Local Government Energy Audit Report

Red Gables

November 7, 2023

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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.

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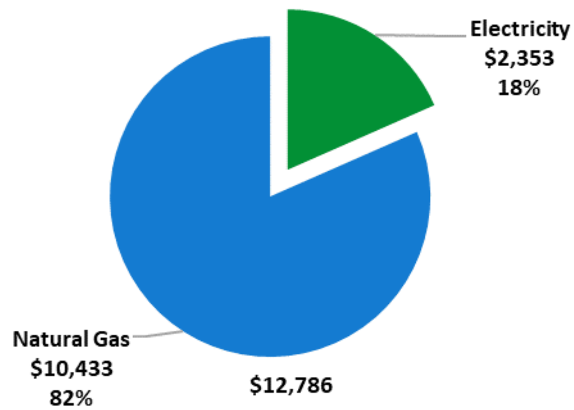
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Red Gables. 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: $12,786 Electricity: 10,584 kWh Natural Gas: 7,210 Therms	
ENERGY STAR® Benchmarking Score	N/A *(1-100 scale)*	A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.

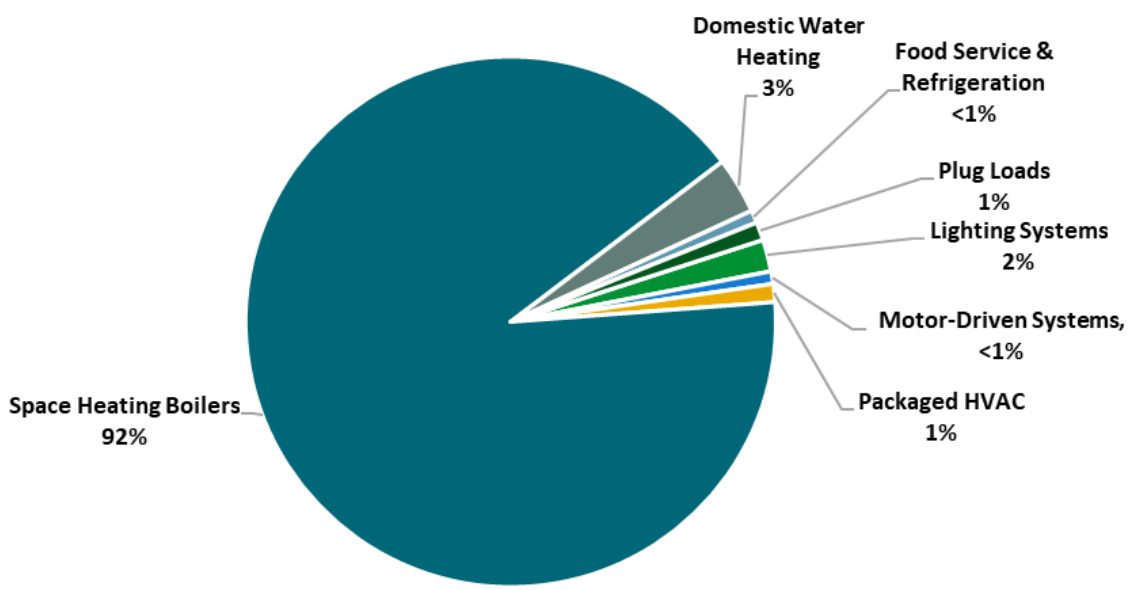


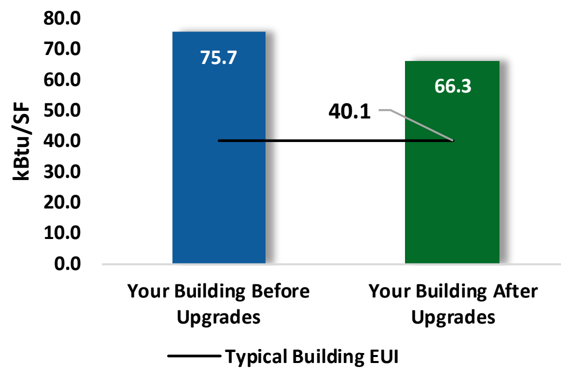
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

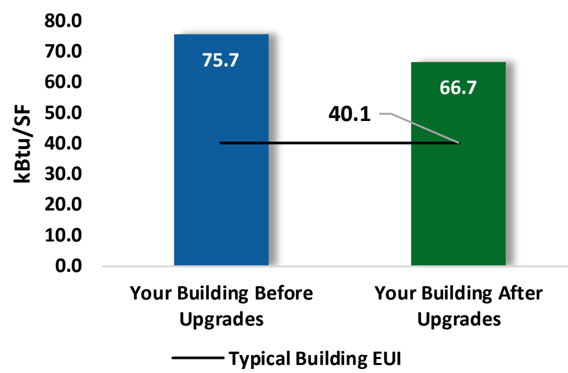
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$25,791
Potential Rebates & Incentives[1]	$1,556
Annual Cost Savings	$1,694
Annual Energy Savings	Electricity: 1,942 kWh Natural Gas: 872 Therms
Greenhouse Gas Emission Savings	6 Tons
Simple Payback	14.3 Years
Site Energy Savings (All Utilities)	12%



Scenario 2: Cost Effective Package[2]

Installation Cost	$14,416
Potential Rebates & Incentives	$756
Annual Cost Savings	$1,542
Annual Energy Savings	Electricity: 1,378 kWh Natural Gas: 854 Therms
Greenhouse Gas Emission Savings	6 Tons
Simple Payback	8.9 Years
Site Energy Savings (all utilities)	12%



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			**792**	**1.2**	**0**	**$174**	**$1,056**	**$132**	**$924**	**5.3**	**778**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	51	0.1	0	$11	$69	$10	$59	5.3	50
ECM 2	Retrofit Fixtures with LED Lamps	Yes	741	1.2	0	$163	$987	$122	$865	5.3	728
Lighting Control Measures			**657**	**0.1**	**0**	**$146**	**$3,037**	**$560**	**$2,477**	**17.0**	**660**
ECM 3	Install Occupancy Sensor Lighting Controls	No	56	0.1	0	$12	$2,387	$385	$2,002	162.2	55
ECM 4	Install Photocell Controls	Yes	585	0.0	0	$130	$200	$0	$200	1.5	589
ECM 5	Install High/Low Lighting Controls	No	15	0.0	0	$3	$450	$175	$275	82.2	15
Variable Frequency Drive (VFD) Measures			**393**	**0.1**	**0**	**$87**	**$6,272**	**$100**	**$6,172**	**70.7**	**395**
ECM 6	Install VFDs on Heating Water Pumps	No	393	0.1	0	$87	$6,272	$100	$6,172	70.7	395
Unitary HVAC Measures			**100**	**0.2**	**0**	**$22**	**$892**	**$0**	**$892**	**40.1**	**101**
ECM 7	Install High Efficiency Air Conditioning Units	No	100	0.2	0	$22	$892	$0	$892	40.1	101
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**41**	**$596**	**$11,785**	**$400**	**$11,385**	**19.1**	**4,821**
ECM 8	Install High Efficiency Hot Water Boilers	Yes	0	0.0	41	$596	$11,785	$400	$11,385	19.1	4,821
HVAC System Improvements			**0**	**0.0**	**39**	**$568**	**$1,221**	**$178**	**$1,043**	**1.8**	**4,592**
ECM 9	Install Pipe Insulation	Yes	0	0.0	39	$568	$1,221	$178	$1,043	1.8	4,592
Domestic Water Heating Upgrade			**0**	**0.0**	**7**	**$102**	**$1,528**	**$186**	**$1,343**	**13.2**	**824**
ECM 10	Install High Efficiency Gas-Fired Water Heater	No	0	0.0	2	$27	$1,375	$140	$1,235	45.6	219
ECM 11	Install Low-Flow DHW Devices	Yes	0	0.0	5	$75	$154	$46	$108	1.4	605
TOTALS (COST EFFECTIVE MEASURES)			**1,378**	**1.2**	**85**	**$1,542**	**$14,416**	**$756**	**$13,660**	**8.9**	**11,385**
TOTALS (ALL MEASURES)			**1,942**	**1.7**	**87**	**$1,694**	**$25,791**	**$1,556**	**$24,235**	**14.3**	**12,171**

* - 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 Red Gables. 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 July 19, 2023, TRC performed an energy audit at Red Gables located in Montclair, New Jersey. TRC met with Ariana Bullard to review the facility operations and help focus our investigation on specific energy-using systems.

Red Gables is a three-story building with a basement, totaling 10,000 square feet and built in 1906. The top floor is an apartment with four bedrooms, kitchen, and two bathrooms. The rest of building consists of offices, classrooms, kitchen, corridors, stairwells, bathrooms, enclosed porches, various closets, and a basement mechanical and storage space. The building has historical landmark status.

Recent improvements and Facility Concerns

In the past few years, much of the lighting was converted to LED technology. A few of the apartment A/C units have been replaced by newer units with high efficiency ratings.

