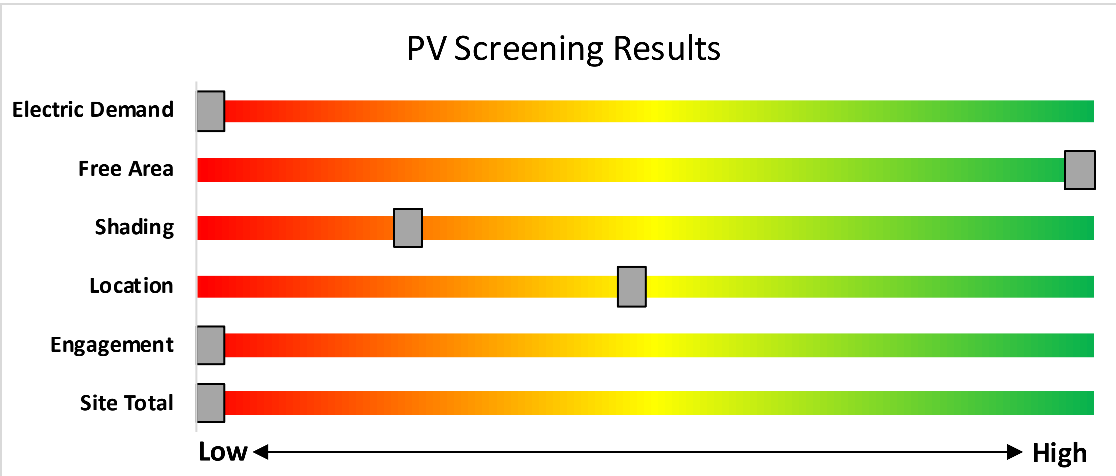


Figure 8 - Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available for solar projects. Solar projects may qualify to earn SREC- IIs (Solar Renewable Energy Certificates-II), however, the project owners *must* register their solar projects prior to the start of construction to establish the project's eligibility.

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:

Successor Solar Incentive Program (SuSI): https://www.njcleanenergy.com/renewable-energy/programs/susi-program

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

6.2 Combined Heat and Power

Combined heat and power (CHP) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

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

The key criteria used for screening is the amount of time that the CHP system would operate at full load and the facility's ability to use the recovered heat. Facilities with a continuous need for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has 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.

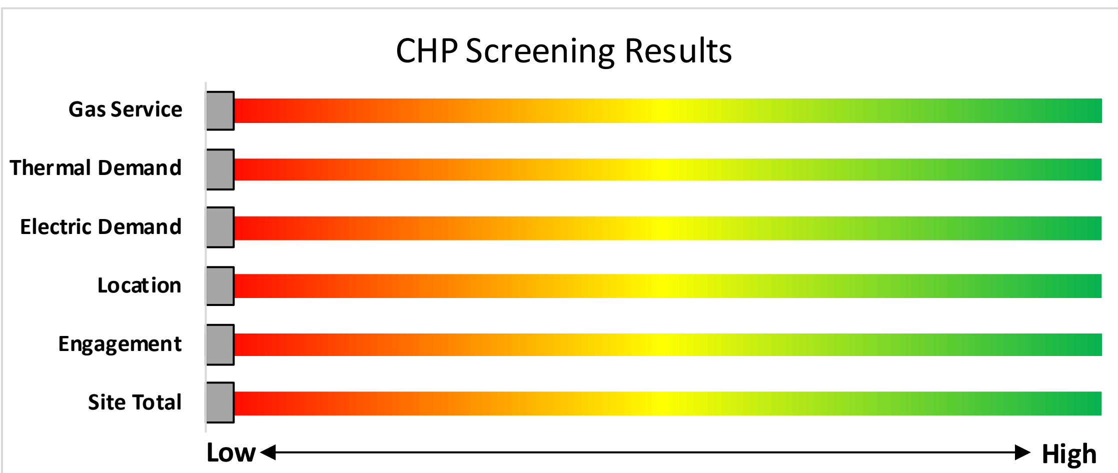


Figure 9 - Combined Heat and Power Screening

Find a qualified firm that specializes in commercial CHP cost assessment and installation: [http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.](http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/)

