Local Government Energy Audit Report

Skylands Manor

January 15, 2024

Prepared for:
State of NJ Ringwood State Park
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Disclaimer

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

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

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

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

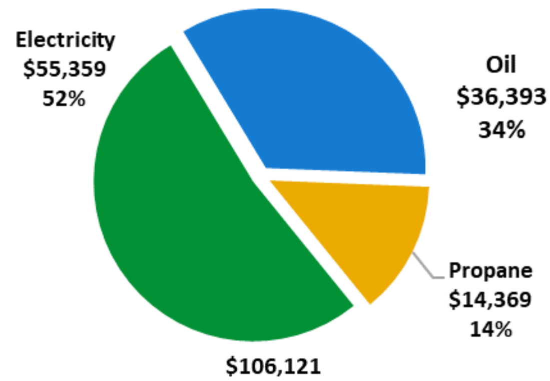
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state, and federal requirements.

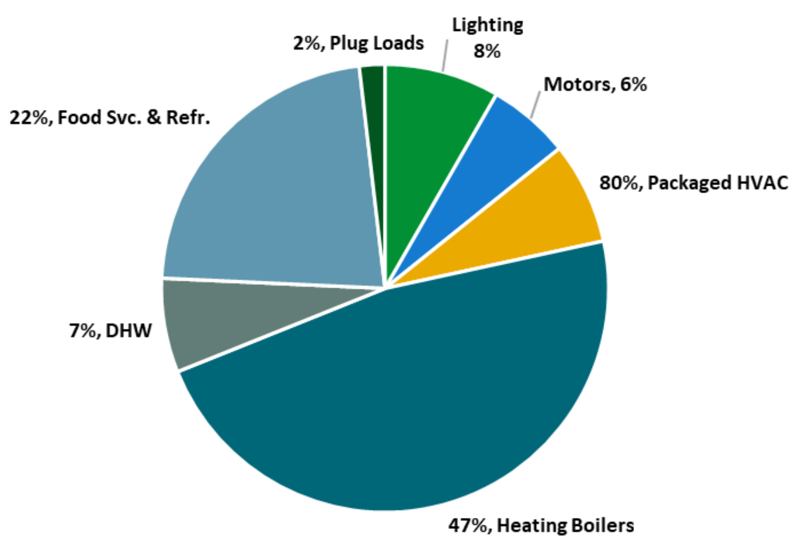
Table of Contents

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Skylands Manor. 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 Energy Utilities	Costs: $106,121 Electricity: 321,999 kWh No. 2 Fuel Oil: 9,460 Gallons Propane: 3,205 Gallons	
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.



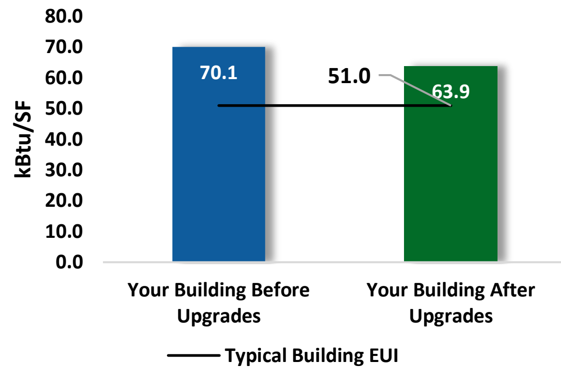
Energy Use by System

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.

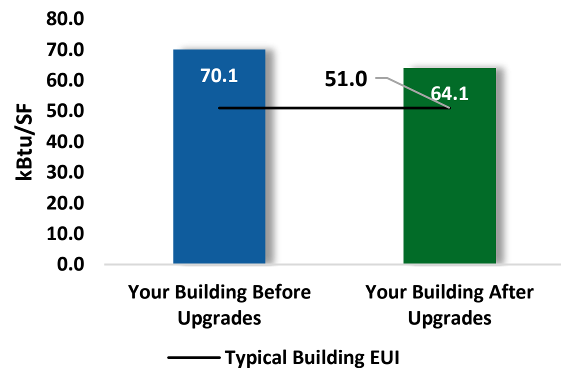
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$84,490
Potential Rebates & Incentives[1]	$7,850
Annual Cost Savings	$11,319
Annual Energy Savings	Electricity: 60,619 kWh No. 2 Fuel Oil: 233 Gallons
Greenhouse Gas Emission Savings	33 Tons
Simple Payback	6.8 Years
Site Energy Savings (All Utilities)	9%



Scenario 2: Cost Effective Package[2]

Installation Cost	$51,890
Potential Rebates & Incentives	$6,250
Annual Cost Savings	$10,968
Annual Energy Savings	Electricity: 58,581 kWh No. 2 Fuel Oil: 233 Gallons
Greenhouse Gas Emission Savings	32 Tons
Simple Payback	4.2 Years
Site Energy Savings (all utilities)	9%



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			**39,221**	**12.2**	**-15**	**$6,338**	**$19,200**	**$1,920**	**$17,280**	**2.7**	**37,110**
ECM 1	Install LED Fixtures	Yes	4,722	0.0	0	$812	$3,230	$1,050	$2,180	2.7	4,755
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	5,968	2.0	-3	$956	$6,690	$560	$6,130	6.4	5,594
ECM 3	Retrofit Fixtures with LED Lamps	Yes	28,531	10.2	-12	$4,571	$9,280	$310	$8,970	2.0	26,761
Lighting Control Measures			**5,158**	**1.4**	**-2**	**$826**	**$7,670**	**$2,390**	**$5,280**	**6.4**	**4,835**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	3,553	1.1	-2	$569	$4,590	$520	$4,070	7.2	3,330
ECM 5	Install High/Low Lighting Controls	Yes	1,606	0.3	-1	$257	$3,080	$1,870	$1,210	4.7	1,505
Variable Frequency Drive (VFD) Measures			**9,052**	**4.3**	**0**	**$1,556**	**$9,900**	**$1,200**	**$8,700**	**5.6**	**9,115**
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	9,052	4.3	0	$1,556	$9,900	$1,200	$8,700	5.6	9,115
Unitary HVAC Measures			**2,038**	**1.4**	**0**	**$350**	**$32,600**	**$1,600**	**$31,000**	**88.5**	**2,052**
ECM 7	Install High Efficiency Air Conditioning Units	No	2,038	1.4	0	$350	$32,600	$1,600	$31,000	88.5	2,052
HVAC System Improvements			**0**	**0.0**	**2**	**$42**	**$30**	**$0**	**$30**	**0.7**	**250**
ECM 8	Install Pipe Insulation	Yes	0	0.0	2	$42	$30	$0	$30	0.7	250
Domestic Water Heating Upgrade			**695**	**0.0**	**13**	**$468**	**$290**	**$130**	**$160**	**0.3**	**2,755**
ECM 9	Install Low-Flow DHW Devices	Yes	695	0.0	13	$468	$290	$130	$160	0.3	2,755
Food Service & Refrigeration Measures			**5,668**	**0.3**	**0**	**$975**	**$9,800**	**$610**	**$9,190**	**9.4**	**5,708**
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	2,097	0.3	0	$361	$2,980	$320	$2,660	7.4	2,112
ECM 11	Refrigeration Controls	Yes	3,571	0.1	0	$614	$6,820	$290	$6,530	10.6	3,596
Custom Measures			**-1,214**	**0.0**	**35**	**$763**	**$5,000**	**$0**	**$5,000**	**6.6**	**4,504**
ECM 12	Replace Electric Water Heater with Heat Pump Water Heater	Yes	2,022	0.0	0	$348	$2,500	$0	$2,500	7.2	2,036
ECM 13	Replace Oil Fired Water Heater with Heat Pump Water Heater	Yes	-3,236	0.0	35	$415	$2,500	$0	$2,500	6.0	2,468
TOTALS (COST EFFECTIVE MEASURES)			**58,581**	**18.2**	**32**	**$10,968**	**$51,890**	**$6,250**	**$45,640**	**4.2**	**64,277**
TOTALS (ALL MEASURES)			**60,619**	**19.6**	**32**	**$11,319**	**$84,490**	**$7,850**	**$76,640**	**6.8**	**66,329**

* - 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).

All 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 decision 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 for the largest energy consumers in the state. Customers in this category spend about $5 million a year on energy bills. This program 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 Skylands Manor. 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 October 17, 2023, TRC performed an energy audit at Skylands Manor located in Ringwood, New Jersey. TRC met with facility staff to review the facility operations and help focus our investigation on specific energy-using systems.

The Skylands Manor located at the botanical gardens in Ringwood is one of New Jersey's premier destination wedding sites. The facility is a four-story, 38,560 square foot building originally built in 1926 and expanded in 1956 to accommodate the need for additional space. The estate was added to the National Register of Historic Places on September 28, 1990, for its significance in architecture and landscape architecture. Spaces include bedrooms, living rooms, great hall, ballroom, dining rooms, restrooms and shower rooms, corridors, game rooms, kitchens, storage rooms, library, and basement mechanical and refrigeration rooms.

Lighting systems consist of a mix of incandescent lamps and linear fluorescent fixtures. The building is 100% heated by steam and a hot water boiler and 40% cooled by packaged units and window air conditioners.

Recent Improvements and Facility Concerns

The facility is progressively replacing the indoor incandescent lamps with LED lamps.

Facility concerns include the aging condition of the windows and exterior doors and the four packaged air conditioners serving the ballroom that have reached the extent of their useful life.

2.2 Building Occupancy

Section of the building is occupied continuously while the bedrooms are occupied intermittently based on the demand. The facility has 15 staff and approximately 300 guests can be accommodated for a castle.

Building Name	Weekday/Weekend	Operating Schedule
Skylands Manor	Weekday	12:00 AM - 12:00 AM
	Weekend	12:00 AM - 12:00 AM

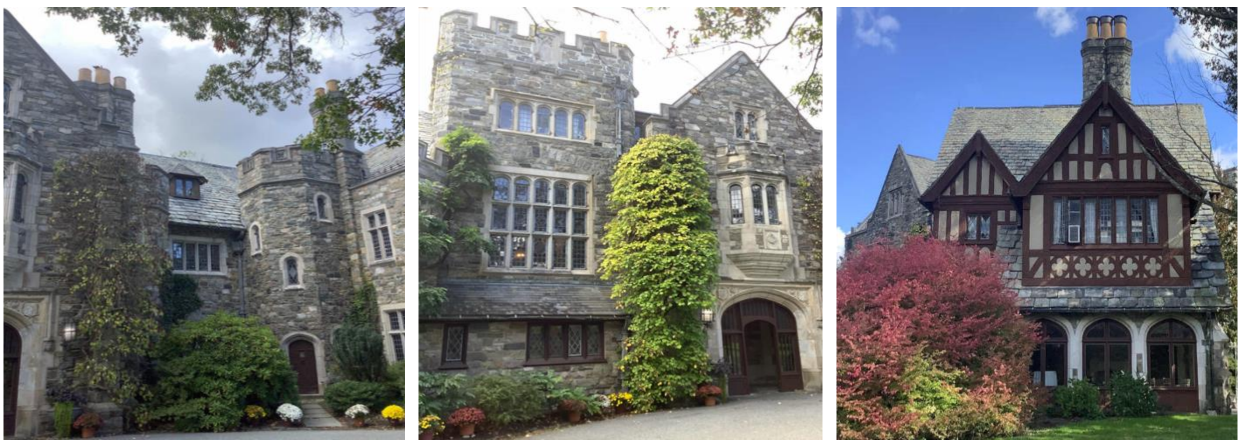
Building Occupancy Schedule

2.3 Building Envelope

Building walls are constructed of stone and wood timbers. Built in an English mansion style, it has a unique blend of classic design elements including intricate millwork alongside rustic features, like exposed beams and wood floors. It features symmetrical facades, classical details such as columns and moldings, and balanced composition. Constructed as a showplace for eclecticism, the interiors display architecture from the late Gothic period to the early renaissance. The building facades are in acceptable aging condition. There is no insulation in the attic above the Ball Hall.

The building has pitched roof sections with a wood deck covered with slate tile roofing material that appear in fair condition.

Most windows are single pane with some decorative glass elements set in wood frames. The windows are part of Skylands Manor's many interior attractions that consist of a collection of antique stained-glass medallions set in leaded windows. The glass-to-frame seals are in poor condition. The fixed window weather seals are in poor condition, showing evidence of wear. Exterior wood entry doors are in poor condition with no door seals. Degraded window and door seals increase drafts and outside air infiltration.



Original Building Walls

Addition Building Walls

Addition Building Roof

Addition Building Walls

Windows

Exterior Door

Ball Hall Window - Interior View

2.4 Lighting Systems

The primary interior lighting systems consist of a mix of incandescent and LED lamps. There are also several linear fluorescent T12 fixtures and compact fluorescent lamps (CFLs). Linear fluorescent fixture types include 2-lamp, 4-foot-long troffer, recessed, and surface mounted fixtures and 2-foot-long fixtures with U-bend tubes. They use inefficient magnetic ballasts. The first-floor kitchen is lit with linear T12 fixtures while its main storage is lit with a mix of linear T12 and recessed can CFLs. The elevator lobby is lit with a both LED lamps and incandescent lamps.

The facility is progressively retrofitting all interior lighting to LED sources, mainly LED lamps. Spaces including ball room, third-floor corridor are lit with LED lamps. Other spaces including restrooms, bedrooms, dining rooms, corridors, living rooms, mechanical rooms, great hall, entry hall, game room, library, stairs, and storage rooms are lit with a combination of incandescent and LED lamps. All exit signs are LED sources. Light fixtures are either in good or fair condition. Interior lighting levels were insufficient in mechanical spaces. Light fixtures in spaces are controlled by wall switches.

Exterior fixtures consist of pole mounted metal halide and wall mounted fixtures containing LED, CFLs and incandescent lamps. There is a 400-Watt wall mounted fixture. Exterior illumination systems are controlled by timers and a wall switch.