Facility raised concerns about lack of building insulation and air infiltration in general.

2.2 Building Occupancy

The facility is occupied continuously year-round due to the top floor apartment, which does not have its own designated entrance.

The basement is unfinished and used as general storage space and houses the bulk of the building's mechanical equipment. It is occupied sporadically as needed.

This first and second floors are used for the Sanctuary's religious school. Classes are held in Red Gables from September through May for three hours on Mondays, Wednesdays, and Saturdays. The building is leased out for other uses, such as to another group for services on Saturdays. The building is also used for summer camp a few weeks every year.

Building Name	Weekday/Weekend	Operating Schedule
First and Second Floor	Monday, Wednesday	9:00 AM - 5:00 PM
	Saturday	9:00 AM - 5:00 PM
Residential Third Floor	Weekday	12:00 AM - 12:00 AM
	Weekend	12:00 AM - 12:00 AM

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are brick and concrete block over wood with a mix of concrete and brick facade. The ceramic terracotta roof is pitched and original to the building, but in good condition. The walls are a plaster interior finish. The building walls, ceilings, and floors are uninsulated.

The windows are original to the building and single paned with storm windows and have wood frames. The storm windows are not tightly sealed. Many windows do not have the storm windows since they are not standard size. Some of the windows are stained glass. A number of the windows were cracked or even had holes in them and were in conditioned spaces of the building. The glass-to-frame seals are in poor condition. The operable window weather seals are in poor condition, showing evidence of excessive wear. Exterior doors have wood frames and are in fair condition but are either missing weather stripping or have worn door seals. Degraded window and door seals increase drafts and outside air infiltration.

Additionally, there are a number of old fireplaces throughout the building that are no longer used. It is unclear if these are sufficiently sealed.

Exterior

Exterior

Brick and Cement Foundation

Broken Windows

Broken Windows

Broken Windows

Second Floor Emergency Exit

Sun Porch Door

Gap under Front Door


Wooden Window Frames in poor condition


Storm Window Seals in poor condition


Window Seals in poor condition

2.4 Lighting Systems

Most lighting had LED A19 lamps or candelabra bulbs. In closets, back hallways, basement and a few places in the apartment, there were several cans and sconces with incandescent or compact fluorescent lamps (CFL) screw-ins.

Fixtures are primarily a mix of pendant 2-lamp fixtures, wall sconces, ceiling mounted fixtures, and chandeliers. Most fixtures are in good condition or original to the building.

There are a handful of 4-foot, T8 linear fluorescent fixtures such as in the common area kitchen, first and second floor back hallways, and second-floor bathrooms. These are primarily 2-lamp, recessed prismatic fixtures.

Exit signs are LED. Interior lighting levels were generally sufficient.


Pendant Fixture with A19 LEDs (Present in most of the classrooms)


Corridor Ceiling Mounted Fixture


LED candelabra bulbs


Wall Sconce


Wall Sconce


Recessed Linear Fluorescent Prismatic Fixture

Exit Sign


Chandelier


CFL in Basement Mechanical

Lighting fixtures are controlled manually by wall switches and draw strings.


Bathroom Wall Switch


Halogen Bulb with a draw String in Basement


Incandescent Bulbs in a Closet with a Draw String

Exterior fixtures include LED wall packs and hardwired parking lot pole lights.

Exterior light fixtures are controlled by switches and breakers.


Parking Lot LED Pole Lights


LED Wall Pack

2.5 Air Handling Systems

Unitary Electric HVAC Equipment

The building's only cooling is done through ten window air conditioning (AC) units spread between the classrooms and apartment bedrooms. These vary in capacity between 0.5 tons and 1 ton. The units range from new to poor condition. They range in efficiency between 7.5 EER to 12.10 EER. Very few are ENERGY STAR label. The building is used only sporadically in the summer months, so these units have very few hours after balancing against the utility bills.


Blue Room A/C


Hearth Room A/C


Sunroom Porch A/C

Unitary Heating Equipment

The entrance foyer has a small electric resistance heating unit.


Entrance Radiator

2.6 Heating Hot Water Systems

One Weil-McLain natural gas 280 MBh hot water boiler serves the building's heating load. The burners are non-modulating with a nominal AFUE efficiency of 80%. Installed in 1994, the boiler is nearing the end of what is typically defined as its useful life.

The hydronic distribution system is a two-pipe, heating-only system.

The boiler is configured in a constant flow primary distribution with two, 1/2 hp heating hot water (HHW) pumps operating with a manual lead-lag control scheme. The boiler provides hot water to fin tube and cast iron radiators throughout the building. However, the first floor had very few radiators, with most of the distribution going towards heating the second and third floors.

No pipes in the building are insulated. Heating hot water supply pipes can be seen throughout the entire basement, which is an unfinished space used primarily for storage. In the basement alone, there are roughly 20 feet of 1.5-inch diameter and 50 feet of 1-inch diameter pipes.

The system is controlled by local controls throughout the building.

Boiler

HHW Pumps

Uninsulated Piping

Uninsulated HHW Supply Piping

Uninsulated HHW Supply Piping

Uninsulated Piping

Fin Tube Radiator

Cast Iron Radiator

2.7 Domestic Hot Water

Domestic hot water (DHW) is produced by a Bradford White 40-gallon, 40 MBh gas-fired storage water heater with a thermal efficiency of 79%.

One, 1/8 hp circulation pump distributes water to end uses. The circulation pump operates continuously.

No DHW pipes in the building are insulated, apart from a small length found in the apartment's kitchen. There is roughly 18 feet of 1-inch diameter uninsulated DHW supply pipes visible in the basement and 1 foot in the apartment kitchen closet.

DHW Heater and uninsulated piping

DHW Circulation Pump

Apartment Kitchen Closet DHW pipes

2.8 Plug Load

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 is one computer workstation in the facility, possibly more depending on apartment residents. Plug loads include general café and office equipment such as microwaves, toasters, coffeemakers, and printers. The microwaves are older models. There are also a handful of televisions.

There are also several electric space heaters that are used, particularly on the first floor of the building where there are fewer built-in hot water radiators. Apartment residents were also using a number of standing fans at the time of the audit instead of the window air conditioning units.

There is a residential-style refrigerator in the apartment kitchen, which also have a full natural gas oven-stovetop range. The common kitchen on the first floor has a mini fridge and an older Kenmore undercounter dishwasher with a heating cycle. These vary in condition and efficiency.

Apartment Microwave *Gas Range* *First Floor Kitchen*

2.9 Water-Using Systems

There are six restrooms with toilets and sinks, one of which also has a urinal. Faucet flow rates are at 1.5 gallons per minute (gpm) or higher. The gallons per flush (gpf) of the toilets are 1.6 gpf and the urinal 1.0 gpf.

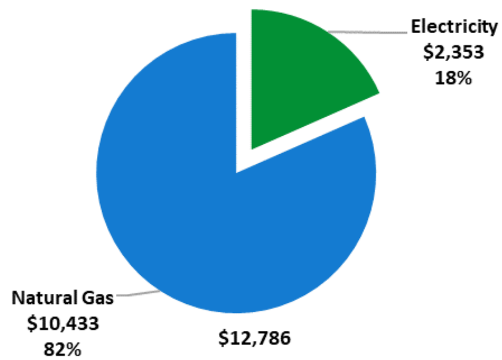
One of the apartment restrooms has a shower and showerheads are rated at 1.5 gpm.

Restroom Sinks *Kitchen Faucet*

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	10,584 kWh	$2,353
Natural Gas	7,210 Therms	$10,433
Total		**$12,786**



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.