7 Electric Vehicles (EV)

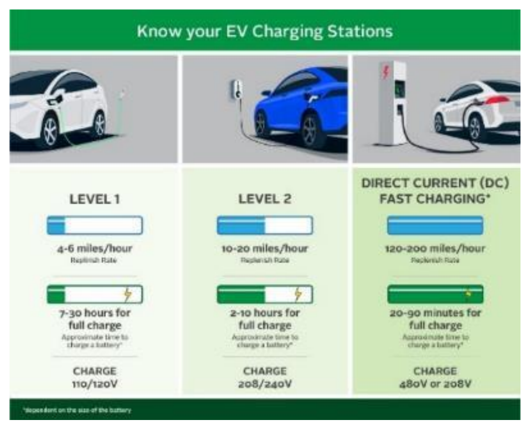
All electric vehicles (EVs) have an electric motor instead of an internal combustion engine. EVs function by plugging into a charge point, taking electricity from the grid, and then storing it in rechargeable batteries. Although electricity production may contribute to air pollution, the U.S. EPA categorizes all-electric vehicles as zero-emission vehicles because they produce no direct exhaust or tailpipe emissions.

EVs are typically more expensive than similar conventional and hybrid vehicles, although some cost can be recovered through fuel savings, federal tax credit, or state incentives.

7.1 Electric Vehicle Charging

EV charging stations provide a means for electric vehicle operators to recharge their batteries at a facility. While many EV drivers charge at home, others do not have access to regular home charging, and the ability to charge at work or in public locations is critical to making EVs practical for more drivers. Charging can also be used for electric fleet vehicles, which can reduce fuel and maintenance costs for fleets that replace gas or diesel vehicles with EVs.

EV charging comes in three main types. For this assessment, the screening considers addition of Level 2 charging, which is most common at workplaces and other public locations. Depending on the site type and usage, other levels of charging power may be more appropriate.



The preliminary assessment of EV charging at the facility shows that there is high potential for adding EV chargers to the facility's parking, based on potential costs of installation and other site factors.

The primary costs associated with installing EV charging are the charger hardware and the cost to extend power from the facility to parking spaces. This may include upgrades to electric panels to serve increased loads.

The type and size of the parking area impact the costs and feasibility of adding EV charging. Parking structure installations can be less costly than surface lot installations as power may be readily available, and equipment and wiring can be surface mounted. Parking lot installations often require trenching through concrete or asphalt surface. Large parking areas provide greater flexibility in charger siting than smaller lots.

The location and capacity of facility electric panels also impact charger installation costs. A Level 2 charger generally requires a dedicated 208-240V, 40 Amp circuit. The electric panel nearest the planned installation may not have available capacity and may need to be upgraded to serve new EV charging loads. Alternatively, chargers could be powered from a more distant panel. The distance from the panel to the location of charging stations ties directly to costs, as conduits, cables, and potential trenching costs all increase on a per-foot basis. The more charging stations planned, the more likely it is that additional electrical capacity will be needed.

Other factors to consider when planning for EV charging at a facility include who the intended users are, how long they park vehicles at the site, and whether they will need to pay for the electricity they use.

The graphic below displays the results of the EV charging assessment conducted as part of this audit. The position of each slider indicates the impact each factor has on the feasibility of installing EV charging at the site.

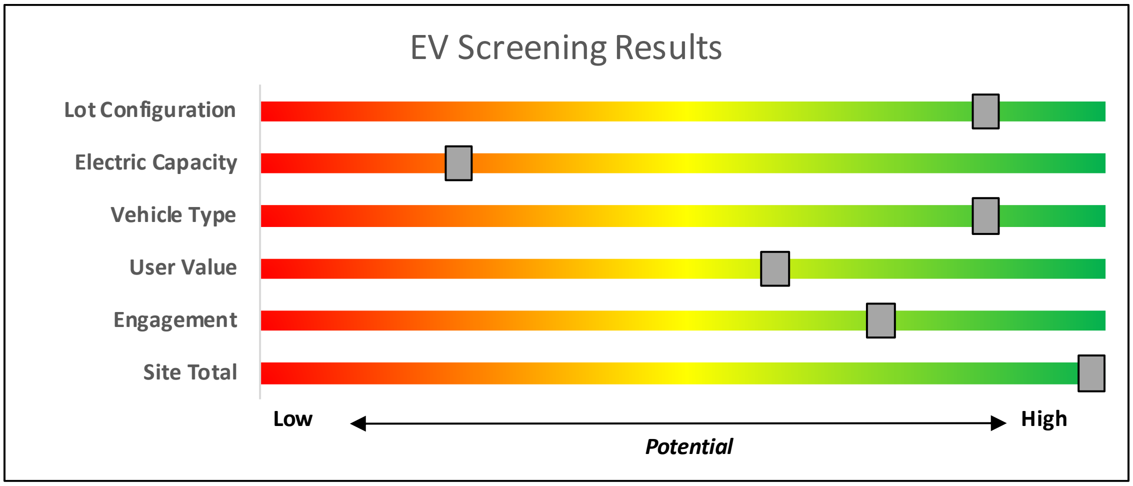


Figure 10 – EV Charger Screening

Electric Vehicle Programs Available

New Jersey is leading the way on electric vehicle (EV) adoption on the East Coast. There are several programs designed to encourage EV adoption in New Jersey, which is crucial to reaching a 100% clean energy future.