Linear Fluorescent T12 and T8 Fixtures

Incandescent lamps (Candelabra)

LED lamps

T12 U-Bend lamp

LED lamp

Incandescent lamp

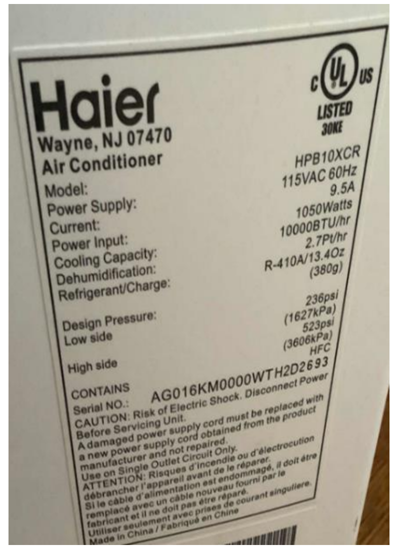

Exterior Wall Pole Mounted Fixtures

2.5 Air Handling Systems

Unitary Electric HVAC Equipment

Spaces including bedrooms, dining room, living rooms, and game room are cooled by 31 window and portable air conditioners (ACs) that are in good condition. These vary in capacity between 0.42 tons to 1.17 tons. They range in efficiency between 9 EER to 11 EER.


Window AC



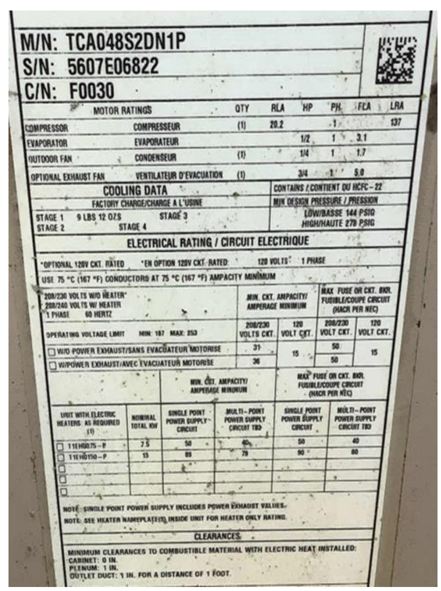
Portable AC

Unitary Heating Equipment

Some bedrooms are heated using linear electric resistance heaters that are controlled by local thermostats.

Packaged Units

The Ball Hall (main reception area) is cooled by four ducted 4-ton Lennox packaged units located on the ground. They provide cooling through direct expansion system and are equipped with 0.5 hp supply fans. The units are 16 years old and have reached the extent of their useful life. They have been evaluated for replacement. The units are controlled by programmable thermostats.



Lennox 4-Ton Packaged Unit

Air Handling Units (AHUs)

Additionally, the Ball Hall is conditioned by a McQuay air handling unit (AHU-1). This unit is equipped with a supply fan motor, hot water heating coil, refrigerant coil for cooling, and a 15 hp supply fan. The AHU is a constant volume unit. The hot water heating coil is supplied by the hot water boiler located in the basement mechanical room. The heating hot water coil is in backup mode as the Ball Hall is primarily heated by hydronic baseboards. The cooling coil is connected by a 5-ton outdoor condensing unit that is in good condition. The AHU is controlled by a programmable thermostat.

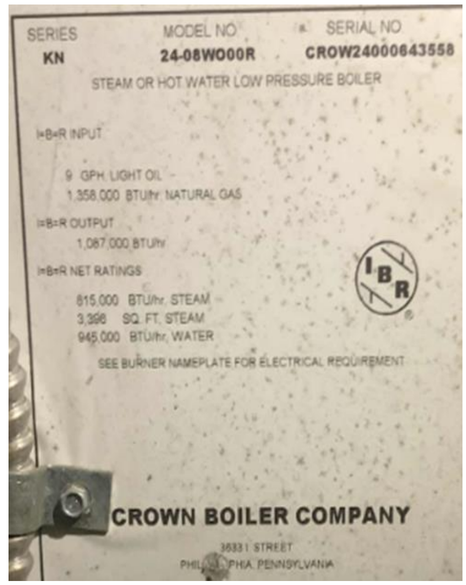
AHU-1 and Condensing Unit

2.6 Heating Hot Water & Steam Systems

The Skylands Manor has two heating loops. The Ball Hall is heated by a 1,087 MBh hydronic boiler located in the basement mechanical room 2. The burner is non-modulating with a nominal efficiency of 80%. The hydronic distribution system is a two-pipe, heating-only system. Two, 0.5 hp constant flow hot water pumps circulate hot water to an AHU-1 coil and hydronic baseboards.

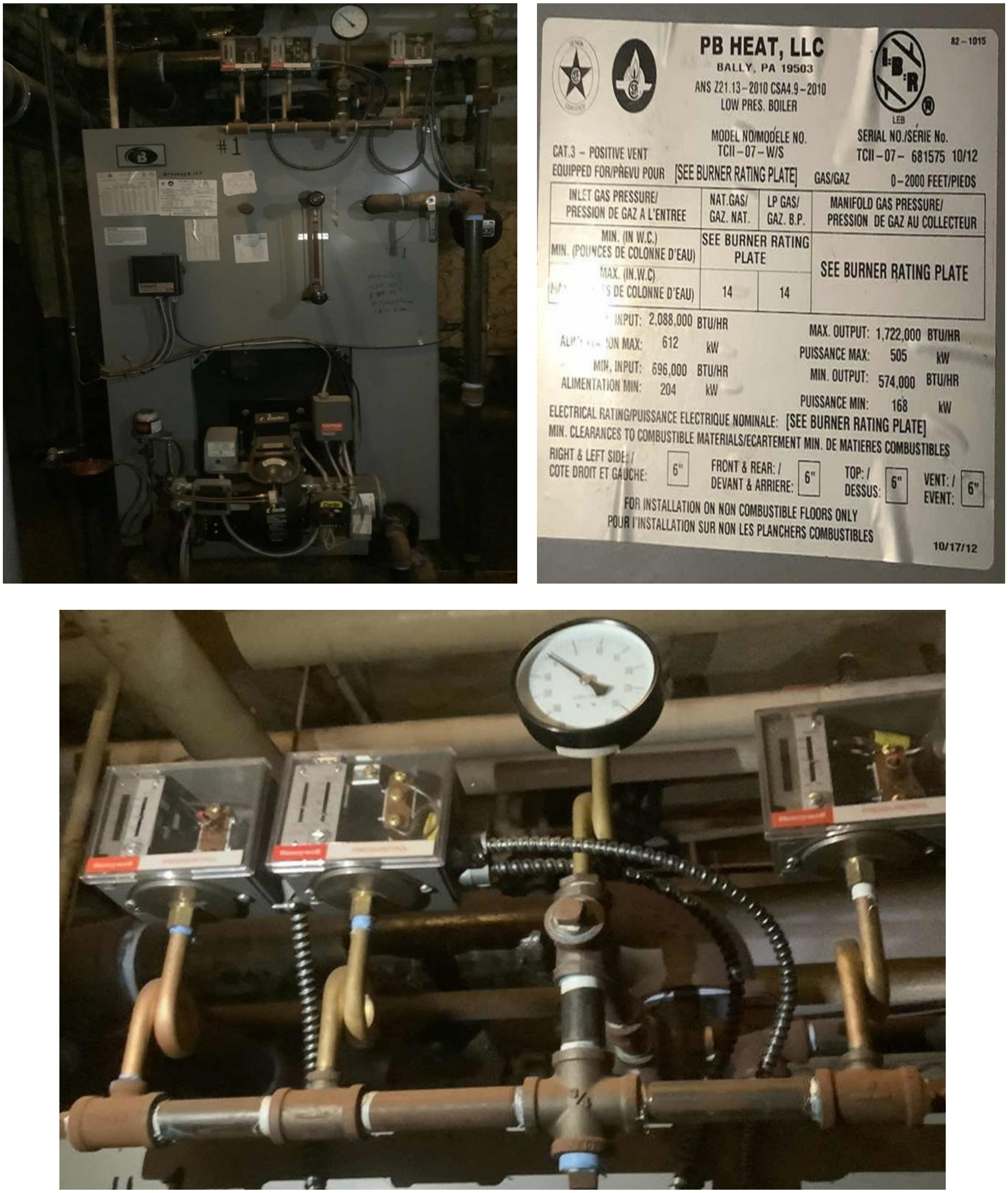
The manor section of the building (original section) is heated by a 1,755 MBh low pressure steam boiler located in the basement mechanical room 1.

The boilers are in good condition and well maintained. Heating in spaces is controlled by local thermostats.



Hydronic Boiler

0.5 hp Hot Water Pumps



Steam Boiler

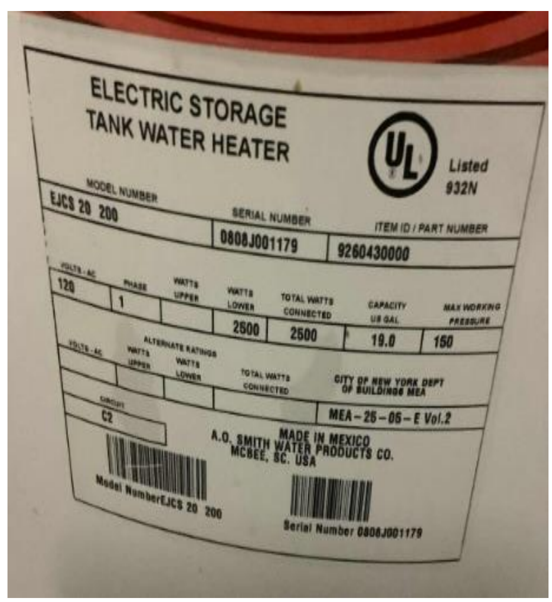
2.7 Domestic Hot Water

Domestic hot water for the facility (except the Ball Hall lobby restrooms) is provided by a 75-gallon, 385 MBh oil-fired storage tank heater. The domestic hot water pipes are partially insulated.

Hot water for the restrooms located in the Ball Hall lobby is produced by a 19-gallon, 2.5 kW electric storage tank heater located in the mechanical room.

The electric and oil-fired storage water heaters have been evaluated for replacement with heat pump water heaters.

Oil-Fired Storage Tank Water Heater



Electric Storage Tank Water Heater

2.8 Food Service Equipment

The Skylands Manor is mostly operated by Frungillo Caterers. The facility houses a commercial kitchen that delivers innovative cuisine for various wedding events. There is also a smaller kitchen located on the first floor. The kitchens use a mix of propane and electric cooking equipment, most of which is standard efficiency and in good condition. Most cooking is done using conventional ovens, ranges, and fryers.

There is a Hobart high-temperature, door-type dishwasher located in the dishwasher room that appears in good condition. A 40.5 kW electric booster heater serves the dishwasher.

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

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

Propane Fired Convection Ovens

Propane-Fired Range

Dishwasher

2.9 Refrigeration

The facility houses various commercial types of refrigeration systems located in various spaces. These include five stand-up refrigerators with either solid or glass doors, one stand-up freezer with glass doors, and three refrigerator chests. All equipment is standard efficiency and in good condition except one stand-up refrigerator and one refrigerator chest that have ENERGY STAR label.

There are three walk-in refrigeration systems including a walk-in cooler and two medium temperature walk-in freezers. The units are in fair condition.

There are two self-contained ice machines that are in good condition.

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

Stand-Up Solid Door Refrigerator

Stand-Up Glass Doors Refrigerator

Walk-In Freezer

2.10 Plug Load and Vending Machines

The facility has two desktop computer workstations. Plug loads include a residential-style clothes washer and dryer, commercial coffee machine and brewer, copier/scanner, microwaves, and 28 televisions that are used occasionally.

Copier/Scanner

Commercial Coffee Machine

2.11 Water-Using Systems

Water is provided by the Ringwood Water Department. Potable water is used for drinking, cleaning, laundry, cooking, dishwashing, steam boiler feed water and sanitary fixtures. Water leaks were not observed.

EPA WaterSense® has set maximum flow rates for sanitary fixtures. They are: 1.28 gallons per flush (gpf) for toilets, 0.5 gpf for urinals, 1.5 gallons per minute (gpm) for lavatory faucets, and 2.0 gpm for showerheads.

There are several restrooms with toilets, urinals, and sinks. Faucet flow rates are at 2.2 gpm or higher. Toilets are rated at 2.5 gpf and urinals are rated at 2.5 gpf. There are several guest showers and showerheads are rated as low.

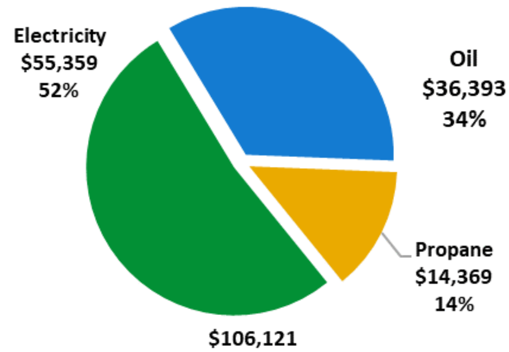
The site has a commercial kitchen with faucet aerators that are rated at 2.2 gpm or higher, two commercial ice machines, and a high temperature non-ENERGY STAR dishwasher.