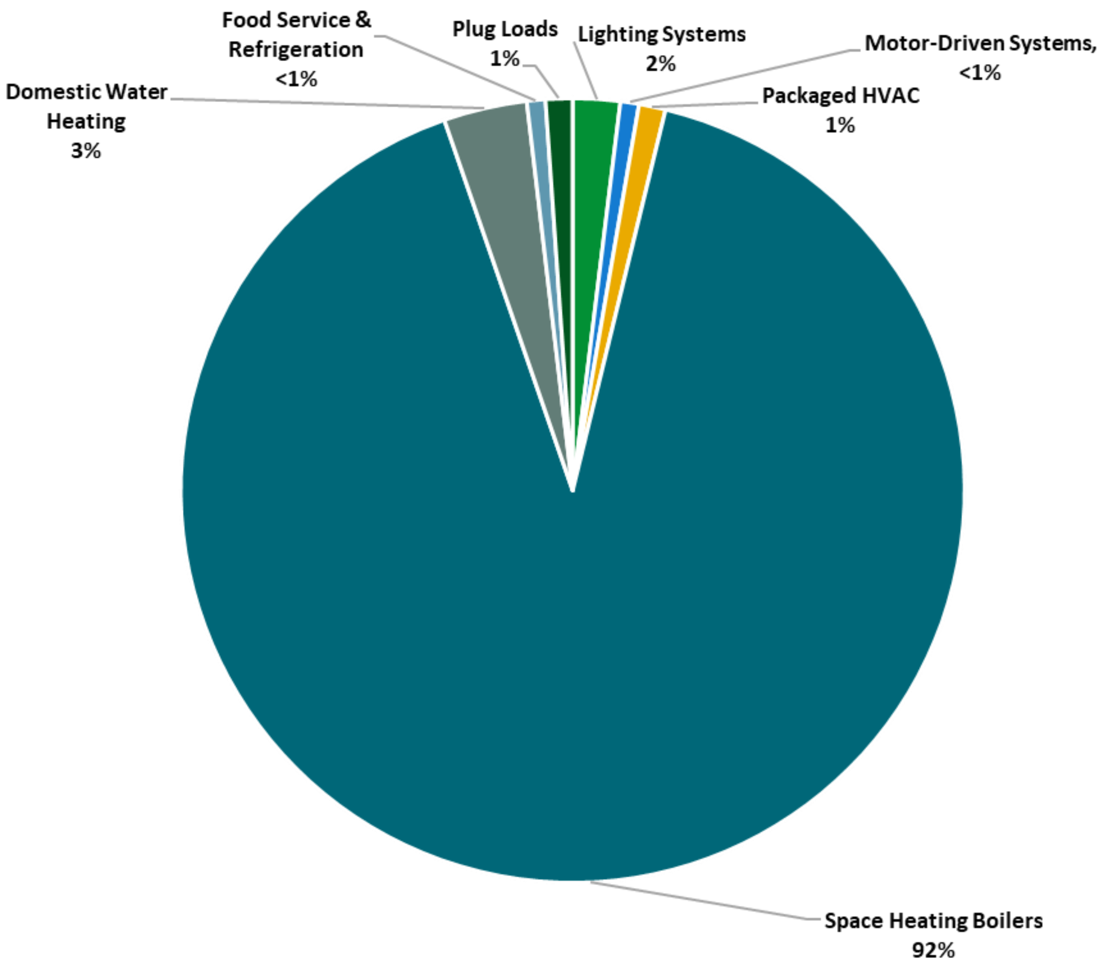
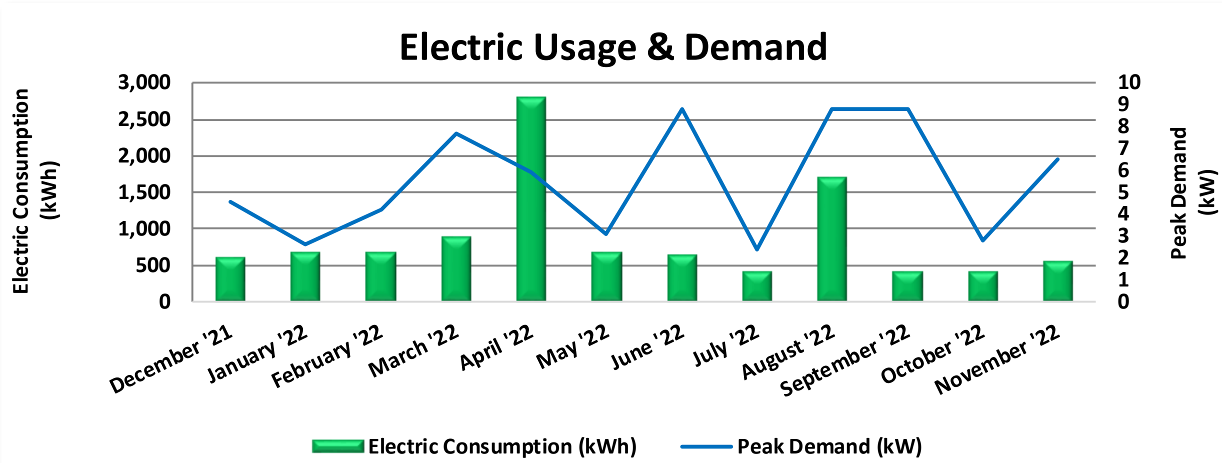


Figure 3 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class General Lighting & Power (GLP), with electric production provided by AP Electric, a third-party supplier.



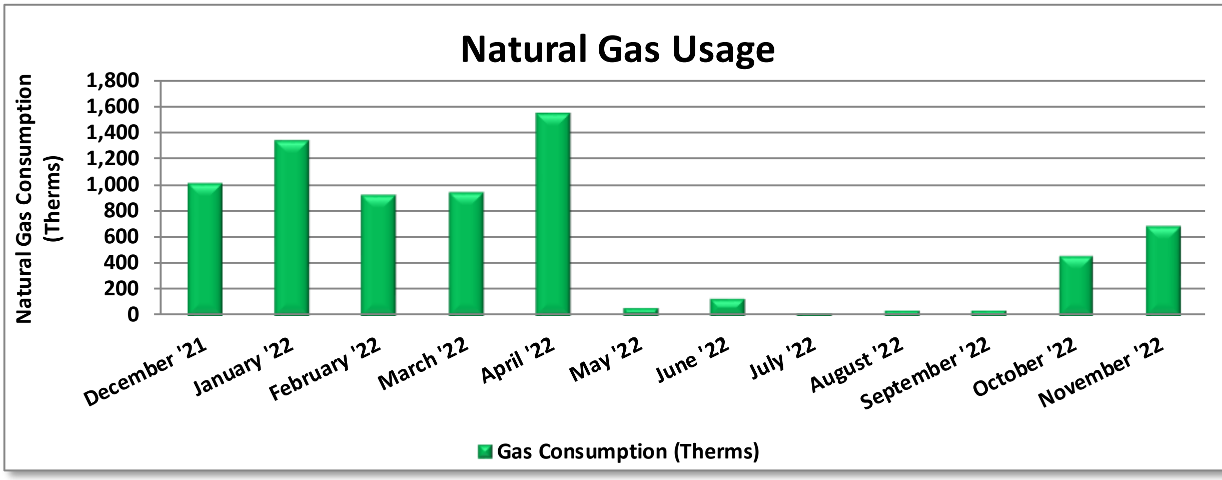
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
1/7/22	31	624	5	$20	$131
2/7/22	31	684	3	$10	$131
3/9/22	30	684	4	$17	$137
4/7/22	29	900	8	$30	$187
5/9/22	32	2,808	6	$23	$502
6/8/22	30	690	3	$43	$161
7/8/22	30	648	9	$128	$239
8/8/22	31	426	2	$35	$110
9/7/22	30	1,710	9	$129	$415
10/6/22	29	420	9	$41	$117
11/4/22	29	426	3	$13	$91
12/7/22	33	564	7	$30	$131
Totals	**365**	**10,584**	**9**	**$520**	**$2,353**
Annual	**365**	**10,584**	**9**	**$520**	**$2,353**

Notes:

- Peak demand of 9 kW occurred in June '22.
- Average demand over the past 12 months was 6 kW.
- The average electric cost over the past 12 months was $0.222/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.
- There were issues with PSE&G billing in the utility data analysis. There was only one actual meter reading during the reported period. The estimates made by PSE&G may be low, though it was noted by Bnai Keshet management that this building was largely underutilized. Bills might not be an accurate representation of how much electricity is consumed.

3.2 Natural Gas

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



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
1/7/22	31	1,014	$1,479
2/7/22	31	1,346	$1,901
3/9/22	30	930	$1,312
4/7/22	29	941	$1,285
5/9/22	32	1,557	$2,030
6/8/22	30	55	$92
7/8/22	30	131	$219
8/8/22	31	18	$48
9/7/22	30	37	$74
10/6/22	29	41	$88
11/4/22	29	457	$849
12/7/22	33	683	$1,056
Totals	**365**	**7,210**	**$10,433**
Annual	**365**	**7,210**	**$10,433**

Notes:

- The average gas cost for the past 12 months is $1.447/therm, which is the blended rate used throughout the analysis.
- Natural gas usage dips in the summer because the only system using natural gas during those months, and the regular classes are only held late September through early May.

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.