NJCEP offers a variety of EV programs for vehicles, charging stations, and fleets. Certain EV charging stations that receive electric utility service from Atlantic City Electric Company (ACE) or Public Service Electric & Gas Company (PSE&G), may be eligible for additional electric vehicle charging incentives directly from the utility. Projects may be eligible for both the incentives offered by this BPU program and incentives offered by ACE or PSE&G, up to 90% of the combined charger purchase and installation costs. Please check ACE or PSE&G program eligibility requirements before purchasing EV charging equipment, as additional conditions on types of eligible chargers may apply for utility incentives.

Both Jersey Central Power & Light (JCP&L) and Rockland Electric (RECO) have filed proposals for EV charging programs. BPU staff is currently reviewing those proposals.

For more information and to keep up to date on all EV programs please visit https://www.njcleanenergy.com/commercial-industrial/programs/electric-vehicle-programs.

8 Project Funding and Incentives

Ready to improve your building's performance? New Jersey's Clean Energy Programs and Utility Energy Efficiency Programs can help. Pick the program that works best for you. This section provides an overview of currently available incentive programs in.

8.1 Utility Energy Efficiency Programs

The Clean Energy Act, signed into law by Governor Murphy in 2018, requires New Jersey's investor-owned gas and electric utilities to reduce their customers' use by set percentages over time. To help reach these targets the New Jersey Board of Public Utilities approved a comprehensive suite of energy efficiency programs to be run by the utility companies.

Prescriptive and Custom

The Prescriptive and Custom rebate program through your utility provider 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.

Equipment Examples

Lighting
Lighting Controls
HVAC Equipment
Refrigeration
Gas Heating
Gas Cooling
Commercial Kitchen Equipment
Food Service Equipment
Variable Frequency Drives
Electronically Commutate Motors
Variable Frequency Drives
Plug Loads Controls
Washers and Dryers
Agricultural
Water Heating

The Prescriptive program provides fixed incentives for specific energy efficiency measures. Prescriptive incentives vary by equipment type. The Custom program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentives.

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 or less 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.

How to Participate

To participate in Direct Install, you will work with a participating contractor. 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 Direct Install program, subject to program rules and eligibility, while the remaining percent of the cost is paid to the contractor by the customer.

Engineered Solutions

The Engineered Solutions Program provides tailored energy-efficiency assistance and services to municipalities, universities, schools, hospitals and healthcare facilities (MUSH), non-profit entities, and multifamily buildings. Customers receive expert guided services, including investment-grade energy auditing, engineering design, installation assistance, construction administration, commissioning, and measurement and verification (M&V) services to support the implementation of cost-effective and comprehensive efficiency projects. Engineered Solutions is generally a good option for medium to large sized facilities with a peak demand over 200 kW looking to implement as many measures as possible under a single project to achieve deep energy savings. Engineered Solutions 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. Incentives for this program are based on project scope and energy savings achieved.

For more information on any of these programs, contact your local utility provider or visit https://www.njcleanenergy.com/transition.

8.2 New Jersey's Clean Energy Programs

Save money while saving the planet! New Jersey's Clean Energy Program is a statewide program that offers incentives, programs, and services that benefit New Jersey residents, businesses, educational, non-profit, and government entities to help them save energy, money, and the environment.

Large Energy Users

The Large Energy Users Program (LEUP) is designed to foster self-directed investment in energy projects. This program is offered to New Jersey's largest energy customers that annually contribute at least $200,000 to the NJCEP aggregate of all buildings/sites. This equates to roughly $5 million in energy costs in the prior fiscal year.