Typical Restroom Sink

3 Energy Use and Costs

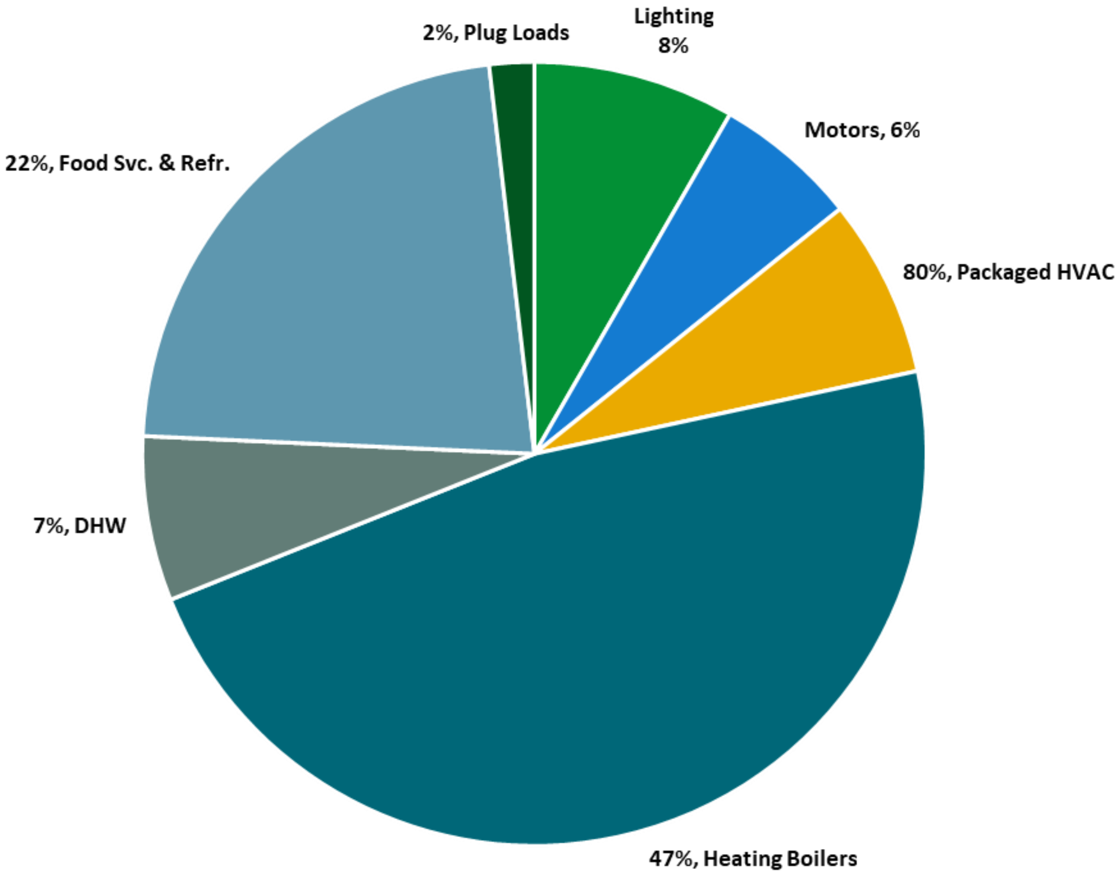
Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

Utility Summary		
Fuel	**Usage**	**Cost**
Electricity	321,999 kWh	$55,359
No. 2 fuel oil	9,460 Gallons	$36,393
Propane	3,205 Gallons	$14,369
Total		**$106,121**



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.

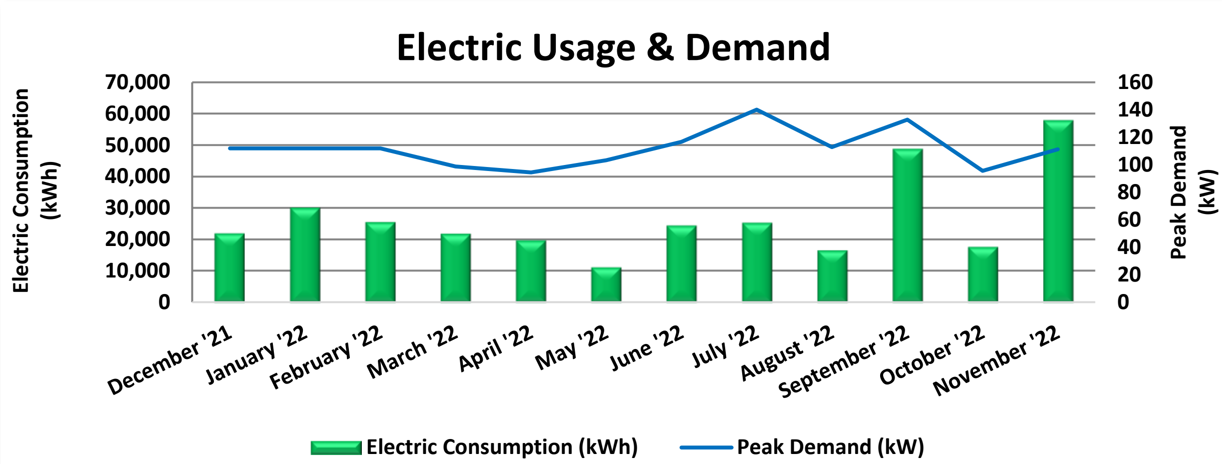
The energy auditor collects information regarding equipment operating hours, capacity, efficiency, and other operational parameters from facility staff, drawings, and on-site observations. This information is used as the inputs to calculate the existing conditions energy use for the site. The calculated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



Energy Balance by System

3.1 Electricity

Rockland Electric delivers electricity under rate class Electric Small C&I General Service Secondary.



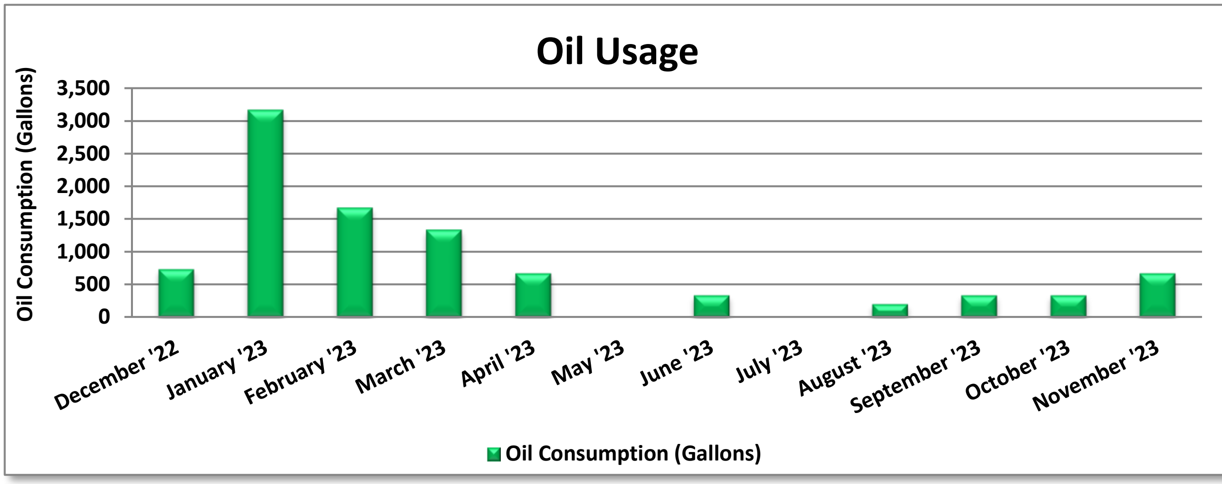
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
12/28/21	34	22,000	112	$552	$3,353
1/27/22	30	30,080	112	$727	$4,275
2/25/22	29	25,520	112	$746	$3,826
3/25/22	28	21,880	99	$656	$3,728
4/25/22	31	19,760	95	$656	$3,653
5/24/22	29	11,287	103	$686	$2,507
6/23/22	30	24,473	117	$894	$4,528
7/25/22	32	25,397	140	$1,119	$4,772
8/24/22	30	16,560	113	$897	$3,055
9/26/22	33	48,720	133	$1,060	$8,804
10/25/22	29	17,680	96	$668	$3,578
11/23/22	29	57,760	111	$757	$9,128
Totals	**364**	**321,117**	**140**	**$9,419**	**$55,207**
Annual	**365**	**321,999**	**140**	**$9,445**	**$55,359**

Notes:

- Peak demand of 140 kW occurred in July '22.
- Average demand over the past 12 months was 112 kW.
- The average electric cost over the past 12 months was $0.172/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 . 2 Fuel Oil

Allied Oil and Copper Oil delivers No. 2 fuel oil to the project site.



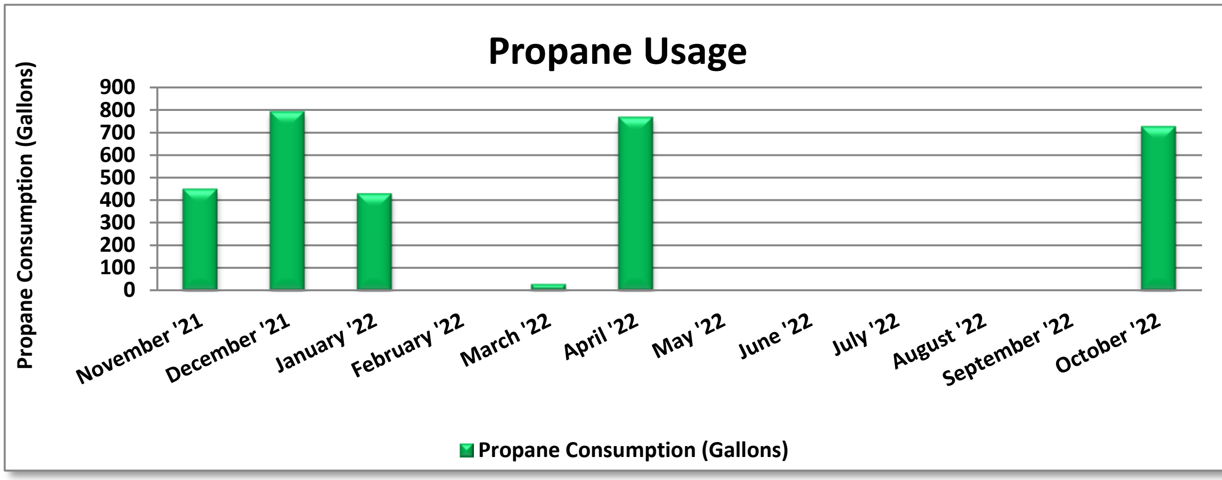
No. 2 fuel oil Billing Data			
Period Ending	**Days in Period**	**Oil Usage (Gallons)**	**Fuel Cost**
12/21/22	29	735	$2,132
1/22/23	32	3,164	$10,065
2/22/23	31	1,675	$6,081
3/22/23	28	1,340	$6,001
4/22/23	31	670	$3,082
5/22/23	30	0	$0
6/22/23	31	335	$1,524
7/22/23	30	0	$0
8/22/23	31	201	$1,103
9/22/23	31	335	$1,538
10/22/23	30	335	$1,390
11/22/23	31	670	$3,477
Totals	**365**	**9,460**	**$36,393**
Annual	**365**	**9,460**	**$36,393**

Notes:

- The average No. 2 fuel oil cost for the past 12 months is $3.847/Gallon, which is the blended rate used throughout the analysis.
- No. 2 fuel oil is used for heating.
- Fuel deliveries do not necessarily correspond to periods of use.

3.3 Propane

Suburban Propane delivers Propane to the project site.



Propane Billing Data			
Period Ending	**Days in Period**	**Propane Usage (Gallons)**	**Fuel Cost**
12/1/21	30	451	$2,159
1/1/22	31	796	$3,397
2/1/22	31	430	$1,844
3/1/22	28	0	$0
4/1/22	31	29	$337
5/1/22	30	770	$3,394
6/1/22	31	0	$0
7/1/22	30	0	$0
8/1/22	31	0	$0
9/1/22	31	0	$0
10/1/22	30	0	$0
11/1/22	31	728	$3,238
Totals	**365**	**3,205**	**$14,369**
Annual	**365**	**3,205**	**$14,369**

Notes:

- The average Propane cost for the past 12 months is $4.484/Gallon, which is the blended rate used throughout the analysis.
- Propane is used for cooking.
- Fuel deliveries do not necessarily correspond to periods of use.

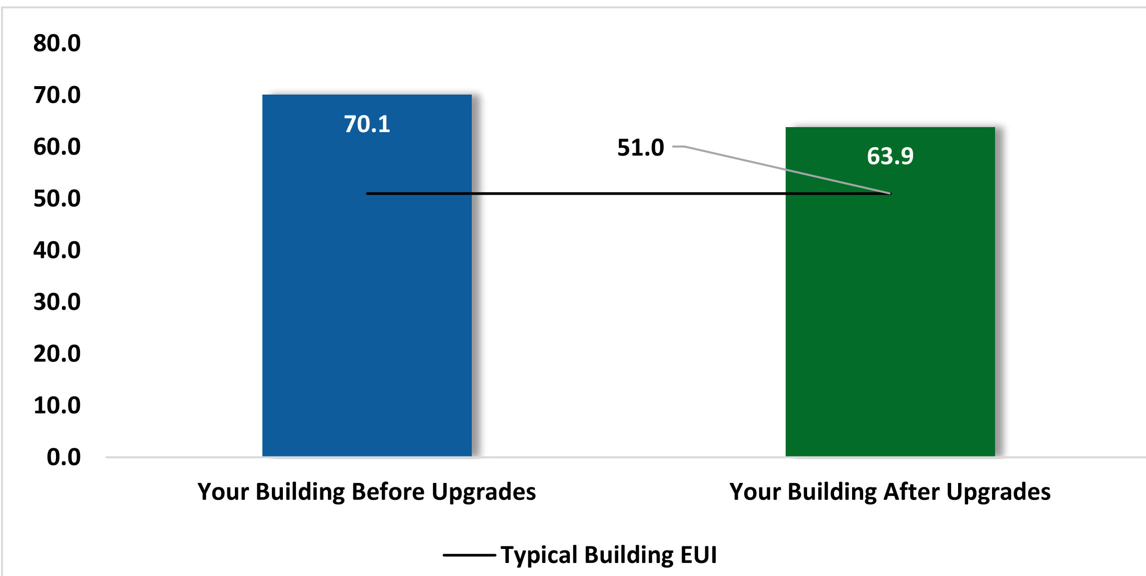
3.4 Benchmarking

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.