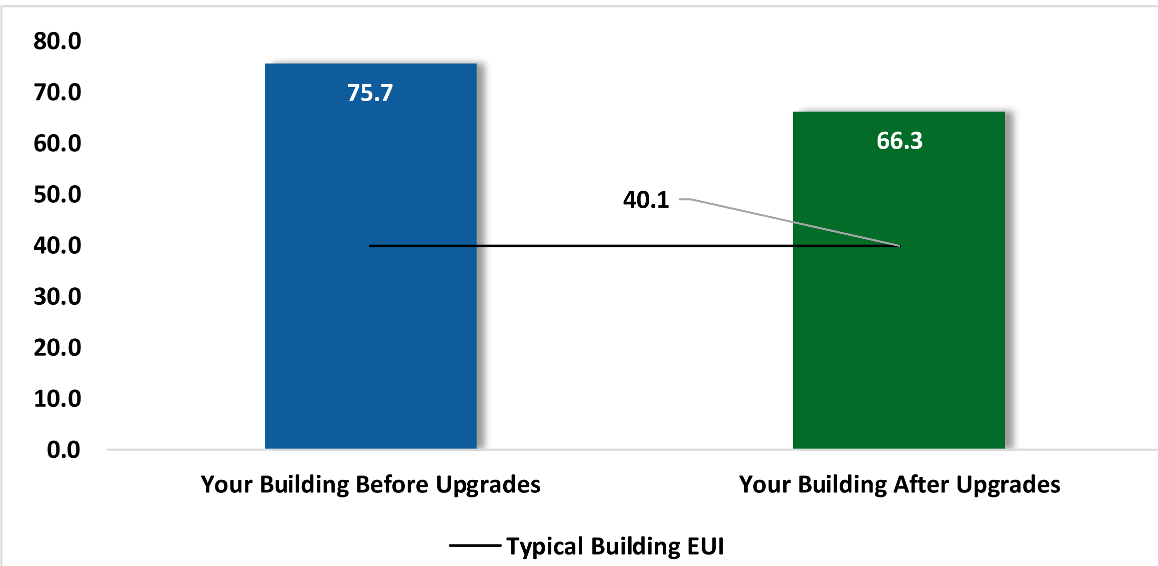


Figure 4 - Energy Use Intensity Comparison[3]

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			**792**	**1.2**	**0**	**$174**	**$1,056**	**$132**	**$924**	**5.3**	**778**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	51	0.1	0	$11	$69	$10	$59	5.3	50
ECM 2	Retrofit Fixtures with LED Lamps	Yes	741	1.2	0	$163	$987	$122	$865	5.3	728
Lighting Control Measures			**657**	**0.1**	**0**	**$146**	**$3,037**	**$560**	**$2,477**	**17.0**	**660**
ECM 3	Install Occupancy Sensor Lighting Controls	No	56	0.1	0	$12	$2,387	$385	$2,002	162.2	55
ECM 4	Install Photocell Controls	Yes	585	0.0	0	$130	$200	$0	$200	1.5	589
ECM 5	Install High/Low Lighting Controls	No	15	0.0	0	$3	$450	$175	$275	82.2	15
Variable Frequency Drive (VFD) Measures			**393**	**0.1**	**0**	**$87**	**$6,272**	**$100**	**$6,172**	**70.7**	**395**
ECM 6	Install VFDs on Heating Water Pumps	No	393	0.1	0	$87	$6,272	$100	$6,172	70.7	395
Unitary HVAC Measures			**100**	**0.2**	**0**	**$22**	**$892**	**$0**	**$892**	**40.1**	**101**
ECM 7	Install High Efficiency Air Conditioning Units	No	100	0.2	0	$22	$892	$0	$892	40.1	101
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**41**	**$596**	**$11,785**	**$400**	**$11,385**	**19.1**	**4,821**
ECM 8	Install High Efficiency Hot Water Boilers	Yes	0	0.0	41	$596	$11,785	$400	$11,385	19.1	4,821
HVAC System Improvements			**0**	**0.0**	**39**	**$568**	**$1,221**	**$178**	**$1,043**	**1.8**	**4,592**
ECM 9	Install Pipe Insulation	Yes	0	0.0	39	$568	$1,221	$178	$1,043	1.8	4,592
Domestic Water Heating Upgrade			**0**	**0.0**	**7**	**$102**	**$1,528**	**$186**	**$1,343**	**13.2**	**824**
ECM 10	Install High Efficiency Gas-Fired Water Heater	No	0	0.0	2	$27	$1,375	$140	$1,235	45.6	219
ECM 11	Install Low-Flow DHW Devices	Yes	0	0.0	5	$75	$154	$46	$108	1.4	605
TOTALS			**1,942**	**1.7**	**87**	**$1,694**	**$25,791**	**$1,556**	**$24,235**	**14.3**	**12,171**

* - 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 5 – 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		**792**	**1.2**	**0**	**$174**	**$1,056**	**$132**	**$924**	**5.3**	**778**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	51	0.1	0	$11	$69	$10	$59	5.3	50
ECM 2	Retrofit Fixtures with LED Lamps	741	1.2	0	$163	$987	$122	$865	5.3	728
Lighting Control Measures		**585**	**0.0**	**0**	**$130**	**$200**	**$0**	**$200**	**1.5**	**589**
ECM 4	Install Photocell Controls	585	0.0	0	$130	$200	$0	$200	1.5	589
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**41**	**$596**	**$11,785**	**$400**	**$11,385**	**19.1**	**4,821**
ECM 8	Install High Efficiency Hot Water Boilers	0	0.0	41	$596	$11,785	$400	$11,385	19.1	4,821
HVAC System Improvements		**0**	**0.0**	**39**	**$568**	**$1,221**	**$178**	**$1,043**	**1.8**	**4,592**
ECM 9	Install Pipe Insulation	0	0.0	39	$568	$1,221	$178	$1,043	1.8	4,592
Domestic Water Heating Upgrade		**0**	**0.0**	**5**	**$75**	**$154**	**$46**	**$108**	**1.4**	**605**
ECM 11	Install Low-Flow DHW Devices	0	0.0	5	$75	$154	$46	$108	1.4	605
TOTALS		**1,378**	**1.2**	**85**	**$1,542**	**$14,416**	**$756**	**$13,660**	**8.9**	**11,385**

* - 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 – 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		**792**	**1.2**	**0**	**$174**	**$1,056**	**$132**	**$924**	**5.3**	**778**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	51	0.1	0	$11	$69	$10	$59	5.3	50
ECM 2	Retrofit Fixtures with LED Lamps	741	1.2	0	$163	$987	$122	$865	5.3	728

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 Fluorescent Fixtures with LED Lamps and Drivers

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

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

Affected Building Areas: all areas with T12 linear fluorescent (office)

ECM 2: Retrofit Fixtures with LED Lamps

Replace fluorescent and incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies. 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: areas with T8 linear fluorescent, incandescent and CFL screw-in bulbs (first floor kitchen, hallways, second floor bathrooms, a few classrooms, closest, basement, chandelier, sconces, back hallway, stairwells)

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		**657**	**0.1**	**0**	**$146**	**$3,037**	**$560**	**$2,477**	**17.0**	**660**
ECM 3	Install Occupancy Sensor Lighting Controls	56	0.1	0	$12	$2,387	$385	$2,002	162.2	55
ECM 4	Install Photocell Controls	585	0.0	0	$130	$200	$0	$200	1.5	589
ECM 5	Install High/Low Lighting Controls	15	0.0	0	$3	$450	$175	$275	82.2	15

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. These measures are not recommended because of long paybacks due to the low wattage of the controlled fixture and low burn times.

ECM 3: Install Occupancy Sensor Lighting Controls

We evaluated the installation of 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: classrooms, offices, kitchens, restrooms, and storage rooms

ECM 4: Install Photocell Controls

Install photocells to eliminate exterior lighting use during daytime periods.

Photocells or photocell sensors are lighting controls used for dusk to dawn applications to automatically turn the fixtures on or off. Photo controls detect the amount of light outside and once the light level reaches a low point, the fixture will switch on. During the day, the photocell will detect higher amounts of light and will turn the fixture off.

Photocells may be fixture mounted or wired externally and connected by line voltage to a single light fixture or to a series of fixtures.

This measure reduces energy use in exterior areas to restrict operation to non-daylight periods.

Affected Building Areas: exterior fixtures

ECM 5: Install High/Low Lighting Controls

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

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

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

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

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

Affected Building Areas: hallways, stairwells, and mechanical spaces

4.3 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**393**	**0.1**	**0**	**$87**	**$6,272**	**$100**	**$6,172**	**70.7**	**395**
ECM 6	Install VFDs on Heating Water Pumps	393	0.1	0	$87	$6,272	$100	$6,172	70.7	395

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. This measure is not recommended because of a long payback period.

ECM 6: Install VFDs on Heating Water Pumps

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

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

Affected Pumps: HHW pump

4.4 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		**100**	**0.2**	**0**	**$22**	**$892**	**$0**	**$892**	**40.1**	**101**
ECM 7	Install High Efficiency Air Conditioning Units	100	0.2	0	$22	$892	$0	$892	40.1	101

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 window air conditioner is eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 7: Install High Efficiency Air Conditioning Units

We evaluated the replacement of older standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling and heating load, and the estimated annual operating hours.