Incentives

Incentives are based on the specifications below. The maximum incentive per entity is the lesser of:

- $4 million
- 75% of the total project(s) cost
- 90% of total NJCEP fund contribution in previous year
- $0.33 per projected kWh saved; $3.75 per projected Therm saved annually

How to Participate

To participate in LEUP, you will first need submit an enrollment application. This program requires all qualified and approved applicants to submit an energy plan that outlines the proposed energy efficiency work for review and approval. Applicants may submit a Draft Energy Efficiency Plan (DEEP), or a Final Energy Efficiency Plan (FEEP). Once the FEEP is approved, the proposed work can begin.

Detailed program descriptions, instructions for applying, and applications can be found at www.njcleanenergy.com/LEUP.

Combined Heat and Power

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

Incentives

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

Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The program is used to register and certify 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 SREC-IIs (Solar Renewable Energy Certificates-II). SuSI consists of two sub-programs. The Administratively Determined Incentive (ADI) Program and the Competitive Solar Incentive (CSI) Program.

Administratively Determined Incentive (ADI) Program

The ADI Program provides administratively set incentives for net metered residential projects, net metered non-residential projects 5 MW or less, and all community solar projects.

After the registration is accepted, construction is complete, and a complete final as-built packet has been submitted, the project is issued a New Jersey certification number, which enables it to generate New Jersey SREC- IIs.

Market Segments	Size MW dc	Incentive Value ($/SREC II)	Public Entities Incentive Value - $20 Adder ($/SRECII)
Net Metered Residential	All types and sizes	$90	N/A
Small Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects smaller than 1 MW	$100	$120
Large Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects 1 MW to 5 MW	$90	$110
Small Net Metered Non-Residential Ground Mount	Projects smaller than 1 MW	$85	$105
Large Net Metered Non-Residential Ground Mount	Projects 1 MW to 5 MW	$80	$100
LMI Community Solar	Up to 5 MW	$90	N/A
Non-LMI Community Solar	Up to 5 MW	$70	N/A
Interim Subsection (t)	All types and sizes	$100	N/A

Eligible projects may generate SREC-IIs for 15 years following the commencement of commercial operations which is defined as permission to operate (PTO) from the Electric Distribution Company. After 15 years, projects may be eligible for a NJ Class I REC.

SREC-IIs will be purchased monthly by the SREC-II Program Administrator who will allocate the SREC-IIs to the Load Serving Entities (BGS Providers and Third-Party Suppliers) annually based on their market share of retail electricity sold during the relevant Energy Year.

The ADI Program online portal is now open to new registrations.

Competitive Solar Incentive Program

The Competitive Solar Incentive (CSI) Program will provide competitively set incentives for grid supply projects and net metered non-residential projects greater than 5MW (dc). The program is currently under development. For updates, please continue to check the Solar Proceedings page on the New Jersey's Clean Energy Program website.

Solar projects help the State of New Jersey reach renewable energy goals outlined in the state's Energy Master Plan.

If you are considering installing solar photovoltaics on your building, visit the following link for more information: https://njcleanenergy.com/renewable-energy/programs/susi-program.

Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. An ESIP is a type of performance contract, whereby school districts, counties, municipalities, housing authorities, and other public and state entities enter into contracts to help finance building energy upgrades. Annual payments are lower than the savings projected from the energy conservation measures (ECMs), ensuring that ESIP projects are cash flow positive for the life of the contract.

ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs described above can also be used to help further reduce the total project cost of eligible measures.

How to Participate

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an energy services company or "ESCO."

(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.

(3) Use a hybrid approach of the two options described above where the ESCO is used for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the energy savings plan can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program descriptions and application can be found at www.njcleanenergy.com/ESIP.

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

9 Project Development

Energy conservation measures (ECMs) have been identified for your site, and their energy and economic analyses are provided within this LGEA report. Note that some of the identified projects may be mutually exclusive, such as replacing equipment versus upgrading motors or controls. The next steps with project development are to set goals and create a comprehensive project plan. The graphic below provides an overview of the process flow for a typical energy efficiency or renewable energy project. We recommend implementing as many ECMs as possible prior to undertaking a feasibility study for a renewable project. The cyclical nature of this process flow demonstrates the ongoing work required to continually improve building energy efficiency over time. If your building(s) scope of work is relatively simple to implement or small in scope, the measurement and verification (M&V) step may not be required. It should be noted through a typical project cycle, there will be changes in costs based on specific scopes of work, contractor selections, design considerations, construction, etc. The estimated costs provided throughout this LGEA report demonstrate the unburdened turn-key material and labor cost only. There will be contingencies and additional costs at the time of implementation. We recommend comprehensive project planning that includes the review of multiple bids for project work, incorporates potential operations and maintenance (O&M) cost savings, and maximizes your incentive potential.