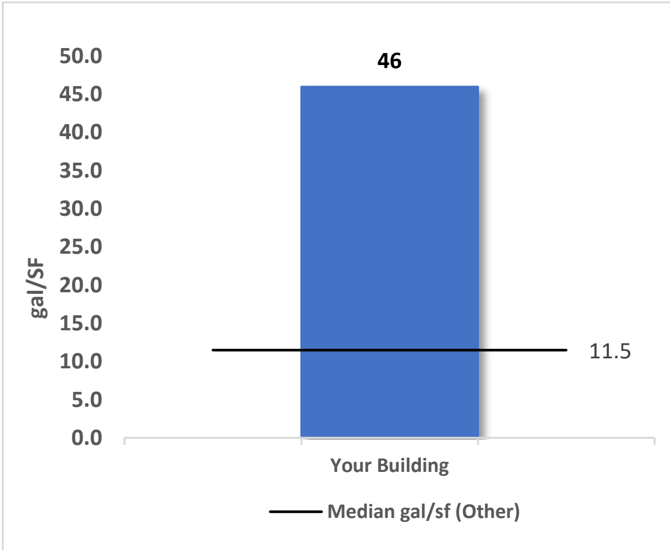


Energy Use Intensity Comparison[3]

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

Water Benchmarking



A benchmark is provided for your building's water use based on the annual water use in gallons per square foot of building area (gal/sf-yr.). Your building is compared to other similar buildings based on average water usage as available from the 2012 Commercial Buildings Energy Consumption Survey (CBECS) and from the EPA ENERGY STAR DataTrends Water Use Tracking database.

Tracking your Energy Performance

Keeping track of your energy and water use monthly is one of the best ways to keep utility costs in check and keep your facility operating efficiently. 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.

3.5 Understanding Your Utility Bills

The State of New Jersey Department of the Public Advocate provides detailed information on how to read natural gas and electric bills. Your bills contain important information including account numbers, meter numbers, rate schedules, meter readings, and the supply and delivery charges. Gas and electric bills both provide comparisons of current energy consumption with prior usage.

Sample bills, with annotation, may be viewed at:
https://www.nj.gov/rpa/docs/Understanding_Electric_Bill.pdf
https://www.nj.gov/rpa/docs/Understanding_Gas_Bill.pdf

Why Utility Bills Vary

Utility bills vary from one month to another for many reasons. For this reason, assessing the effects of your energy savings efforts can be difficult.

Billing periods vary, typically ranging between 28 and 33 days. Electric bills provide the kilowatt-hours (kWh) used per month while gas bills provide therms (or hundreds of cubic feet - CCF) per month consumption information. Monthly consumption information can be helpful as a tool to assess your efforts to reduce energy, particularly when compared to monthly usage from a similar calendar period in a prior year.

Bills typically vary seasonally, often with more gas consumed in the winter for heating, and more electricity used in the summer when air conditioning is used. Facilities with electric heating may experience higher electricity use in the winter. Seasonal variance will be impacted by the type of heating and cooling systems used. Normal seasonal fluctuations are further impacted by the weather. Extremely cold or hot weathers causes HVAC equipment to run longer, increasing usage. Other monthly fluctuations in usage can be caused by changes in building occupancy. Utility bills provide a comparison of usage between the current period and comparable billing month period of the prior year. Year-to-year monthly use comparisons can point to trends with energy savings for measures/projects that were implemented within the timeframe, but these comparisons do not account for changing weather of occupancy patterns.

The price of fuel and purchased power used to produce and delivery electricity and gas fluctuates. Any increase or decrease in these costs will be reflected in your monthly bill. Additionally, billing rates occasionally change after justification and approval of the NJBPU. For this reason, it is more useful to review energy use rather than cost when assessing energy use trends or the impact of energy conservation measures implemented.

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			**39,221**	**12.2**	**-15**	**$6,338**	**$19,200**	**$1,920**	**$17,280**	**2.7**	**37,110**
ECM 1	Install LED Fixtures	Yes	4,722	0.0	0	$812	$3,230	$1,050	$2,180	2.7	4,755
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	5,968	2.0	-3	$956	$6,690	$560	$6,130	6.4	5,594
ECM 3	Retrofit Fixtures with LED Lamps	Yes	28,531	10.2	-12	$4,571	$9,280	$310	$8,970	2.0	26,761
Lighting Control Measures			**5,158**	**1.4**	**-2**	**$826**	**$7,670**	**$2,390**	**$5,280**	**6.4**	**4,835**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	3,553	1.1	-2	$569	$4,590	$520	$4,070	7.2	3,330
ECM 5	Install High/Low Lighting Controls	Yes	1,606	0.3	-1	$257	$3,080	$1,870	$1,210	4.7	1,505
Variable Frequency Drive (VFD) Measures			**9,052**	**4.3**	**0**	**$1,556**	**$9,900**	**$1,200**	**$8,700**	**5.6**	**9,115**
ECM 6	Install VFDs on Constant Volume (CV) Fans	Yes	9,052	4.3	0	$1,556	$9,900	$1,200	$8,700	5.6	9,115
Unitary HVAC Measures			**2,038**	**1.4**	**0**	**$350**	**$32,600**	**$1,600**	**$31,000**	**88.5**	**2,052**
ECM 7	Install High Efficiency Air Conditioning Units	No	2,038	1.4	0	$350	$32,600	$1,600	$31,000	88.5	2,052
HVAC System Improvements			**0**	**0.0**	**2**	**$42**	**$30**	**$0**	**$30**	**0.7**	**250**
ECM 8	Install Pipe Insulation	Yes	0	0.0	2	$42	$30	$0	$30	0.7	250
Domestic Water Heating Upgrade			**695**	**0.0**	**13**	**$468**	**$290**	**$130**	**$160**	**0.3**	**2,755**
ECM 9	Install Low-Flow DHW Devices	Yes	695	0.0	13	$468	$290	$130	$160	0.3	2,755
Food Service & Refrigeration Measures			**5,668**	**0.3**	**0**	**$975**	**$9,800**	**$610**	**$9,190**	**9.4**	**5,708**
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	2,097	0.3	0	$361	$2,980	$320	$2,660	7.4	2,112
ECM 11	Refrigeration Controls	Yes	3,571	0.1	0	$614	$6,820	$290	$6,530	10.6	3,596
Custom Measures			**-1,214**	**0.0**	**35**	**$763**	**$5,000**	**$0**	**$5,000**	**6.6**	**4,504**
ECM 12	Replace Electric Water Heater with Heat Pump Water Heater	Yes	2,022	0.0	0	$348	$2,500	$0	$2,500	7.2	2,036
ECM 13	Replace Oil Fired Water Heater with Heat Pump Water Heater	Yes	-3,236	0.0	35	$415	$2,500	$0	$2,500	6.0	2,468
TOTALS			**60,619**	**19.6**	**32**	**$11,319**	**$84,490**	**$7,850**	**$76,640**	**6.8**	**66,329**

* - 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).

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		**39,221**	**12.2**	**-15**	**$6,338**	**$19,200**	**$1,920**	**$17,280**	**2.7**	**37,110**
ECM 1	Install LED Fixtures	4,722	0.0	0	$812	$3,230	$1,050	$2,180	2.7	4,755
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	5,968	2.0	-3	$956	$6,690	$560	$6,130	6.4	5,594
ECM 3	Retrofit Fixtures with LED Lamps	28,531	10.2	-12	$4,571	$9,280	$310	$8,970	2.0	26,761
Lighting Control Measures		**5,158**	**1.4**	**-2**	**$826**	**$7,670**	**$2,390**	**$5,280**	**6.4**	**4,835**
ECM 4	Install Occupancy Sensor Lighting Controls	3,553	1.1	-2	$569	$4,590	$520	$4,070	7.2	3,330
ECM 5	Install High/Low Lighting Controls	1,606	0.3	-1	$257	$3,080	$1,870	$1,210	4.7	1,505
Variable Frequency Drive (VFD) Measures		**9,052**	**4.3**	**0**	**$1,556**	**$9,900**	**$1,200**	**$8,700**	**5.6**	**9,115**
ECM 6	Install VFDs on Constant Volume (CV) Fans	9,052	4.3	0	$1,556	$9,900	$1,200	$8,700	5.6	9,115
HVAC System Improvements		**0**	**0.0**	**2**	**$42**	**$30**	**$0**	**$30**	**0.7**	**250**
ECM 8	Install Pipe Insulation	0	0.0	2	$42	$30	$0	$30	0.7	250
Domestic Water Heating Upgrade		**695**	**0.0**	**13**	**$468**	**$290**	**$130**	**$160**	**0.3**	**2,755**
ECM 9	Install Low-Flow DHW Devices	695	0.0	13	$468	$290	$130	$160	0.3	2,755
Food Service & Refrigeration Measures		**5,668**	**0.3**	**0**	**$975**	**$9,800**	**$610**	**$9,190**	**9.4**	**5,708**
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	2,097	0.3	0	$361	$2,980	$320	$2,660	7.4	2,112
ECM 11	Refrigeration Controls	3,571	0.1	0	$614	$6,820	$290	$6,530	10.6	3,596
Custom Measures		**-1,214**	**0.0**	**35**	**$763**	**$5,000**	**$0**	**$5,000**	**6.6**	**4,504**
ECM 12	Replace Electric Water Heater with Heat Pump Water Heater	2,022	0.0	0	$348	$2,500	$0	$2,500	7.2	2,036
ECM 13	Replace Oil Fired Water Heater with Heat Pump Water Heater	-3,236	0.0	35	$415	$2,500	$0	$2,500	6.0	2,468
TOTALS		**58,581**	**18.2**	**32**	**$10,968**	**$51,890**	**$6,250**	**$45,640**	**4.2**	**64,277**

* - 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).

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		**39,221**	**12.2**	**-15**	**$6,338**	**$19,200**	**$1,920**	**$17,280**	**2.7**	**37,110**
ECM 1	Install LED Fixtures	4,722	0.0	0	$812	$3,230	$1,050	$2,180	2.7	4,755
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	5,968	2.0	-3	$956	$6,690	$560	$6,130	6.4	5,594
ECM 3	Retrofit Fixtures with LED Lamps	28,531	10.2	-12	$4,571	$9,280	$310	$8,970	2.0	26,761

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

ECM 1: Install LED Fixtures

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

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

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

Affected Building Areas: exterior pole and wall mounted metal halide fixtures

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

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

The measure uses the existing fixture housing but replaces the electric components with more efficient lighting technology, which 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: kitchen main storage, first floor and basement mechanical room

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent T8 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: one linear T8 fixture in the mechanical room

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		**5,158**	**1.4**	**-2**	**$826**	**$7,670**	**$2,390**	**$5,280**	**6.4**	**4,835**
ECM 4	Install Occupancy Sensor Lighting Controls	3,553	1.1	-2	$569	$4,590	$520	$4,070	7.2	3,330
ECM 5	Install High/Low Lighting Controls	1,606	0.3	-1	$257	$3,080	$1,870	$1,210	4.7	1,505

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

ECM 4: Install Occupancy Sensor Lighting Controls

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

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

Occupancy sensors can be mounted on the wall at existing switch locations, 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: ballroom, dining room, restrooms, storage rooms, and library

ECM 5: Install High/Low Lighting Controls

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

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

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

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: elevator lobby and corridors

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		**9,052**	**4.3**	**0**	**$1,556**	**$9,900**	**$1,200**	**$8,700**	**5.6**	**9,115**
ECM 6	Install VFDs on Constant Volume (CV) Fans	9,052	4.3	0	$1,556	$9,900	$1,200	$8,700	5.6	9,115

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

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

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

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

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing must be determined during the final project design. The control system programming should maintain the minimum air flow whenever the compressor is operating. Prior to implementation, verify minimum fan speed in cooling mode with the manufacturer. Note that savings will vary depending on the operating characteristics of each AHU.

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

Affected Air Handlers: AHU-1 serving the Ball Hall

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		**2,038**	**1.4**	**0**	**$350**	**$32,600**	**$1,600**	**$31,000**	**88.5**	**2,052**
ECM 7	Install High Efficiency Air Conditioning Units	2,038	1.4	0	$350	$32,600	$1,600	$31,000	88.5	2,052

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 unitary HVAC units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 7: Install High Efficiency Air Conditioning Units

We evaluated replacing 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: four Lennox packaged units serving the Ball Hall

4.5 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**	**2**	**$42**	**$30**	**$0**	**$30**	**0.7**	**250**
ECM 8	Install Pipe Insulation	0	0.0	2	$42	$30	$0	$30	0.7	250

ECM 8: Install Pipe Insulation

Install insulation on system type system piping. Distribution system thermal losses are dependent on system fluid temperature, the size of the distribution system, and the extent and condition of piping insulation. When the insulation has been damaged due to exposure to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated, system thermal efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Affected Systems: oil fired domestic hot water heater piping

4.6 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		**695**	**0.0**	**13**	**$468**	**$290**	**$130**	**$160**	**0.3**	**2,755**
ECM 9	Install Low-Flow DHW Devices***	695	0.0	13	$468	$290	$130	$160	0.3	2,755

ECM 9: Install Low-Flow DHW Devices

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

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

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

This measure could also save approximately 69,550 Gallons annually.

4.7 Food Service and Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**5,668**	**0.3**	**0**	**$975**	**$9,800**	**$610**	**$9,190**	**9.4**	**5,708**
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	2,097	0.3	0	$361	$2,980	$320	$2,660	7.4	2,112
ECM 11	Refrigeration Controls	3,571	0.1	0	$614	$6,820	$290	$6,530	10.6	3,596

ECM 10: Refrigerator/Freezer Case Electrically Commutated Motors

Replace shaded pole or permanent split capacitor (PSC) motors with electronically commutated (EC) motors in the walk-in coolers and freezer. Fractional horsepower EC motors are significantly more efficient than mechanically commutated, brushed motors, particularly at low speeds or partial load. By using variable-speed technology, EC motors can optimize fan usage. Because these motors are brushless and use DC power, losses due to friction and phase shifting are eliminated.

Savings for this measure consider both the increased efficiency of the motor as well as the reduction in refrigeration load due to motor heat loss.

Affected Systems: walk-in freezer and both walk-in coolers

ECM 11: Refrigeration Controls

Install additional controls to optimize the operation of walk-in coolers and freezers.

Many walk-in coolers and freezers have continuously operating electric heaters on the doors to prevent condensation formation. This measure adds a control system feature to shut off the door heaters when the humidity level is low enough that condensation will not occur if the heaters are off. This is done by measuring the ambient humidity and temperature of the store, comparing that to the dewpoint, and using pulse width modulation to control the anti-sweat door heaters.