Affected Units: sunroom window AC unit

4.5 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**	**41**	**$596**	**$11,785**	**$400**	**$11,385**	**19.1**	**4,821**
ECM 8	Install High Efficiency Hot Water Boilers	0	0.0	41	$596	$11,785	$400	$11,385	19.1	4,821

ECM 8: Install High Efficiency Hot Water Boilers

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

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

4.6 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**	**39**	**$568**	**$1,221**	**$178**	**$1,043**	**1.8**	**4,592**
ECM 9	Install Pipe Insulation	0	0.0	39	$568	$1,221	$178	$1,043	1.8	4,592

ECM 9: Install Pipe Insulation

Install insulation on heating water and 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: all visible HHW and DHW pipe (basement, apartment kitchen)

4.7 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**7**	**$102**	**$1,528**	**$186**	**$1,343**	**13.2**	**824**
ECM 10	Install High Efficiency Gas-Fired Water Heater	0	0.0	2	$27	$1,375	$140	$1,235	45.6	219
ECM 11	Install Low-Flow DHW Devices	0	0.0	5	$75	$154	$46	$108	1.4	605

ECM 10: Install High Efficiency Gas-Fired Water Heater

Consider replacing the existing tank water heater with a high-efficiency condensing tank water heater. Energy savings result from the increased efficiency of the unit, which uses less gas to heat water, and fewer operating hours to maintain the tank water temperature. This measure is not recommended because of a long payback period.

ECM 11: Install Low-Flow DHW Devices

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

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

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

4.8 Measures for Future Consideration

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

Bnai Keshet 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.

Window Replacements

Energy efficient windows are an important consideration when improving the building envelope, though this can be difficult for building with historic landmark status. The heat transfer through the glass panes is responsible for a significant portion of the facility's heating and cooling energy consumption. We recommend replacing single-pane windows with double-pane windows, and we recommend models that are gas-filled with low-e coatings to reduce heat loss. Windows should be selected with low U-factors to maximize energy savings. The U-factor is the rate at which the window conducts non-solar heat flow and is a key indicator of performance. The lower the U-factor, the higher the efficiency of the window. Window frames and sashes should be efficient as well. If metal frames are specified or required by code, the frame extrusions should have a thermal break to reduce conduction through the frame. As part of the installation, the window frames should be properly sealed with caulk materials to ensure the mitigation of air infiltration. Building envelopes that limit air infiltration and that have adequate fenestrations play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort. Window system replacement is an expensive upgrade that generally involves architectural elements. We recommend this as a measure for further study.

VRF Systems

Consider variable refrigerant flow (VRF) systems as part of a comprehensive package unit upgrade project. (VRF systems use direct expansion (DX) heat pumps to transport heat between an outdoor condensing unit and a network of indoor evaporators, located near or within the conditioned space, through refrigerant piping installed in the building. Attributes that distinguish VRF from other DX system types are:

- Multiple indoor units connected to a common outdoor unit
- Scalability
- Variable capacity
- Distributed control
- Simultaneous heating and cooling capability

VRF provides flexibility by allowing for many different indoor units (with different capacities and configurations), individual zone control, the unique ability to offer simultaneous heating and cooling in separate zones on a common refrigerant circuit, and heat recovery from one zone to another. VRF systems are equipped with at least one variable-speed and/or variable-capacity compressor.

To match the building's load profiles, energy is transferred from one indoor space to another through the refrigerant line, and only one energy source is necessary to provide both heating and cooling. VRF systems also operate efficiently at part load because of the compressor's variable capacity control. VRF systems are ideal for applications with varying loads or where zoning is required. Some other advantages of VRF systems include consistent comfort, quiet operation, energy efficiency, installation flexibility, zoned heating and cooling, state-of-the-art controls, and reliability.

VRF systems are more expensive than conventional heat pump systems; however, the higher initial cost can be offset by improved cooling efficiency during part load operation—a SEER (cooling) rating of 18.0 is not uncommon for small packaged VRF-equipped heat pumps.

When you are replacing packaged HVAC equipment, we recommend a comprehensive approach. Work with your contractor or design engineer to make sure your systems are sized and zoned according to current space configurations and occupancy. Select high efficiency equipment and controls that match your heating and cooling needs. Commission the system and controls to ensure proper operation, comfort, ventilation, and energy use.

Building Insulation

Heat flows from warmer to cooler areas until there is no longer a temperature difference. Heat flows directly from all heated spaces to adjacent unheated attics, garages, basements, and to the outdoors. Heat flow can also move indirectly through interior ceilings, walls, and floors—wherever there is a difference in temperature. During the cooling season, heat flows from the exterior to the building interior.

To maintain comfort, the heat lost in the winter must be replaced by your heating system. Similarly, heat gained in the summer must be removed by your cooling system. Properly insulating your building will decrease this heat flow by providing an effective resistance to the flow of heat.

An insulating material's resistance to conductive heat flow is measured or rated in terms of its thermal resistance or R-value—the higher the R-value, the greater the insulating effectiveness. The R-value depends on the type of insulation, its thickness, and its density. Installing more (and thicker) insulation increases the R-value and the resistance to heat flow.

Consider using a thermal camera to conduct a study of building heat loss to better understand where insulation will provide the greatest benefit.

Install Roof or Ceiling Insulation

Installing ceiling or roof insulation as a thermal barrier will improve thermal comfort in the building and reduce the heating energy use. Commonly used insulation materials include fiberglass, cellulose, rigid foam, and polystyrene. Insulation can be blown in, applied as a layer, or sprayed on, depending on the type of material. Install insulation to levels that meet or exceed the current adopted building and energy code.

Install Exterior Wall Insulation

The installation of blown in wall insulation on all sides of the building will improve thermal comfort in the building and reduce heating energy use.

For masonry walls generally foam board or rigid foam insulation made from polystyrene or similar materials can be added to the building exterior. The material provides high insulating value for relatively little thickness but must be properly weatherproofed. For frame walls insulation material can be blown in between the exterior and interior walls.

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

Weatherization

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

Doors and Windows

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

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

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.

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.

Thermostat Schedules and Temperature Resets

Use thermostat setback temperatures and schedules to reduce heating and cooling energy use during periods of low or no occupancy. Thermostats should be programmed for a setback of 5-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Boiler Maintenance

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

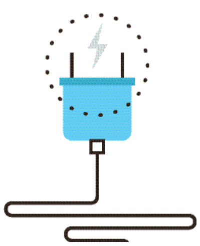
Water Heater Maintenance

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

Computer Monitor Replacement

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

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

Water Conservation

Installing 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[6] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[7] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Water conservation devices that do not reduce hot water consumption will not provide energy savings at the site level, but they may significantly affect your water and sewer usage costs. Any reduction in water use does however ultimately reduce grid-level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users.

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

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

Procurement Strategies

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

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

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

6 On-site Generation

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

This facility does not appear to meet the minimum criteria for a cost-effective solar PV installation. To be cost-effective, a solar PV array needs certain minimum criteria, such as sufficient and sustained electric demand and sufficient flat or south-facing rooftop or other unshaded space on which to place the PV panels.

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

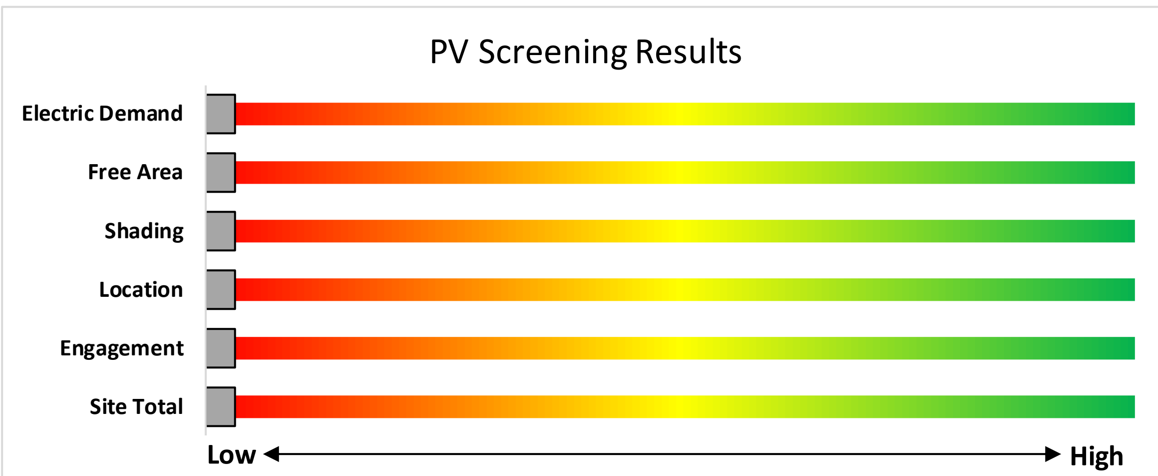


Figure 7 - Photovoltaic Screening

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.