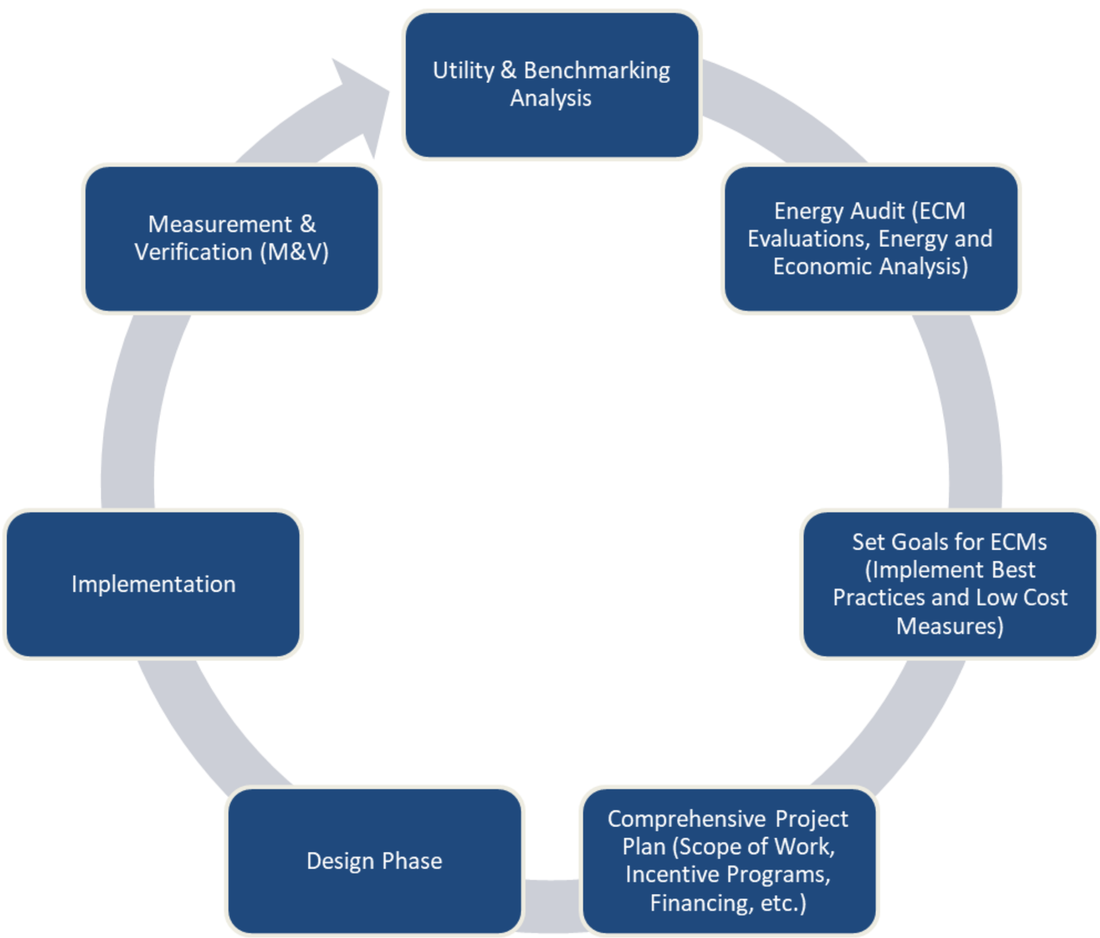


Figure 11 – Project Development Cycle

10 Energy Purchasing and Procurement Strategies

10.1 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. 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[11].

10.2 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 fluctuate monthly. The utility provides basic gas supply service 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[12].