Defrost controllers can be used to override defrost of evaporator fans when the defrost operation is not necessary, which reduces annual energy consumption. This measure is applicable to existing evaporator fans with a traditional electric de-frost mechanism.

Affected Systems: walk-in freezer

Many walk-in coolers and freezers have evaporator fans that run continuously. The measure adds a control system feature to automatically shut off evaporator fans when not needed.

Energy savings for each of the control measures account for reduction in compressor and fan operating hours as well as reduction in the refrigeration heat load as appropriate.

Affected Systems: walk-in freezer and both walk-in coolers

4.8 Custom Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Custom Measures		**-1,214**	**0.0**	**35**	**$763**	**$5,000**	**$0**	**$5,000**	**6.6**	**4,504**
ECM 12	Replace Electric Water Heater with Heat Pump Water Heater	2,022	0.0	0	$348	$2,500	$0	$2,500	7.2	2,036
ECM 13	Replace Oil Fired Water Heater with Heat Pump Water Heater	-3,236	0.0	35	$415	$2,500	$0	$2,500	6.0	2,468

CM 12: Replace Electric Water Heater with Heat Pump Water Heater

Replace the existing electric water heater with heat pump water heater (HPWH).

A typical electric water heater uses electric resistance coils to heat water at a coefficient of performance (COP) of 1. Air source heat pump water heaters use a refrigeration cycle to transfer heat from the surrounding air to the domestic water. The typical average COP for a HPWH is about 2.5, so they require significantly less electricity to produce the same amount of hot water as a traditional electric water heater. There are two types of HPWH, those integrated with the heat pump and storage tank in the same unit, and those that are split into two sections (with the storage tank separate from the heat pump). The following addresses integrated HPWH.

HPWH reject cold air. As such, they need to be installed in a space of about 750 cubic feet with good ventilation. Ideal locations are garages, large enclosed, unconditioned storage areas, or areas with excess heat such as a furnace or boiler room.[4] The HPWH will also produce condensate so accommodations for draining the condensate need to be provided.

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

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

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

Affected Units: existing 19-gallon electric water heater

ECM 13: Replace Oil Fired Water Heater with Heat Pump Water Heater

We evaluated replacing existing oil-fired water heater with heat pump water heater (HPWH).

An oil-fired water heater uses a burner to heat water. Air source heat pump water heater us a refrigeration cycle to transfer heat from the surrounding air to the domestic water. Water heater efficiency is rated by the uniform energy factor (UEF).

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

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Switching from a gas fired water heater to a HPWH has the potential to reduce the sites overall greenhouse gas emissions. If the electricity for the HPWH is provided by an on-site photovoltaic (PV) system, then there are essentially no greenhouse gas (GHG) emissions. A 2016 study conducted at Cornell[6]

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

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

calculated the kg of methane (CH_4) and carbon dioxide (CO_2) produced per GJ of water heated. The study compared HPWH to gas and electric fired, storage and tankless water heaters. The study also considered electricity produced from natural gas and coal fired electric plants. In all cases the study found that HPWHs produced less methane than all of the other water heaters. The study also found that HPWH produced less carbon dioxide than electric resistance water heaters but more carbon dioxide than tankless gas water heaters and about the same amount of carbon dioxide as storage gas water heaters. The summary tables provide the reduction in CO2 equivalent emissions based on the typical New Jersey electric utility.

Affected Units: existing 75-gallon main oil-fired water heater

4.9 Measures for Future Consideration

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

State of NJ Ringwood State Park 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. 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 between the conditioned space and unconditioned attic, between the conditioned space and the roof will improve thermal comfort in the building and reduce the heating / cooling 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.

5 Energy Efficient Best Practices

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs.

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

You may already be doing some of these things—see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

Energy Tracking with ENERGY STAR Portfolio Manager

You've heard it before—you cannot manage what you do not measure. ENERGY STAR Portfolio Manager is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions[7]. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Doors and Windows

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

Window Treatments/Coverings

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

Lighting Maintenance

Clean lamps, reflectors and lenses of dirt, dust, oil, and smoke buildup every six to twelve months. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust. Together, this can reduce total light output by up to 60% while still drawing full power.

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.

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

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.

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

Air filters should be checked regularly (often monthly) and cleaned or replaced when appropriate. Air filters reduce indoor air pollution, increase occupant comfort, and help keep equipment operating efficiently. If the building has a building management system, consider installing a differential pressure switch across filters to send an alarm about premature fouling or overdue filter replacement. Over time, filters become less and less effective as particulate buildup increases. Dirty filters also restrict air flow through the air conditioning or heat pump system, which increases the load on the distribution fans.

Ductwork Maintenance

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

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

Duct leakage in commercial buildings can account for 5%–25% of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building wasting conditioned air. Check ductwork for leakage. Eliminating duct leaks can improve ventilation system performance and reduce heating and cooling system operation.

Distribution system losses are dependent on-air system temperature, the size of the distribution system, and the level of insulation of the ductwork. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is missing or worn, the system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Steam Trap Repair and Replacement

Steam traps are a crucial part of delivering heat from the boiler to the space heating units. Steam traps are automatic valves that remove condensate from the system. If the traps fail closed, condensate can build up in the steam supply side of the trap, which reduces the flow in the steam lines and thermal capacity of the radiators. Or they may fail open, allowing steam into the condensate return lines resulting in wasted energy, water, and hammering. Losses can be significantly reduced by testing and replacing equipment as they start to fail. Repair or replace traps that are blocked or allowing steam to pass. Inspect steam traps as part of a regular steam system maintenance plan.

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.

Label HVAC Equipment

For improved coordination in maintenance practices, we recommend labeling or re-labeling the site HVAC equipment. Maintain continuity in labeling by following labeling conventions as indicated in the facility drawings or BAS building equipment list. Use weatherproof or heatproof labeling or stickers for permanence, but do not cover over original equipment nameplates, which should be kept clean and readable whenever possible. Besides equipment, label piping for service and direction of flow when possible. Ideally, maintain a log of HVAC equipment, including nameplate information, asset tag designation, areas served, installation year, service dates, and other pertinent information.

This investment in your equipment will enhance collaboration and communication between your staff and your contracted service providers and may help you with regulatory compliance.

Optimize HVAC Equipment Schedules

Energy management systems (BAS) typically provide advanced controls for building HVAC systems, including chillers, boilers, air handling units, rooftop units and exhaust fans. The BAS monitors and reports operational status, schedules equipment start and stop times, locks out equipment operation based on outside air or space temperature, and often optimizes damper and valve operation based on complex algorithms. These BAS features, when in proper adjustment, can improve comfort for building occupants and save substantial energy.

Know your BAS scheduling capabilities. Regularly monitor HVAC equipment operating schedules and match them to building operating hours to eliminate unnecessary equipment operation and save energy. Monitoring should be performed often at sites with frequently changing usage patterns – daily in some cases. We recommend using the optimal start feature of the BAS (if available) to optimize the building warmup sequence. Most BAS scheduling programs provide for holiday schedules, which can be used during reduced use or shutdown periods. Finally, many systems are equipped with a one-time override function, which can be used to provide additional space conditioning due to a one-time, special event. When available this override feature should be used rather than changing the base operating schedule.

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.

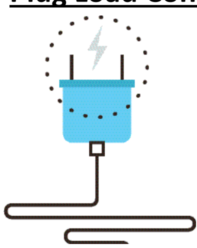
Refrigeration Equipment Maintenance

Preventative maintenance keeps commercial refrigeration equipment running reliably and efficiently. Commercial refrigerators and freezers are mission-critical equipment that can cost a fortune when they go down. Even when they appear to be working properly, refrigeration units can be consuming too much energy. Have walk-in refrigeration and freezer and other commercial systems serviced at least annually. This practice will allow systems to perform to their highest capabilities and will help identify system issues if they exist.

Maintaining your commercial refrigeration equipment can save between five and ten percent on energy costs. When condenser coils are dirty, your commercial refrigerators and freezers work harder to maintain the temperature inside. Worn gaskets, hinges, door handles or faulty seals cause cold air to leak from the unit, forcing the unit to run longer and use more electricity.

Regular cleaning and maintenance also help your commercial refrigeration equipment to last longer.

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips[8]. Your local utility may offer incentives or rebates for this equipment.

Procurement Strategies

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

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

6 WATER BEST PRACTICES

Getting Started

The commercial and institutional sector is the second largest consumer of publicly supplied water in the United States, accounting for 17% of the withdrawals from public water supplies[9]. In New Jersey, excluding water used for power generation, approximately 80% of total water use was attributed to potable supply during the period of 2009 to 2018. Water withdrawals for potable supply have not changed noticeably during the period from 1990 to 2018[10].

Water management planning serves as the foundation for any successful water reduction effort. It is the first step a commercial or institutional facility owner or manager should take to achieve and sustain long-term water savings. Understanding how water is used within a facility is critical for the water management planning process. A water assessment provides a comprehensive account of all known water uses at the facility. It allows the water management team to establish a baseline from which progress and program success can be measured. It also enables the water management team to set achievable goals and identify and prioritize specific projects based on the relative savings opportunities and project cost-effectiveness.

Water conservation devices may significantly reduce your water and sewer usage costs. Any reduction in water use reduces grid-level electricity use since a significant amount of electricity is used to treat and deliver water from reservoirs to end users.

For more information regarding water conservation or additional details regarding the practices shown below go to the EPA's WaterSense website[11] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[12] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Toilets and Urinals

Toilets and urinals are considered sanitary fixtures and are found in most facilities. High efficiency fixtures are at least 20% more efficient than available standard products. Leaking or damaged equipment is a substantial source of water waste. Train users to report continuously flushing, leaking, or otherwise improperly operating equipment to the appropriate personnel. Depending on the age of the equipment and the frequency of use, it may be cost effective to replace older inefficient fixtures with current generation WaterSense labeled equipment.

Commercial facilities typically use tank toilets or wall-mount flushometers. Educate and inform users with restroom signage and other means to avoid flushing inappropriate objects. For tank toilets, periodically check to ensure fill valves are working properly and that water level is set correctly. Annually test toilets to ensure the flappers are not worn or allowing water to seep from the tank into the bowl and down the sewer. Control stops and piston valves on flushometer toilets should be checked at least annually.

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[9] Estimated from analyzing data in: Solley, Wayne B,. et al, "Estimated Use of Water in the United States in 1995", U.S Geological Survey Circular 1200, (1998)

[10] https://dep.nj.gov/wp-content/uploads/dsr/trends-water-supply.pdf

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

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

Most urinals use water to flush liquid. These standard single-user fixtures are present in most facilities. Non-water urinals use a specially designed trap that allows liquid waste to drain out of the fixture through a trap seal, and into the drainage system. Flushing urinals should be inspected at least annually for proper valve and sensor operation. For non-water urinals, follow maintenance practices as directed by the manufacturer to ensure products perform as expected. Non-water urinals can be considered during urinal replacement, however, review the condition and design of the existing plumbing system and the expected usage patterns to ensure that these products will provide the anticipated performance.

Faucets and Showerheads

Faucets and showerheads are sanitary fixtures that generally dispense heated water. Reducing water use by these fixtures translates into a reduction of site fuel or electric use depending on how water is heated. High efficiency fixtures are at least 20% more efficient than available standard products. Leaking or damaged equipment is a substantial source of water waste. Train users to report continuously dripping, leaking, or otherwise improperly operating equipment to the appropriate personnel. Depending on the age of the equipment and the frequency of use, it may be cost effective to replace older fixtures with current generation WaterSense labeled equipment.

Faucets are used for a variety of purposes, and standard flow rates are dictated by the intended use. Public use lavatory faucets and kitchen faucets are subject to maximum flow rates while service sinks are not. Periodically inspect faucet aerators for scale buildup to ensure flow is not being restricted. Clean or replace the aerator or other spout end device as needed. Check and adjust automatic sensors (where installed) to ensure they are operating properly to avoid faucets running longer than necessary. Post materials in restrooms and kitchens to ensure user awareness of the facility's water-efficiency goals. Remind users to turn off the tap when they are done and to consider turning the tap off during sanitation activities when it is not being used. Consider installing lavatory and kitchen faucet fixtures with reduced flow. Federal standards limit kitchen and restroom faucet flows to 2.2 gpm. To qualify for a WaterSense label a faucet cannot exceed 1.5 gpm.

Effective in 1992, the maximum allowable flow rate for all showerheads sold in the United States is 2.5 gpm. Since this standard was enacted, many showerheads have been designed to use even less water. WaterSense labeled equipment is designed to use 2.0 gpm, or less. For optimum showerhead efficiency, the system pressure should be tested to make sure that it is between 20 and 80 pounds per square inch (psi). Verify that plumbing lines are routed through a shower valve to prevent water pressure fluctuations. Periodically inspect showerheads for scale buildup to ensure flow is not being restricted. In general, replace showerheads with 2.5 gpm flow rates or higher with WaterSense labeled models. Note: Use of poor performing replacement reduced flow showerheads may result in increased use if the duration of use is increased to compensate for reduced performance. WaterSense labeled showerheads are independently certified to meet or exceed minimum performance requirements for spray coverage and force.

Commercial Kitchen Equipment

Commercial and institutional sectors, including hospitals, offices, and schools, have substantial kitchen water use. Water in food service is used for steam cooking, spray/flow cleaning, dish washing, and ice making. In most commercial kitchens, the commercial dishwasher and pre-rinse spray valve account for over two-thirds of the water use. Newer technologies and better practices are available that can significantly reduce commercial kitchen equipment water and energy use. For example, ENERGY STAR qualified dishwashers and steam cookers are at least 10% more water-efficient and 15% more energy-efficient than standard models. With some models saving significantly more.

Cooking equipment includes combination ovens, steam cookers, and steam kettles. For efficient steam cooking operation, fill vessels to capacity when possible, and set temperatures optimally for the process, and keep doors and lids closed while cooking. Replace gaskets to ensure proper sealing and repair leaks. When replacing combination ovens, select connectionless equipment; replace steam cookers with ENERGY STAR rated steam cookers.