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

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

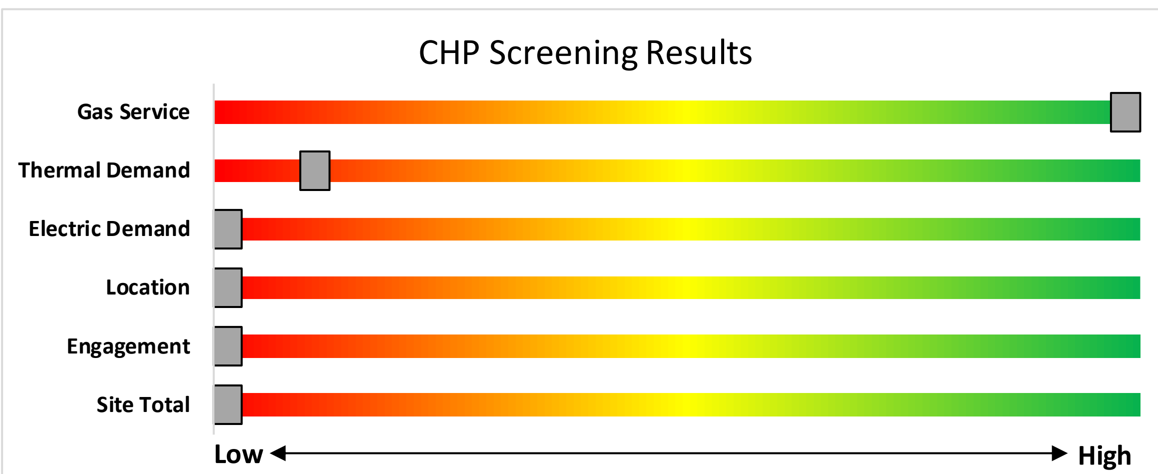


Figure 8 - Combined Heat and Power Screening

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

7 Electric Vehicles (EV)

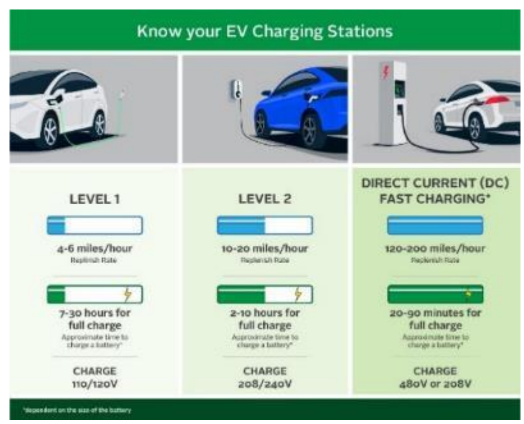
All electric vehicles (EVs) have an electric motor instead of an internal combustion engine. EVs function by plugging into a charge point, taking electricity from the grid, and then storing it in rechargeable batteries. Although electricity production may contribute to air pollution, the U.S. EPA categorizes 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 medium 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.

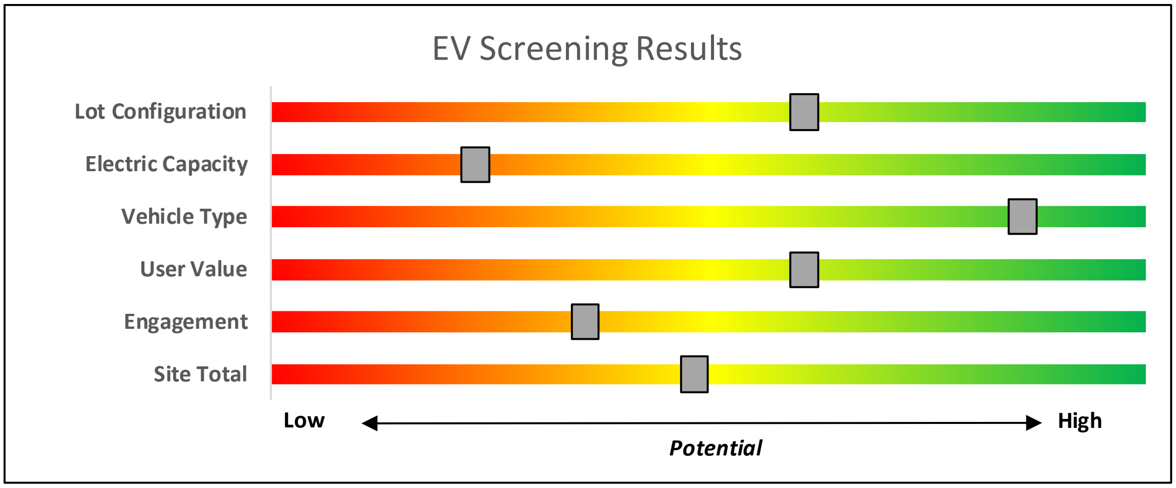


Figure 9 – EV Charger Screening

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 Fuel Cells with Heat Recovery	>3 MW	$350		
Waste Heat to Power*	<1 MW	$1,000	30%	$2 million
	> 1MW	$500		$3 million

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

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

How to Participate

You 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.

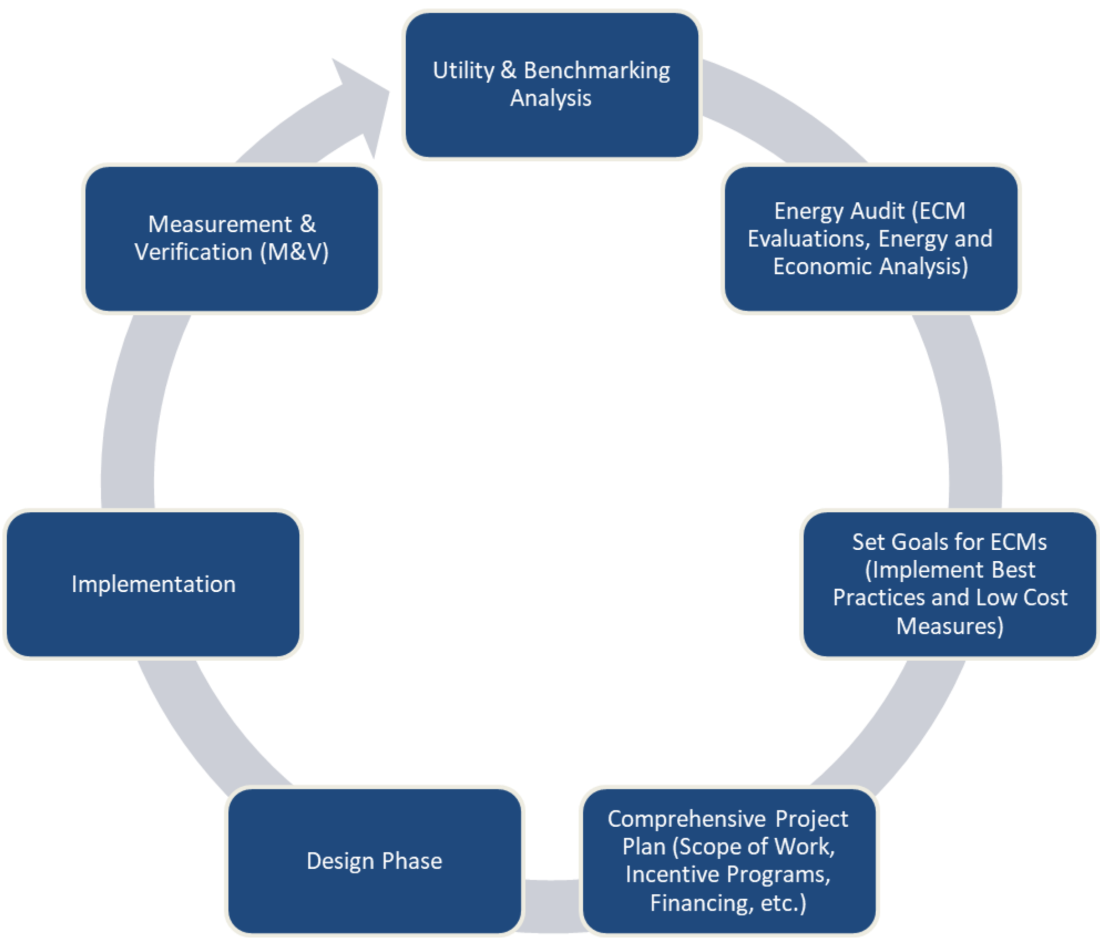


Figure 10 – Project Development Cycle

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[8].

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[9].