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

[12] 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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Electrical Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.1	389	0	$64	$189	$40	2.3
Locker Room - Men	2	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	4,368	1, 2	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	3,014	0.1	245	0	$41	$50	$4	1.1
Locker Room - Men	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	1, 2	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,014	0.5	2,055	-1	$340	$708	$155	1.6
Locker Room - Women	2	Compact Fluorescent: (1) 26W Double Biaxial Plug-In Lamp	Wall Switch	S	26	4,368	1, 2	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	19	3,014	0.0	119	0	$20	$25	$2	1.2
Locker Room - Women	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1, 2	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.1	583	0	$97	$380	$65	3.3
Locker Room - Women	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,368	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.1	363	0	$60	$145	$20	2.1
Office - Pro Shop #1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	153	0	$25	$37	$10	1.0
Office - Pro Shop #2	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	153	0	$25	$37	$10	1.0
Office - Pro Shop #3	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	1	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,368	0.0	81	0	$13	$18	$5	1.0
Office - Pro Shop #3	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	153	0	$25	$37	$10	1.0
Pro Shop - Store	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
Pro Shop - Store	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.5	2,041	-1	$338	$653	$140	1.5
Stairs - Entrance	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs - Entrance	3	Incandescent: (1) 60W PAR30 Screw-In Lamp	Wall Switch		60	4,368	1, 2	Relamp	Yes	3	LED Lamps: PAR30 Lamps	Occupancy Sensor	9	3,014	0.2	747	0	$124	$295	$114	1.5
Stairs - Entrance	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch		9	4,368	2	None	Yes	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	3,014	0.0	26	0	$4	$0	$0	0.0
Stairs - Entrance	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch		62	4,368	1, 2	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.0	182	0	$30	$72	$10	2.1
Dining Area	26	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	4,368	2	None	Yes	26	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	3,014	0.1	336	0	$56	$540	$70	8.5
Dining Area	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	153	0	$25	$37	$10	1.0
Kitchen	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	4,368	2	None	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.0	83	0	$14	$270	$35	17.1
Restroom - Female 2nd	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	4,368	1	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	4,368	0.0	74	0	$12	$33	$6	2.2
Restroom - Male 2nd	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	4,368	1	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	4,368	0.0	74	0	$12	$33	$6	2.2
Storage - Kitchen	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.1	389	0	$64	$189	$40	2.3
Mechanical Room	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	4,368	1, 2	Relamp	Yes	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,014	0.1	295	0	$49	$368	$53	6.4
Stairs to 3rd Floor	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch		33	4,368	1, 2	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,014	0.0	197	0	$33	$290	$82	6.4
Exterior	6	LED Lamps: (1) 12W A19 Screw-In Lamp	Timeclock		12	4,380		None	No	6	LED Lamps: (1) 12W A19 Screw-In Lamp	Timeclock	12	4,380	0.0	0	0	$0	$0	$0	0.0

	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior	1	LED - Fixtures: Bollard Fixture	Timeclock		20	4,380		None	No	1	LED - Fixtures: Bollard Fixture	Timeclock	20	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior	2	LED Lamps: (1) 12W Corn Bulb Screw-In Lamp	Timeclock		12	4,380		None	No	2	LED Lamps: (1) 12W Corn Bulb Screw-In Lamp	Timeclock	12	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior	4	LED - Fixtures: Ceiling Mount	Timeclock		20	4,380		None	No	4	LED - Fixtures: Ceiling Mount	Timeclock	20	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior	2	LED - Fixtures: Wall Pack	Timeclock		20	4,380		None	No	2	LED - Fixtures: Wall Pack	Timeclock	20	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior	4	LED - Fixtures: Wall Pack	Timeclock		40	4,380		None	No	4	LED - Fixtures: Wall Pack	Timeclock	40	4,380	0.0	0	0	$0	$0	$0	0.0

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?	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	Combustion Air Fan	2	Combustion Air Fan	0.2	70.0%	No			W	55		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior	Exhaust Fan	3	Exhaust Fan	0.3	70.0%	No			W	4,380		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	Heating Hot Water Pump	1	DHW Circulation Pump	0.2	70.0%	No			W	8,760		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior	Kitchen Hood Exhaust Fan	1	Kitchen Hood Exhaust Fan	0.5	70.0%	No			W	4,380	3, 4	Yes	78.2%	Yes	1	0.0	1,772	20	$831	$3,136	$50	3.7
Electrical Room	Other	2	Other	1.0	77.0%	No	Myers	C48AB64AO3	W	1,460		No	77.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior	Other	1	Other	1.0	86.0%	No			W	300		No	86.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	AHU Supply Fan	2	Supply Fan	2.0	86.0%	No			W	4,380		No	86.0%	No		0.0	0	0	$0	$0	$0	0.0