Spray/flow cleaning equipment includes dipper wells, pre-rinse spray valves, food disposals, and wash down sprayers. Turn off water when service periods are slow and keep flow rates to minimum level. Train users to scrape food rather than rely on water pressure. Inspect for leaks and scaling. Test system pressure to ensure it is between 20 and 80 pounds per square inch (psi) for optimum flow and performance of spray equipment. For dipper wells, consider installing in-line flow restrictors to reduce flow. Pre-rinse spray valves can be replaced with new assemblies which use 1.3 gpm or less. Washdown sprayers can be equipped with self-closing nozzles or consider mopping/sweeping as an alternative.

Dishwashers range in type and include undercounter, stationary/hood, conveyor, and flight-type models. Only run dishwashers when they are full, and fill racks to maximum capacity. Be sure to replace damaged dishwasher racks. Educate staff to scrape dishes prior to loading. Ensure that final rinse pressure and water temperature are within the manufacturer's recommendations. Operate the dishwasher close to or at the minimum flow rate and set rinse cycle time to the manufacturer's minimum recommended settings. Make sure that manual fill valves close completely after the wash tank is filled. Find and repair any leaks. Inspect valves and rinse nozzles for proper operation and repair worn nozzles. Look for ENERGY STAR qualified models when purchasing or leasing a new commercial dishwasher or replacing an existing unit. Consider your kitchen throughput to select an appropriately sized commercial dishwasher since an oversized dishwasher will waste water if the machine is not loaded to capacity.

Ice Machines

Commercial ice machines use refrigeration units to freeze water into ice. Ice machines typically use water for two purposes: cooling the refrigeration unit and making ice. Because the ice-making process generates a significant amount of heat, either water or air is used to remove this waste heat from the ice machine's refrigeration unit.

Water-cooled ice machines generally pass water through the machine once to cool it and then dispose of the single-pass water down the drain. Water-cooled systems can use less water by recirculating the cooling water through a chiller or a cooling tower to lower the temperature, returning the water to the machine for reuse. To eliminate using water to cool the refrigeration unit altogether, air can be used to cool the unit. Air-cooled ice machines use motor-driven fans or centrifugal blowers to move air through the refrigeration unit to remove heat. In general, water-cooled units are more energy efficient than air-cooled units but use more water. Commercial ice machines that are ENERGY STAR qualified are, on average, 15% more energy-efficient and 10% more water-efficient than standard air-cooled models.

For optimal ice machine efficiency, consider the following:

- Clean the ice machine to remove lime and scale buildup; sanitize it to kill bacteria and fungi. Run the self-cleaning sequence if available. For machines without a self-cleaning mode, shut down the machine, empty the bin of ice, add cleaning or sanitizing solution to the machine, switch it to cleaning mode, and then switch it to ice production mode. For health and safety purposes, create and discard several batches of ice to remove residual cleaning solution.
- Keep the ice machine's coils clean to ensure the heat exchange process is running efficiently.
- Keep the lid closed to preserve cool air and maintain the appropriate temperature.
- Install a timer to shift ice production to off-peak hours to decrease peak energy demand.

- Work with the manufacturer to ensure that the ice machine's rinse cycle is set to the lowest possible frequency that still provides sufficient ice quality and meets local water quality and site requirements.
- Follow the manufacturer's use and care instructions for the specific ice machine model.
- Train users to report leaking or otherwise improperly operating ice machines to the appropriate personnel.

If the machine is cooled using single-pass water, modify the machine to operate on a closed loop that recirculates the cooling water through a cooling tower or heat exchanger, if possible.

When replacing an ice machine or installing a new one, ensure that the new model is sized appropriately to fit the facility's need. Choose an ice machine that is appropriate for the quality of ice needed. Producing ice of higher quality than required will use water unnecessarily. Look for ENERGY STAR qualified models, all of which are air-cooled. Also consider air- or water-cooled ice machines that meet the efficiency specifications outlined by the Consortium for Energy Efficiency. If feasible, consider selecting air-cooled flake or nugget ice machines, which use less water and energy than cubed ice machines.

Steam Boiler System

Typically, boilers that produce hot water are closed loop systems and do not have significant water losses if there are no leaks in the boiler or distribution piping. Therefore, this section focuses on boilers that produce steam. Steam is typically used for space heating, indirectly to heat domestic water and for process heating.

As steam is distributed, its heat is transferred to the process or the ambient environment and, as a result, the steam condenses to water. This condensate is then either discharged to the sewer or captured and returned to the boiler for reuse.

As water is converted to steam within the boiler, dissolved solids, such as calcium, magnesium, chloride, and silica, are left behind. With evaporation, the total dissolved solids (TDS) concentration increases. If the concentration gets too high, the TDS can cause scale to form within the system or can lead to corrosion. The concentration of TDS is controlled by removing (i.e., blowing down) a portion of the water that has a high concentration of TDS and replacing that water with make-up water, which has a lower concentration of TDS. Some boiler operators practice continuous blowdown by leaving the blowdown valve partially open, requiring a continuous feed of make-up water.

Proper control of boiler blowdown water is critical to ensure efficient boiler operation and minimize make-up water use. Insufficient blowdown can lead to scaling and corrosion, while excessive blowdown wastes water, energy, and chemicals. The optimum blowdown rate is influenced by several factors, including boiler type, operating pressure, water treatment, and quality of make-up water. Generally, blowdown rates range from 4% to 8% of the make-up water flow rate, although they can be as high as 10% if the make-up water is poor quality with high concentrations of solids.

Blowdown is typically assessed and controlled by measuring the conductivity of the boiler make-up water compared to that in the boiler blowdown water. Conductivity provides an indication of the overall TDS concentration in the boiler. The blowdown percentage can be calculated as indicated below. The boiler water quality is often expressed in terms of cycles of concentration, which is the inverse of the blowdown percentage. See figure below.

Blowdown Percentage = Make-up Water Conductivity / Blowdown Conductivity

Blowdown Percentage

Controlling the blowdown percentage and maximizing the cycles of concentration will reduce make-up water use; however, this can only be done within the constraints of the make-up and boiler water chemistry. As the TDS concentration in the blowdown water increases, scaling and corrosion problems can occur, unless carefully controlled.

For optimum steam boiler water efficiency, there are several operations, maintenance, and user education strategies to consider.

- Check steam, hot water, and condensate lines for leaks regularly and make repairs promptly.
- Regularly clean and inspect boiler water and fire tubes.
- Develop and implement an annual boiler tune-up program.
- Provide proper insulation on piping and the central storage tank to conserve heat.
- Implement a steam trap inspection program for boiler systems with condensate recovery. Repair leaking traps as soon as possible.
- Choose a water treatment vendor that will work with you to minimize water use, chemical use, and cost, while maintaining appropriate water chemistry for efficient scale and corrosion control.
- Have the water treatment vendor produce a report every time they evaluate the water chemistry in the boiler. Review the reports to ensure that characteristics, such as conductivity and cycles of concentration, are within the target range.
- To minimize blowdown, calculate and understand the boiler's cycles of concentration.
- Consider pre-treating boiler make-up water to remove impurities, which can increase the cycles of concentration the boiler can achieve.

There are also retrofits to consider if the steam system is not already equipped with these items.

- Install and maintain a condensate recovery system to return condensate to the boiler for reuse. If there already is a condensate recovery system inspect and maintain it regularly to maintain the maximum level of condensate return possible. Maximizing condensate return to the boiler is the most effective way to reduce water use. Recovering condensate:
    - Reduces the amount of make-up water required.
    - Reduces the frequency of blowdown.
    - Reduces boiler fuel use since the temperature of the condensate is considerably higher than the temperature of the make-up water.
- Where condensate cannot be returned to the boiler and must be discharged to the sanitary sewer, consider one of the following options:
    - Installing a heat exchanger to recover heat from the condensate to preheat the make-up water.
    - Install an expansion tank to temper hot condensate rather than adding water to cool it.
- Install an automatic blowdown control system, particularly on boilers that are more than 200 horsepower (6,700 kBtu/hr.), to control the amount and frequency of blowdown rather than relying on continuous blowdown. Control systems with a conductivity controller will initiate blowdown only when the TDS concentrations in the boiler have built up to a specified concentration.

- Install flow meters on the make-up water line and the condensate return line to monitor the amount of make-up water added to the boiler.
- Install automated chemical feed systems to monitor conductivity, control blowdown, and add chemicals based on make-up water flow. These systems minimize water and chemical use while protecting against scale buildup and corrosion.

7 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.

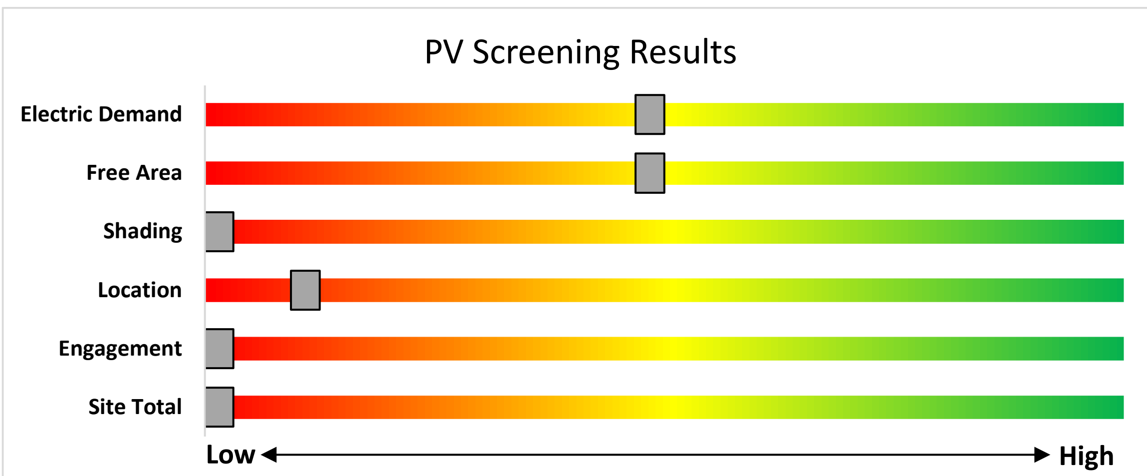
7.1 Solar Photovoltaic

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.



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

7.2 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.

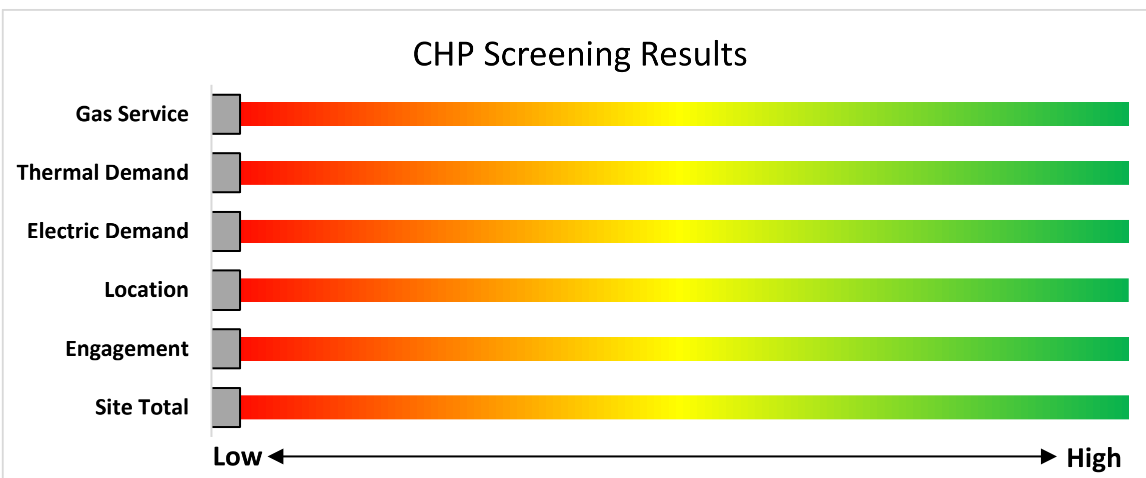
CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be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



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/

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8 Electric Vehicles

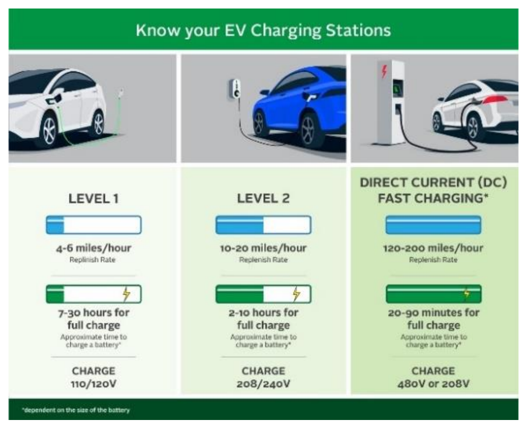
All electric vehicles (EVs) have an electric motor instead of an internal combustion engine. EVs function by plugging into a charge point, taking electricity from the grid, and then storing it in rechargeable batteries. Although electricity production may contribute to air pollution, the U.S. EPA categorizes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

8.1 EV 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.

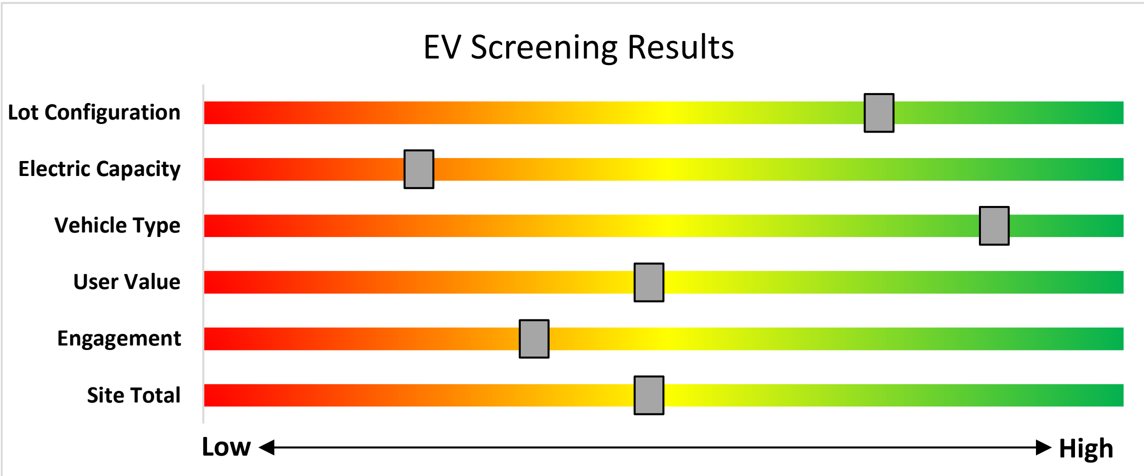
The primary costs associated with installing EV charging are the charger hardware and the cost to extend power from the facility to parking spaces. This may include upgrades to electric panels to serve increased loads.