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

[9] 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
Back hall	1	Incandescent: (1) 75W PAR30 Screw-In Lamp	Wall Switch	S	75	200	2	Relamp	No	1	LED Lamps: PAR30 Lamps	Wall Switch	12	200	0.1	14	0	$3	$23	$3	6.8
Back hall	1	LED Lamps: (1) 26W PAR30 Screw-In Lamp	Wall Switch	S	26	20		None	No	1	LED Lamps: (1) 26W PAR30 Screw-In Lamp	Wall Switch	26	20	0.0	0	0	$0	$0	$0	0.0
Back hall	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	200	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	200	0.0	7	0	$2	$37	$10	17.0
Corridor 1	1	Compact Fluorescent: (8) 23W Spiral Plug-In Lamps	Wall Switch	S	184	1,000	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	129	1,000	0.0	60	0	$13	$138	$8	9.9
Corridor 1	2	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 1	3	Incandescent: (2) 40W A19 Screw-In Lamps	Wall Switch	S	80	1,000	2, 5	Relamp	Yes	3	LED Lamps: A19 Lamps	High/Low Control	12	690	0.2	232	0	$51	$328	$111	4.3
Corridor 1	1	LED Lamps: (3) 3.5W A19 Screw-In Lamps	Wall Switch	S	11	1,000		None	No	1	LED Lamps: (3) 3.5W A19 Screw-In Lamps	Wall Switch	11	1,000	0.0	0	0	$0	$0	$0	0.0
Exterior 1	6	LED - Fixtures: Cobrahead Pole Mount	None	S	50	6,000	4	None	Yes	6	LED - Fixtures: Cobrahead Pole Mount	Photocell	50	4,380	0.0	486	0	$108	$200	$0	1.9
Exterior 1	4	LED - Fixtures: Wall Pack	None	S	40	5,000	4	None	Yes	4	LED - Fixtures: Wall Pack	Photocell	40	4,380	0.0	99	0	$22	$0	$0	0.0
Foyer	1	LED Lamps: (3) 3.5W A19 Screw-In Lamps	Wall Switch	S	11	1,000		None	No	1	LED Lamps: (3) 3.5W A19 Screw-In Lamps	Wall Switch	11	1,000	0.0	0	0	$0	$0	$0	0.0
Great room	4	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	500	3	None	Yes	4	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	345	0.0	6	0	$1	$270	$35	177.9
Green Room	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	500	3	None	Yes	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	345	0.0	3	0	$1	$116	$20	145.3
Kitchen 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	800	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	800	0.0	29	0	$6	$37	$10	4.2
Library	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	500		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	500	0.0	0	0	$0	$0	$0	0.0
Library	4	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	500	3	None	Yes	4	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	345	0.0	6	0	$1	$270	$35	177.9
Main Office	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	S	18	200		None	No	1	LED Lamps: (2) 9W A19 Screw-In Lamps	Wall Switch	18	200	0.0	0	0	$0	$0	$0	0.0
Main Office	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	800	1	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	800	0.1	51	0	$11	$69	$10	5.3
Restroom - Back hall	1	LED Lamps: (1) 15W A19 Screw-In Lamp	Wall Switch	S	15	200		None	No	1	LED Lamps: (1) 15W A19 Screw-In Lamp	Wall Switch	15	200	0.0	0	0	$0	$0	$0	0.0
Restroom - Unisex 1	1	LED Lamps: (1) 15W A19 Screw-In Lamp	Wall Switch	S	15	500		None	No	1	LED Lamps: (1) 15W A19 Screw-In Lamp	Wall Switch	15	500	0.0	0	0	$0	$0	$0	0.0
Sunroom	1	Halogen Incandescent: (1) 40W A19 Screw-In Lamp	Wall Switch	S	40	50	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	6	50	0.0	2	0	$0	$17	$1	40.3
Sunroom	2	LED Lamps: (1) 15W A19 Screw-In Lamp	Wall Switch	S	15	300	3	None	Yes	2	LED Lamps: (1) 15W A19 Screw-In Lamp	Occupancy Sensor	15	207	0.0	3	0	$1	$116	$20	145.3
Sunroom	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	300		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	300	0.0	0	0	$0	$0	$0	0.0
Sunroom	4	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	300	3	None	Yes	4	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	207	0.0	4	0	$1	$270	$35	296.5
Sunroom porch	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	200	3	None	Yes	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	138	0.0	1	0	$0	$116	$20	363.3
Blue Room	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	400	3	None	Yes	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	276	0.0	2	0	$1	$116	$20	181.7

	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
Corridor 2	2	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 2	2	Incandescent: (1) 40W A19 Screw-In Lamp	Wall Switch	S	40	800	2, 5	Relamp	Yes	2	LED Lamps: A19 Lamps	High/Low Control	6	552	0.1	62	0	$14	$259	$72	13.8
Corridor 2	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	400		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	400	0.0	0	0	$0	$0	$0	0.0
Corridor 2	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	800	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	800	0.0	29	0	$6	$37	$10	4.2
Gray Room	2	LED - Fixtures: Ceiling Mount	Wall Switch	S	20	500	3	None	Yes	2	LED - Fixtures: Ceiling Mount	Occupancy Sensor	20	345	0.0	7	0	$1	$116	$20	65.4
Hearth Room	1	Incandescent: (2) 40W A19 Screw-In Lamps	Wall Switch	S	80	300	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	12	300	0.1	22	0	$5	$34	$2	6.7
Hearth Room	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	500	3	None	Yes	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	345	0.0	3	0	$1	$116	$20	145.3
Porch	1	LED Lamps: (6) 15W PAR14 Screw-In Lamps	Wall Switch	S	90	300		None	No	1	LED Lamps: (6) 15W PAR14 Screw-In Lamps	Wall Switch	90	300	0.0	0	0	$0	$0	$0	0.0
Red Room	1	Exit Signs: LED - 2 W Lamp	None	S	6	500		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	500	0.0	0	0	$0	$0	$0	0.0
Red Room	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	800	3	None	Yes	2	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	552	0.0	5	0	$1	$116	$20	90.8
Restroom - Female 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	300	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	207	0.1	27	0	$6	$343	$55	48.3
Restroom - Male 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	300	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	207	0.1	27	0	$6	$343	$55	48.3
The Nest	1	Incandescent: (1) 100W A19 Screw-In Lamp	Wall Switch	S	100	800	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	15	800	0.1	73	0	$16	$17	$1	1.0
The Nest	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	800	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	800	0.0	29	0	$6	$37	$10	4.2
Corridor 3	1	LED Lamps: (1) 9W A19 Screw-In Lamp	None	S	9	1,200		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	None	9	1,200	0.0	0	0	$0	$0	$0	0.0
Corridor 3	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	1,200		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	1,200	0.0	0	0	$0	$0	$0	0.0
Resident - Kitchen	1	Compact Fluorescent: (1) 27W Spiral Plug-In Lamp	Wall Switch	S	27	200	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	19	200	0.0	2	0	$0	$17	$1	42.3
Resident - Kitchen	1	LED Lamps: (1) 17W A19 Screw-In Lamp	None	S	17	900		None	No	1	LED Lamps: (1) 17W A19 Screw-In Lamp	None	17	900	0.0	0	0	$0	$0	$0	0.0
Resident - Kitchen	1	LED Lamps: (1) 5W A19 Screw-In Lamp	Wall Switch	S	5	900		None	No	1	LED Lamps: (1) 5W A19 Screw-In Lamp	Wall Switch	5	900	0.0	0	0	$0	$0	$0	0.0
Resident - Kitchen	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	900		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	900	0.0	0	0	$0	$0	$0	0.0
Residential - Restroom 1	1	LED Lamps: (1) 17W A19 Screw-In Lamp	Wall Switch	S	17	500		None	No	1	LED Lamps: (1) 17W A19 Screw-In Lamp	Wall Switch	17	500	0.0	0	0	$0	$0	$0	0.0
Residential - Restroom 2	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	500		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	500	0.0	0	0	$0	$0	$0	0.0
Residential 1	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	1,500		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	1,500	0.0	0	0	$0	$0	$0	0.0
Residential 2	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	1,500		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	1,500	0.0	0	0	$0	$0	$0	0.0
Residential 4	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	1,500		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	1,500	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
Residential Storage	1	Compact Fluorescent: (1) 23W Spiral Plug-In Lamp	Wall Switch	S	23	50	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	16	50	0.0	0	0	$0	$17	$1	198.6
Residential Storage	1	Incandescent: (1) 40W A19 Screw-In Lamp	Wall Switch	S	40	50	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	6	50	0.0	2	0	$0	$17	$1	40.3
Residential Storage	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	50		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	50	0.0	0	0	$0	$0	$0	0.0
Basement Entry	1	Exit Signs: LED - 2 W Lamp	None	S	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
Basement Entry	1	Halogen Incandescent: Screw-In Lamp	Wall Switch	S	40	200	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	6	200	0.0	7	0	$2	$17	$1	10.1
Basement Entry	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	200		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	200	0.0	0	0	$0	$0	$0	0.0
Mechanical	2	Compact Fluorescent: (1) 23W Spiral Plug-In Lamp	Wall Switch	S	23	200	2	Relamp	No	2	LED Lamps: A19 Lamps	Wall Switch	16	200	0.0	3	0	$1	$34	$2	49.7
Mechanical	1	Compact Fluorescent: (1) 27W Spiral Plug-In Lamp	None	S	27	50	2	Relamp	No	1	LED Lamps: A19 Lamps	None	19	50	0.0	0	0	$0	$17	$1	169.2
Mechanical	1	LED Lamps: (1) 15W A19 Screw-In Lamp	Wall Switch	S	15	200		None	No	1	LED Lamps: (1) 15W A19 Screw-In Lamp	Wall Switch	15	200	0.0	0	0	$0	$0	$0	0.0
Basement Storage 1	1	Incandescent: (1) 75W A19 Screw-In Lamp	Wall Switch	S	75	50	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	12	50	0.1	3	0	$1	$17	$1	21.8
Basement Storage 2	1	Compact Fluorescent: (1) 27W Spiral Plug-In Lamp	Wall Switch	S	27	200	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	19	200	0.0	2	0	$0	$17	$1	42.3
Basement Storage 2	1	Exit Signs: LED - 2 W Lamp	None	S	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
Basement Storage 3	1	Halogen Incandescent: (1) 40W A19 Screw-In Lamp	Wall Switch	S	40	50	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	6	50	0.0	2	0	$0	$17	$1	40.3
Basement Storage 4	1	Compact Fluorescent: (1) 23W Spiral Plug-In Lamp	Wall Switch	S	23	50	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	16	50	0.0	0	0	$0	$17	$1	198.6
Basement Storage 5	1	Compact Fluorescent: (1) 23W Spiral Plug-In Lamp	Wall Switch	S	23	50	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	16	50	0.0	0	0	$0	$17	$1	198.6
Basement Storage 7	1	Incandescent: (1) 75W A19 Screw-In Lamp	Wall Switch	S	75	50	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	12	50	0.1	3	0	$1	$17	$1	21.8
Stairs 1	1	Exit Signs: LED - 2 W Lamp	None	S	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
Stairs 1	2	Incandescent: (2) 40W A19 Screw-In Lamps	Wall Switch	S	80	600	2, 3	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	12	414	0.1	93	0	$20	$294	$74	10.8
Stairs 1	1	Incandescent: (1) 75W A19 Screw-In Lamp	Wall Switch	S	75	600	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	12	600	0.1	41	0	$9	$17	$1	1.8
Stairs 1	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	800		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	800	0.0	0	0	$0	$0	$0	0.0
Stairs 1	1	LED - Fixtures: Ceiling Mount	Wall Switch	S	20	600		None	No	1	LED - Fixtures: Ceiling Mount	Wall Switch	20	600	0.0	0	0	$0	$0	$0	0.0
Stairs 2	1	Compact Fluorescent: (1) 23W Spiral Plug-In Lamp	Wall Switch	S	23	200	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	16	200	0.0	1	0	$0	$17	$1	49.7
Stairs 2	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	200		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	200	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	heating hot water	2	Heating Hot Water Pump	0.5	85.5%	No	Bell & Gossett	56A17D58e	W	1,200	5	No	85.5%	Yes	2	0.1	393	0	$87	$6,272	$100	70.7
Mechanical	heating hot water	1	DHW Circulation Pump	0.1	65.0%	No	Taco		W	8,760		No	65.0%	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
Great room	Great room	1	Window AC	1.00		9.80		LG	L1204R	W		No							0.0	0	0	$0	$0	$0	0.0
Library	Library	1	Window AC	0.83		9.50		Frigidaire	FAK104R1V	W		No							0.0	0	0	$0	$0	$0	0.0
Sunroom	Sunroom	1	Window AC	1.00		9.80		LG	L1204R	W		No							0.0	0	0	$0	$0	$0	0.0
Sunroom porch	Sunroom porch	1	Window AC	0.83		7.50		Fedders		B	6	Yes	1	Window AC	0.83		12.00		0.2	100	0	$22	$892	$0	40.1
Blue Room	Blue Room	1	Window AC	0.68		11.40		GE	AEL08LS1	W		No							0.0	0	0	$0	$0	$0	0.0
Hearth Room	Hearth Room	1	Window AC	0.83		9.50		Frigidaire	FAK104R1V	W		No							0.0	0	0	$0	$0	$0	0.0
Red Room	Red Room	1	Window AC	0.83		9.80		LG	L1006RY6	W		No							0.0	0	0	$0	$0	$0	0.0
Residential 1	Residential 1	1	Window AC	0.50		9.80		Sharp		W		No							0.0	0	0	$0	$0	$0	0.0
Residential 2	Residential 2	1	Window AC	0.50		12.10		Frigidaire	FFRA062WA1	N		No							0.0	0	0	$0	$0	$0	0.0
Residential 4	Residential 4	1	Window AC	0.50		9.50				W		No							0.0	0	0	$0	$0	$0	0.0
Foyer	Foyer	1	Fan Coil		8.00		1 COP					No							0.0	0	0	$0	$0	$0	0.0