Packaged 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)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	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/IEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior	Condensing Unit	1	Split-System Air-Source HP	7.50	26.58	10.10	3.2 COP	Lennox	HP29-090	B	5	Yes	1	Split-System Air-Source HP	7.50	26.58	12.80	3.5 COP	0.9	1,817	0	$321	$14,347	$578	42.9
Exterior	Condensing Unit	1	Split-System Air-Source HP	10.00	37.53	10.10	3.2 COP	Lennox	HP29-120	B	5	Yes	1	Split-System Air-Source HP	10.00	37.53	12.80	3.5 COP	1.3	2,432	0	$429	$19,406	$770	43.4
Mechanical Room	Furnace	2	Forced Air Furnace		160.00		0.8 Et	Reznor	Nortek HVAC M/N X--200	W	6	Yes	2	Forced Air Furnace		160.00		0.97 AFUE	0.0	0	4	$97	$9,065	$1,000	83.4
Stairs to 3rd Floor	Through-the-Wall Heat Pump	1	Through-The-Wall HP	2.00	3.41	10.00	1 COP	Sea Breeze	Obscured	W		No							0.0	0	0	$0	$0	$0	0.0

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Domestic Water Heater	Domestic Water Heater	7	20	0.75	0.0	0	1	$13	$239	$40	15.7

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	Storage Water Heater	1	Storage Tank Water Heater (> 50 Gal)	Bradford White	RG275H6X	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Locker Room - Men	8	3	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	1	$14	$22	$11	0.7
Locker Room - Women	8	2	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	0	$10	$14	$7	0.7
Restroom - Female 2nd	8	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	0	$5	$7	$4	0.7
Restroom - Male 2nd	8	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	0	$5	$7	$4	0.7

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Dining Area	1	Freezer Chest	nameplate obscured		No	10	Yes	0.4	3,201	0	$565	$1,950	$0	3.5
Storage - Kitchen	1	Freezer Chest	nameplate obscured		No	10	Yes	0.4	3,201	0	$565	$1,950	$0	3.5
Dining Area	2	Refrigerator Chest	nameplate obscured		No	10	Yes	0.2	2,055	0	$363	$2,500	$0	6.9
Pro Shop - Store	1	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	Blueair	BKGM12-HC	No	10	Yes	0.1	723	0	$128	$1,674	$75	12.5
Dining Area	1	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	Metalfrio	NG11CHC	No	10	Yes	0.1	722	0	$127	$1,516	$75	11.3
Dining Area	1	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	Imbera	VR13	No	10	Yes	0.1	723	0	$128	$1,656	$75	12.4
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Beverage-Air Corp	HF1HC-1S	Yes		No	0.0	0	0	$0	$0	$0	0.0

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Dining Area	1	Ice Making Head (<450 lbs/day), Batch	Manitowoc	IYF0300A	No	10	Yes	0.1	652	0	$115	$4,444	$75	38.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Dining Area	1	Convection Oven (Half Size)	Baker's Pride		No		No	0.0	0	0	$0	$0	$0	0.0
Dining Area	2	Electric Fryer			No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Gas Fryer			No		No	0.0	0	0	$0	$0	$0	0.0
Dining Area	1	Electric Griddle (3 Feet Width)			No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Gas Rack Oven (Single)			No		No	0.0	0	0	$0	$0	$0	0.0

Dishwasher Inventory & Recommendations

	Existing Conditions							Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Manufacturer	Model	Water Heater Fuel Type	Booster Heater Fuel 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	Estimated M&L Cost ($)	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Door Type (High Temp)	CMA	CMA-180	Electric	N/A	No	9	Yes	1.0	9,072	0	$1,601	$9,270	$700	5.4
Kitchen	1	Undercounter (High Temp)	Hobart	N/A	Electric	N/A	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?	Manufacturer	Model
Dining Area Coffee Machine	2	Coffee Machine	500	No		
Office - Pro Shop #1 Desktop	2	Desktop	120	No		
Office - Pro Shop #2 Desktop	1	Desktop	120	No		
Office - Pro Shop #3 Desktop	1	Desktop	120	No		
Pro Shop - Store Desktop	3	Desktop	120	No		
Stairs - Entrance Desktop	1	Desktop	120	No		
Dining Area Desktop	1	Desktop	120	No		
Office - Pro Shop #3 Microwave	1	Microwave	1,000	No		
Dining Area Microwave	1	Microwave	1,000	No		
Kitchen Microwave	1	Microwave	1,000	No		
Dining Area Printer (Medium/Small)	1	Printer (Medium/Small)	450	No		
Office - Pro Shop #3 Printer/Copier (Large)	1	Printer/Copier (Large)	600	No		
Dining Area Serving Table (Chilled/Heated)	1	Serving Table (Chilled/Heated)	500	No		
Dining Area Television	4	Television	224	No		
Office - Pro Shop #3 Refrigerator (Mini)	1	Refrigerator (Mini)	174	No		
Dining Area Refrigerator (Mini)	3	Refrigerator (Mini)	174	No		
Kitchen Refrigerator (Mini)	1	Refrigerator (Mini)	174	No		
Kitchen Refrigerator (Residential)	2	Refrigerator (Residential)	340	No		
Storage - Kitchen Refrigerator (Residential)	1	Refrigerator (Residential)	340	No		