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.



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), Public Service Electric and Gas Company (PSE&G) or Jersey Central Power and Light (JCP&L), 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, PSE&G or JCP&L, up to 90% of the combined charger purchase and installation costs. Please check ACE, PSE&G or JCP&L program eligibility requirements before purchasing EV charging equipment, as additional conditions on types of eligible chargers may apply for utility incentives.

EV Charging incentive information is available from Atlantic City Electric, PSE&G and JCP&L.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

9 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.

NJBPU and NJCEP Administered Programs

New Jersey's cleanenergy program™

- New Construction (residential, commercial, industrial, government)
- Large Energy Users
- Energy Savings Improvement Program (financing)
- State Facilities Initiative*
- Local Government Energy Audits
- Combined Heat & Power & Fuel Cells

*State facilities are also eligible for utility programs

Utility Administered Programs

atlantic city electric – An Exelon Company; Jersey Central Power & Light – A FirstEnergy Company; PSE&G; Rockland Electric Company; Elizabethtown Gas; South Jersey Gas; New Jersey Natural Gas

- Existing buildings (residential, commercial, industrial, government)
- Efficient Products
  - Lighting & Marketplace
  - HVAC
  - Appliance Rebates
  - Appliance Recycling

9.1 New Jersey's Clean Energy Program

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. To qualify entities must have incurred at least $5 million in total 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 http://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[13]

Eligible Technology	Size (Installed Rated Capacity)	Incentive ($/Watt)[5]	% of Total Cost Cap per Project	$ Cap per Project
CHPs powered by non-renewable or renewable fuel source, or a combination:[4] - Gas Internal Combustion Engine - Gas Combustion Turbine - Microturbine Fuel Cells ≥60%	≤500 kW[1]	$2.00	30-40%[2]	$2 million
	>500 kW - 1 MW[1]	$1.00		
	> 1 MW - 3 MW[1]	$0.55	30%	$3 million
	>3 MW[1]	$0.35		
Fuel Cells ≥40%	Same as above[1]	Applicable amount above	30%	$1 million
Waste Heat to Power (WHP)[3] Powered by non-renewable fuel source. Heat recovery or other mechanical recovery from existing equipment utilizing new electric generation equipment (e.g. steam turbine)	≤1MW[1]	$1.00	30%	$2 million
	> 1MW[1]	$.50	30%	$3 million

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 http://www.njcleanenergy.com/CHP.

13

1 Incentives are tiered, which means the incentive levels vary based upon the installed rated capacity, as listed in the chart above. For example, a 4 MW CHP system would receive $2.00/watt for the first 500 kW, $1.00/watt for the second 500 kW, $0.55/watt for the next 2 MW and $0.35/watt for the last 1 MW (up to the caps listed).

2 The maximum incentive will be limited to 30% of total project. For CHP projects up to 1 MW, this cap will be increased to 40% where a cooling application is used or included with the CHP system (e.g. absorption chiller).

3 Projects will be eligible for incentives shown above, not to exceed the lesser of % of total project cost per project cap or maximum $ per project cap. Projects installing CHP or FC with WHP will be eligible for incentive shown above, not to exceed the lesser caps of the CHP or FC incentive. Minimum efficiency will be calculated based on annual total electricity generated, utilized waste heat at the host site (i.e., not lost/rejected), and energy input.

4 Systems fueled by a Class 1 Renewable Fuel Source, as defined by N.J.A.C. 14:8-2.5, are eligible for a 30% incentive bonus. If the fuel is mixed, the bonus will be prorated accordingly. For example, if the mix is 60/40 (60% being a Class 1 renewable), the bonus will be 18%. This bonus will be included in the final performance incentive payment, based on system performance and fuel mix consumption data. Total incentive, inclusive of bonus, shall not exceed above stipulated caps.

5 CHP-FC systems located at Critical Facility and incorporating blackstart and islanding technology are eligible for a 25% incentive bonus. This bonus incentive will be paid with the second/Installation incentive payment. Total incentive, inclusive of bonus, shall not exceed above stipulated caps.

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 (CSI) Program

The CSI Program opened on April 15, 2023, and will serve as the permanent program within the SuSI Program providing incentives to larger solar facilities. The CSI Program is open to qualifying grid supply solar facilities, non-residential net metered solar installations with a capacity greater than five (5) megawatts ("MW"), and to eligible grid supply solar facilities installed in combination with energy storage. CSI eligible facilities will only be allowed to register in the CSI program upon award of a bid pursuant to N.J.A.C. 14:8-11.10.

The CSI program structure has separate categories, or tranches, to ensure that a range of solar project types, including those on preferred sites, are able to participate despite potentially different project cost profiles. The Board has approved four tranches for grid supply and large net metered solar and an additional fifth tranche for storage in combination with grid supply solar. The following table lists procurement targets for the first solicitation:

Tranche	Project Type	MW (dc) Targets
Tranche 1.	Basic Grid Supply	140
Tranche 2.	Grid Supply on the Built Environment	80
Tranche 3.	Grid Supply on Contaminated Sites and Landfills	40
Tranche 4.	Net Metered Non- Residential	40
Tranche 5.	*Storage Paired with Grid	160 MWh

*The storage tranche of 160 MWh corresponds to a 4-hour storage pairing of 40 MW of solar

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 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 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.

Demand Response (DR) Energy Aggregator

Demand Response Energy Aggregator is a program designed to reduce the electric load when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Grid operators call upon curtailment service providers and commercial facilities to reduce electric usage during times of peak demand, making the grid more reliable and reducing transmission costs for all ratepayers. Curtailment service providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary, and participants receive payments whether or not their facility is called upon to curtail its electric usage.

Typically, an electric customer must be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with greater capability to quickly curtail their demand during peak hours receive higher payments. Customers with back-up generators on site may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in DR programs often find it to be a valuable source of revenue for their facility, because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature setpoints on thermostats (so that air conditioning units run less frequently) or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a DR activity in most situations.

The first step toward participation in a DR program is to contact a curtailment service provider. A list of these providers is available on the website of the independent system operator, PJM, and it includes contact information for each company, as well as the states where they have active business[14]. PJM also posts training materials for program members interested in specific rules and requirements regarding DR activity along with a variety of other DR program information[15].

Curtailment service providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities, and they may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

[14] http://www.pjm.com/markets-and-operations/demand-response.aspx.

[15] http://www.pjm.com/training/training-events.aspx.

9.2 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.

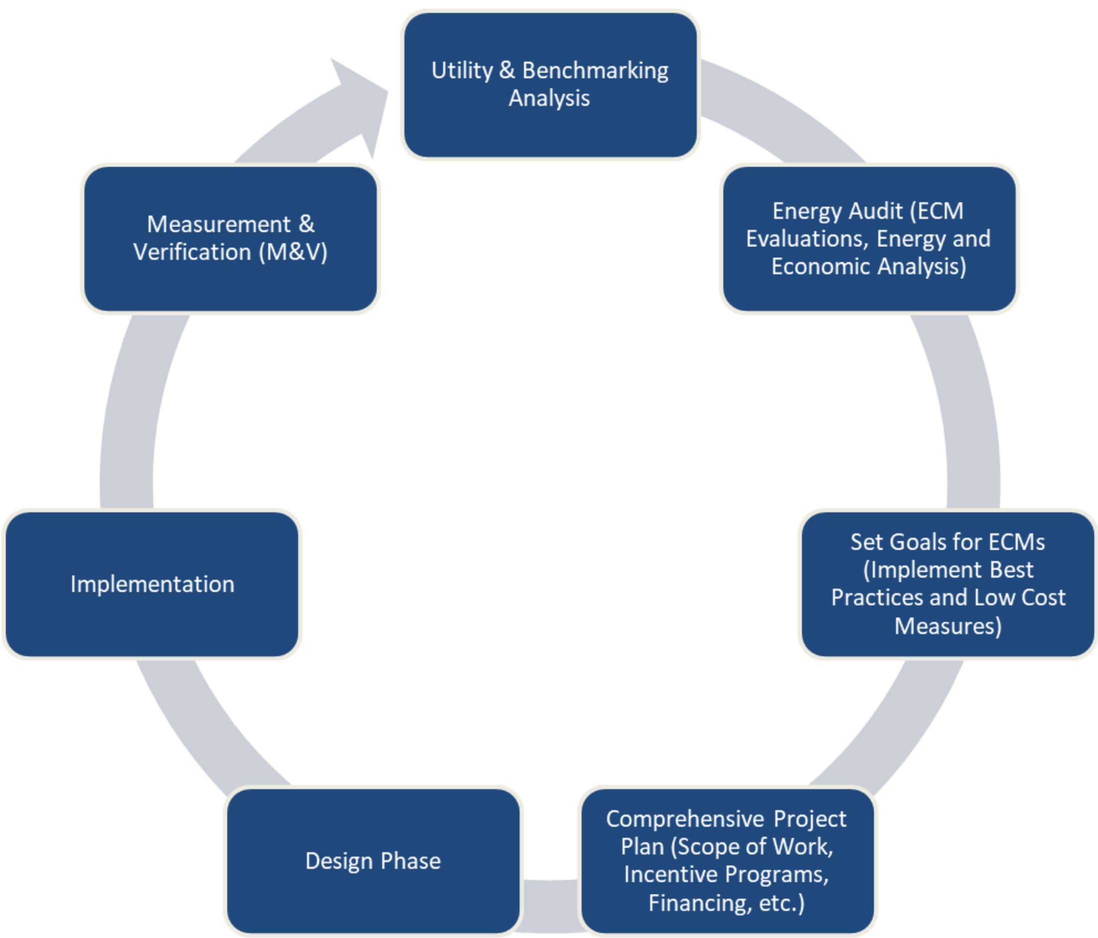
Engineered Solutions

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.

10 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.



Project Development Cycle

11 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

11.1 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[16].

11.2 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[17].