Space Heating Boiler Inventory & Recommendations

		Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical	entire building	1	Non-Condensing Hot Water Boiler	280	Weil-McLain	EGH-85-PIN	B	7	Yes	1	Non-Condensing Hot Water Boiler	280	85.00%	AFUE	0.0	0	41	$596	$11,785	$400	19.1

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
Basement	radiators and baseboards	8	20	1.50	0.0	0	13	$194	$328	$40	1.5
Basement	radiators and baseboards	8	50	1.00	0.0	0	23	$329	$666	$100	1.7
Basement	hot water heater	8	18	1.00	0.0	0	3	$38	$215	$36	4.7
Residential Kitchen	kitchen water	8	1	1.00	0.0	0	0	$6	$12	$2	1.6

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	Restrooms and Kitchens	1	Storage Tank Water Heater (≤ 50 Gal)	Bradford White	RG240T6N	W	9	Yes	1	Storage Tank Water Heater (≤ 50 Gal)	Natural Gas	85.00%	UEF	0.0	0	2	$27	$1,375	$140	45.6

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
Kitchen 1	10	1	Faucet Aerator (Kitchen)	2.20	1.50	0.0	0	0	$3	$7	$2	1.8
Back hall	10	1	Faucet Aerator (Lavatory)	2.00	0.50	0.0	0	0	$6	$7	$4	0.6
Restroom - Unisex 1	10	1	Faucet Aerator (Lavatory)	2.00	0.50	0.0	0	1	$12	$7	$4	0.3
Restroom - Female 1	10	2	Faucet Aerator (Lavatory)	2.00	0.50	0.0	0	1	$12	$14	$7	0.6
Restroom - Male 1	10	2	Faucet Aerator (Lavatory)	2.00	0.50	0.0	0	1	$12	$14	$7	0.6
Residential - Restroom 1	10	1	Faucet Aerator (Lavatory)	2.00	0.50	0.0	0	1	$12	$7	$4	0.3
Residential - Restroom 2	10	1	Faucet Aerator (Lavatory)	2.00	0.50	0.0	0	0	$6	$7	$4	0.6
Residential - Restroom 1	10	1	Showerhead	2.00	1.50	0.0	0	1	$11	$89	$15	6.6

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
Kitchen	1	Range			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
Kitchen 1	1	Coffee Machine	900	No		
Main Office	1	Desktop	220	No		
Kitchen 1	1	Dishwasher (Undercounter)	1,000	No	Kenmore	363 1404196
Great room	1	Electric Space Heater	1,500	No		
Residential 2	1	Fan (Portable)	40	No		
Residential 3	1	Fan (Portable)	40	No		
Kitchen 1	1	Microwave	800	No		
Resident - Kitchen	1	Microwave	1,000	No		
Residential 3	1	Gaming consol	200	No		
Main Office	1	Printer/Copier (Large)	500	No		
Kitchen 1	1	Refrigerator (Mini)	150	No		
Resident - Kitchen	1	Refrigerator (Residential)	500	No		
Residential 2	1	Television	200	No		
Residential 3	1	Television	120	No		
Kitchen 1	1	Toaster	1,000	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]

Bnai Keshet - Red Gables

Primary Property Type: Other - Lodging/Residential
Gross Floor Area (ft²): 10,000
Built: 1906

For Year Ending: November 30, 2022
Date Generated: September 18, 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
Bnai Keshet - Red Gables 97 South Fullerton Street Montclair, New Jersey 07042	Bnai Keshet 99 South Fullerton Avenue Montclair, NJ 07042 (973) 746-4889	Farrell Borine 99 South Fullerton Avenue Montclair, NJ 07042 (973) 746-4889 farrell@bnaikeshet.org

Property ID: 27977563

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
75.8 kBtu/ft²

Source EUI
86 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	722,253 (95%)
Electric - Grid (kBtu)	36,148 (5%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	126.7
National Median Source EUI (kBtu/ft²)	143.6
% Diff from National Median Source EUI	-40%
Annual Emissions	
Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	42

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, that is implemented in a building system to reduce total energy consumption.
MH	*Metal halide*: a type of HID lamp.
MBh	*Thousand Btu per hour*
MBtu	*One thousand British thermal units*
MMBtu	*One million British thermal units*
MV	*Mercury Vapor:* a type of HID lamp.
NJBPU	*New Jersey Board of Public Utilities*
NJCEP	*New Jersey's Clean Energy Program:* NJCEP is a statewide program that offers financial incentives, programs and services for New Jersey residents, business owners and local governments to help them save energy, money, and the environment.
psig	Pounds per square inch gauge
Plug Load	Refers to the amount of power used in a space by products that are powered by means of an ordinary AC plug.
PV	*Photovoltaic:* refers to an electronic device capable of converting incident light directly into electricity (direct current).

SEER	*Seasonal energy efficiency ratio:* a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	*Statement of energy performance:* a summary document from the ENERGY STAR Portfolio Manager.
Simple Payback	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
SREC (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.