APPENDIX B: ENERGY STAR STATEMENT OF ENERGY PERFORMANCE

Energy use intensity (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]

John Gaffney Green Tree Golf Course

Primary Property Type: Other - Recreation
Gross Floor Area (ft²): 15,500
Built: 1971

For Year Ending: December 31, 2021
Date Generated: November 27, 2023

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
John Gaffney Green Tree Golf Course 1030 Somers Point Road Egg Harbor Township, New Jersey 8234	Atlantic County 1227 Drexel Avenue Atlantic City, NJ 08401 (609) 343-2284	Chris Palermo 1227 Drexel Avenue PO Box 1107 Atlantic City, NJ 08404-1107 (609) 343-2284 Palermo_christopher@aclink.org

Property ID: 23954922

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
31.4 kBtu/ft²

Source EUI
85.2 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	462,667 (95%)
Propane (kBtu)	24,419 (5%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	41.3
National Median Source EUI (kBtu/ft²)	112
% Diff from National Median Source EUI	-24%
Annual Emissions	
Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	54

Signature & Stamp of Verifying Professional

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

LP Signature: ______________________Date: ___________

Licensed Professional

____ ________
,
(___)____-______
____

Professional Engineer or Registered Architect Stamp (if applicable)

APPENDIX C: GLOSSARY

TERM	DEFINITION
Blended Rate	Used to calculate fiscal savings associated with measures. The blended rate is calculated by dividing the amount of your bill by the total energy use. For example, if your bill is $22,217.22, and you used 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
Btu	*British thermal unit*: a unit of energy equal to the amount of heat required to increase the temperature of one pound of water by one-degree Fahrenheit.
CHP	*Combined heat and power*. Also referred to as cogeneration.
COP	*Coefficient of performance*: a measure of efficiency in terms of useful energy delivered divided by total energy input.
Demand Response	Demand response reduces or shifts electricity usage at or among participating buildings/sites during peak energy use periods in response to time-based rates or other forms of financial incentives.
DCV	*Demand control ventilation*: a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
US DOE	*United States Department of Energy*
EC Motor	*Electronically commutated motor*
ECM	*Energy conservation measure*
EER	*Energy efficiency ratio*: a measure of efficiency in terms of cooling energy provided divided by electric input.
EUI	*Energy Use Intensity:* measures energy consumption per square foot and is a standard metric for comparing buildings' energy performance.
Energy Efficiency	Reducing the amount of energy necessary to provide comfort and service to a building/area. Achieved through the installation of new equipment and/or optimizing the operation of energy use systems. Unlike conservation, which involves some reduction of service, energy efficiency provides energy reductions without sacrifice of service.
ENERGY STAR	ENERGY STAR is the government-backed symbol for energy efficiency. The ENERGY STAR program is managed by the EPA.
EPA	*United States Environmental Protection Agency*
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
GHG	*Greenhouse gas* gases that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.
gpf	*Gallons per flush*

gpm	*Gallon per minute*
HID	*High intensity discharge:* high-output lighting lamps such as high-pressure sodium, metal halide, and mercury vapor.
hp	*Horsepower*
HPS	*High-pressure sodium*: a type of HID lamp.
HSPF	*Heating seasonal performance factor:* a measure of efficiency typically applied to heat pumps. Heating energy provided divided by seasonal energy input.
HVAC	*Heating, ventilating, and air conditioning*
IHP 2014	US DOE Integral Horsepower rule. The current ruling regarding required electric motor efficiency.
IPLV	*Integrated part load value:* a measure of the part load efficiency usually applied to chillers.
kBtu	One thousand British thermal units
kW	*Kilowatt*: equal to 1,000 Watts.
kWh	*Kilowatt-hour*: 1,000 Watts of power expended over one hour.
LED	*Light emitting diode*: a high-efficiency source of light with a long lamp life.
LGEA	*Local Government Energy Audit*
Load	The total power a building or system is using at any given time.
Measure	A single activity, or installation of a single type of equipment, which 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 (II)	*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.