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

[17] 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
2nd Floor Lobby	7	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	2,621	3	Relamp	No	7	LED Lamps: A19 Lamps	Wall Switch	10	2,621	0.3	1,090	0	$174	$180	$10	1.0
Attic	5	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	2,621	3	Relamp	No	5	LED Lamps: A19 Lamps	Wall Switch	10	2,621	0.2	778	0	$125	$130	$10	1.0
Back Porch	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Back Porch	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	2,621		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	2,621	0.0	0	0	$0	$0	$0	0.0
Ball Room	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Ball Room	6	LED Lamps: (12) 7W A15 Screw-In Lamps	Wall Switch	S	84	2,621	4	None	Yes	6	LED Lamps: (12) 7W A15 Screw-In Lamps	Occupancy Sensor	84	1,808	0.1	442	0	$71	$330	$40	4.1
Ball Room	30	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,621	4	None	Yes	30	LED Lamps: (1) 10W A19 Screw-In Lamp	Occupancy Sensor	10	1,808	0.1	263	0	$42	$660	$70	14.0
Breakfast Room	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	2,621	3	Relamp	No	2	LED Lamps: A19 Lamps	Wall Switch	9	2,621	0.1	289	0	$46	$50	$0	1.1
Closet	1	Compact Fluorescent: (1) 14W A19 Screw-In Lamp	Wall Switch	S	14	874	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	8	874	0.0	6	0	$1	$30	$0	33.1
Closet	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	874	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	874	0.0	52	0	$8	$30	$0	3.6
Closet	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	874		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	874	0.0	0	0	$0	$0	$0	0.0
Closet	1	Compact Fluorescent: (1) 14W A19 Screw-In Lamp	Wall Switch	S	14	874	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	8	874	0.0	6	0	$1	$30	$0	33.1
Closet	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	874		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	874	0.0	0	0	$0	$0	$0	0.0
Closet	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Closet	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	874		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	874	0.0	0	0	$0	$0	$0	0.0
Closet	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	874		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	874	0.0	0	0	$0	$0	$0	0.0
Compressor Room	1	Compact Fluorescent: (1) 14W A19 Screw-In Lamp	Wall Switch	S	14	1,311	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	1,311	0.0	6	0	$1	$30	$0	33.1
Corridor 3rd Floor	5	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	8,736		None	No	5	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	8,736	0.0	0	0	$0	$0	$0	0.0
Corridor Center	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor Center	1	Incandescent: (6) 40W A15 Screw-In Lamps	Wall Switch	S	240	2,621	3	Relamp	No	1	LED Lamps: LED Lamps	Wall Switch	36	2,621	0.2	577	0	$92	$190	$10	1.9
Corridor Center	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	8,736		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	8,736	0.0	0	0	$0	$0	$0	0.0
Corridor Queen Suite	1	Incandescent: (4) 40W A17 Screw-In Lamps	Wall Switch	S	160	2,621	3	Relamp	No	1	LED Lamps: LED Lamps	Wall Switch	24	2,621	0.1	385	0	$62	$130	$0	2.1
Dining Rom	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Dining Rom	16	Incandescent: (1) 40W A15 Screw-In Lamp	Wall Switch	S	40	2,621	3, 4	Relamp	Yes	16	LED Lamps: A 17 LED Lamp	Occupancy Sensor	6	1,808	0.5	1,624	-1	$260	$1,060	$90	3.7
Dining Rom	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	2,621	4	None	Yes	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Occupancy Sensor	9	1,808	0.0	15	0	$2	$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
Dishwasher Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Dishwasher Room	2	LED - Fixtures: Linear Strip	Wall Switch	S	30	2,621	4	None	Yes	2	LED - Fixtures: Linear Strip	Occupancy Sensor	30	1,808	0.0	53	0	$8	$150	$20	15.4
Dishwasher Room	1	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	2,621	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,621	0.0	122	0	$19	$90	$10	4.1
Electrical Room	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	1,311	3	Relamp	No	1	LED Lamps: A21 Lamps	Wall Switch	10	1,311	0.0	78	0	$12	$50	$0	4.0
Elevator Lobby	6	Compact Fluorescent: (1) 23W A19 Screw-In Lamp	Wall Switch	S	23	2,621	3, 5	Relamp	Yes	6	LED Lamps: A19 Lamps	High/Low Control	17	1,808	0.1	191	0	$31	$430	$220	6.9
Elevator Lobby	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Elevator Lobby	12	Incandescent: (1) 40W A15 Screw-In Lamp	Wall Switch	S	40	2,621	3, 5	Relamp	Yes	12	LED Lamps: A 15 LED Lamp	High/Low Control	6	1,808	0.4	1,218	-1	$195	$860	$430	2.2
Elevator Lobby	5	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	2,621	3, 5	Relamp	Yes	5	LED Lamps: A19 Lamps	High/Low Control	10	1,808	0.3	822	0	$132	$410	$190	1.7
Elevator Room	1	LED Lamps: (3) 10W A19 Screw-In Lamps	Wall Switch	S	30	2,621		None	No	1	LED Lamps: (3) 10W A19 Screw-In Lamps	Wall Switch	30	2,621	0.0	0	0	$0	$0	$0	0.0
Exterior Soffit	4	LED Lamps: (1) 10W A19 Screw-In Lamp	Timeclock		10	4,380		None	No	4	LED Lamps: (1) 10W A19 Screw-In Lamp	Timeclock	10	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Walkway Pole	10	Metal Halide: (1) 70W Lamp	Timeclock		95	4,380	1	Fixture Replacement	No	10	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	21	4,380	0.0	3,241	0	$557	$2,530	$1,000	2.7
Great Hall	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Great Hall	6	Incandescent: (1) 40W A15 Screw-In Lamp	Wall Switch	S	40	2,621	3	Relamp	No	6	LED Lamps: A 15 LED Lamp	Wall Switch	6	2,621	0.2	577	0	$92	$150	$10	1.5
Great Hall	4	LED Lamps: (9) 8.5W A19 Screw-In Lamps	Wall Switch	S	77	2,621		None	No	4	LED Lamps: (9) 8.5W A19 Screw-In Lamps	Wall Switch	77	2,621	0.0	0	0	$0	$0	$0	0.0
Janitorial	1	Incandescent: (1) 25W A19 Screw-In Lamp	Wall Switch	S	25	874	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	4	874	0.0	20	0	$3	$30	$0	9.5
Janitorial	1	LED Lamps: (1) 8W A19 Screw-In Lamp	Wall Switch	S	8	874		None	No	1	LED Lamps: (1) 8W A19 Screw-In Lamp	Wall Switch	8	874	0.0	0	0	$0	$0	$0	0.0
Janitorial	1	Incandescent: (1) 52W A19 Screw-In Lamp	Wall Switch	S	52	874	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	8	874	0.0	42	0	$7	$30	$0	4.5
Living Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Living Room	8	Incandescent: (1) 40W A15 Screw-In Lamp	Wall Switch	S	40	1,748	3	Relamp	No	8	LED Lamps: A 15 LED Lamp	Wall Switch	6	1,748	0.2	513	0	$82	$200	$10	2.3
Living Room	2	LED Lamps: (3) 8.5W A19 Screw-In Lamps	Wall Switch	S	26	1,748		None	No	2	LED Lamps: (3) 8.5W A19 Screw-In Lamps	Wall Switch	26	1,748	0.0	0	0	$0	$0	$0	0.0
Mechanical Room	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	1,311		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	1,311	0.0	0	0	$0	$0	$0	0.0
Mechanical Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,311	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,311	0.1	93	0	$15	$100	$20	5.3
Office	1	Incandescent: (9) 40W A15 Screw-In Lamps	Wall Switch	S	360	2,210	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	54	2,210	0.3	730	0	$117	$280	$10	2.3
Office	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	2,210		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	2,210	0.0	0	0	$0	$0	$0	0.0
Office	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	2,210		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	2,210	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
Organ Loft	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	2,621		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	2,621	0.0	0	0	$0	$0	$0	0.0
Queen Suite Living Room	1	Incandescent: (6) 40W A15 Screw-In Lamps	Wall Switch	S	240	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	36	1,748	0.2	385	0	$62	$190	$10	2.9
Restroom	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom	1	Incandescent: (1) 60W A15 Screw-In Lamp	Wall Switch	S	60	874	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	9	874	0.0	48	0	$8	$30	$0	3.9
Restroom	2	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	2	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom - Female	2	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	2	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom - Female	4	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	874	3, 4	Relamp	Yes	4	LED Lamps: A19 Lamps	Occupancy Sensor	10	603	0.2	219	0	$35	$430	$40	11.1
Restroom - Female	7	LED Lamps: (1) 8W A19 Screw-In Lamp	Wall Switch	S	8	874		None	No	7	LED Lamps: (1) 8W A19 Screw-In Lamp	Wall Switch	8	874	0.0	0	0	$0	$0	$0	0.0
Restroom - Men	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	874	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	874	0.0	52	0	$8	$30	$0	3.6
Restroom - Men	9	LED Lamps: (1) 8W A19 Screw-In Lamp	Wall Switch	S	8	874		None	No	9	LED Lamps: (1) 8W A19 Screw-In Lamp	Wall Switch	8	874	0.0	0	0	$0	$0	$0	0.0
Restroom - Men	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	874		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	874	0.0	0	0	$0	$0	$0	0.0
Restroom - Men	2	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	2	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom 301	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom 302	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom 304/305	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom 307	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Aux Kitchen	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	S	72	2,621		None	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,621	0.0	0	0	$0	$0	$0	0.0
Bar 1st Floor	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Wall Switch	S	20	2,621		None	No	1	LED Lamps: (2) 10W A19 Screw-In Lamps	Wall Switch	20	2,621	0.0	0	0	$0	$0	$0	0.0
Basement Boiler Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Basement Boiler Room	2	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	U	65	1,311	3	Relamp	No	2	LED Lamps: A19 Lamps	Wall Switch	10	1,311	0.1	156	0	$25	$50	$0	2.0
Basement Boiler Room	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	U	10	1,311		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	1,311	0.0	0	0	$0	$0	$0	0.0
Basement Boiler Room (1)	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Basement Boiler Room (1)	2	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	U	65	1,311	3	Relamp	No	2	LED Lamps: A19 Lamps	Wall Switch	10	1,311	0.1	156	0	$25	$50	$0	2.0
Basement Boiler Room (1)	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	U	10	1,311		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	1,311	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
Basement Boiler Room 2	1	Compact Fluorescent: (1) 23W A19 Screw-In Lamp	Wall Switch	U	23	1,311	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	17	1,311	0.0	8	0	$1	$30	$0	22.1
Basement Heater Room	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	1,311		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	1,311	0.0	0	0	$0	$0	$0	0.0
Basement Mechanical Room	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	U	65	1,311	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	1,311	0.0	78	0	$12	$30	$0	2.4
Basement Mechanical Room	1	LED Lamps: (1) 8.5W Plug-In Lamp	Wall Switch	U	10	1,311		None	No	1	LED Lamps: (1) 8.5W Plug-In Lamp	Wall Switch	10	1,311	0.0	0	0	$0	$0	$0	0.0
Basement Mechanical Room	2	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	U	72	1,311	2	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,311	0.1	122	0	$19	$180	$20	8.2
Basement Pump Room	1	Compact Fluorescent: (1) 23W A19 Screw-In Lamp	Wall Switch	S	23	1,311	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	17	1,311	0.0	8	0	$1	$30	$0	22.1
Basement Storage Room	2	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	874	3, 4	Relamp	Yes	2	LED Lamps: A19 Lamps	Occupancy Sensor	10	603	0.1	110	0	$18	$200	$20	10.3
Basement Storage Room	1	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	874	2	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	874	0.1	111	0	$18	$150	$20	7.3
Basement Storage Room 2	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	874	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	874	0.0	52	0	$8	$30	$0	3.6
Basement Storage Room 3	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	874	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	874	0.0	52	0	$8	$30	$0	3.6
Basement Walk In Cooler	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	1,311		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	1,311	0.0	0	0	$0	$0	$0	0.0
Bedroom	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 1	1	Incandescent: (6) 40W A15 Screw-In Lamps	Wall Switch	S	240	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	36	1,748	0.2	385	0	$62	$190	$10	2.9
Bedroom 1	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 1 2nd Floor	1	Incandescent: (6) 40W A15 Screw-In Lamps	Wall Switch	S	240	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	36	1,748	0.2	385	0	$62	$190	$10	2.9
Bedroom 1 2nd Floor	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 201 2nd Floor	1	Incandescent: (4) 40W A17 Screw-In Lamps	Wall Switch	S	160	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	24	1,748	0.1	257	0	$41	$130	$0	3.2
Bedroom 201 2nd Floor	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 204 2nd Floor	1	Incandescent: (1) 43W A19 Screw-In Lamp	Wall Switch	S	43	1,748	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	7	1,748	0.0	68	0	$11	$30	$0	2.8
Bedroom 204 2nd Floor	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 205 2nd Floor	1	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	1,748	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	9	1,748	0.0	96	0	$15	$30	$0	1.9
Bedroom 205 2nd Floor	4	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	4	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 207 2nd Floor	1	Incandescent: (1) 43W A19 Screw-In Lamp	Wall Switch	S	43	1,748	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	7	1,748	0.0	68	0	$11	$30	$0	2.8
Bedroom 207 2nd Floor	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 208 2nd Floor	1	Incandescent: (1) 43W A19 Screw-In Lamp	Wall Switch	S	43	1,748	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	7	1,748	0.0	68	0	$11	$30	$0	2.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Bedroom 208 2nd Floor	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 209 2nd Floor	3	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	1,748		None	No	3	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 210 2nd Floor	1	Incandescent: (4) 40W A17 Screw-In Lamps	Wall Switch	S	160	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	24	1,748	0.1	257	0	$41	$130	$0	3.2
Bedroom 210 2nd Floor	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 213 2nd Floor	1	Incandescent: (6) 40W A15 Screw-In Lamps	Wall Switch	S	240	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	36	1,748	0.2	385	0	$62	$190	$10	2.9
Bedroom 213 2nd Floor	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 3 2nd Floor	1	Incandescent: (6) 40W A15 Screw-In Lamps	Wall Switch	S	240	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	36	1,748	0.2	385	0	$62	$190	$10	2.9
Bedroom 3 2nd Floor	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 301	1	Incandescent: (4) 40W A15 Screw-In Lamps	Wall Switch	S	160	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	24	1,748	0.1	257	0	$41	$130	$0	3.2
Bedroom 301	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	1,748	3	Relamp	No	2	LED Lamps: A19 Lamps	Wall Switch	9	1,748	0.1	193	0	$31	$50	$0	1.6
Bedroom 302	1	Incandescent: (4) 40W A15 Screw-In Lamps	Wall Switch	S	160	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	24	1,748	0.1	257	0	$41	$130	$0	3.2
Bedroom 302	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	1,748	3	Relamp	No	2	LED Lamps: A19 Lamps	Wall Switch	9	1,748	0.1	193	0	$31	$50	$0	1.6
Bedroom 303	1	Incandescent: (1) 60W A15 Screw-In Lamp	Wall Switch	S	60	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	9	1,748	0.0	96	0	$15	$30	$0	1.9
Bedroom 303	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	1,748	3	Relamp	No	2	LED Lamps: A19 Lamps	Wall Switch	9	1,748	0.1	193	0	$31	$50	$0	1.6
Bedroom 304	1	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	1,748	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	9	1,748	0.0	96	0	$15	$30	$0	1.9
Bedroom 304	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 305	1	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	1,748	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	9	1,748	0.0	96	0	$15	$30	$0	1.9
Bedroom 305	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 306	1	Incandescent: (4) 40W A15 Screw-In Lamps	Wall Switch	S	160	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	24	1,748	0.1	257	0	$41	$130	$0	3.2
Bedroom 306	2	Incandescent: (1) 60W A19 Screw-In Lamp	Wall Switch	S	60	1,748	3	Relamp	No	2	LED Lamps: A19 Lamps	Wall Switch	9	1,748	0.1	193	0	$31	$50	$0	1.6
Bedroom 307	1	Incandescent: (6) 40W A15 Screw-In Lamps	Wall Switch	S	240	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	36	1,748	0.2	385	0	$62	$190	$10	2.9
Bedroom 307	1	Incandescent: (1) 43W A19 Screw-In Lamp	Wall Switch	S	43	1,748	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	7	1,748	0.0	68	0	$11	$30	$0	2.8
Bedroom 307	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 308	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom 309	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	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
Bedroom 309	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	1,748		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	1,748	0.0	0	0	$0	$0	$0	0.0
Bedroom Foyer	1	Incandescent: (8) 40W A19 Screw-In Lamps	Wall Switch	S	320	1,748	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	48	1,748	0.2	513	0	$82	$180	$10	2.1
Bedroom Queen Suite 2nd Floor	3	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	3	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Closet	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	874		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	874	0.0	0	0	$0	$0	$0	0.0
Closet	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	874	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	874	0.0	52	0	$8	$30	$0	3.6
Corridor 307/309	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 307/309	3	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	8,736		None	No	3	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	8,736	0.0	0	0	$0	$0	$0	0.0
Corridor 307/309	3	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	8,736		None	No	3	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	8,736	0.0	0	0	$0	$0	$0	0.0
Corridor 1st Floor	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 1st Floor	5	Incandescent: (6) 40W A15 Screw-In Lamps	Wall Switch	S	240	2,621	3, 5	Relamp	Yes	5	LED Lamps: A 15 LED Lamp	High/Low Control	36	1,808	1.0	3,045	-1	$488	$1,230	$210	2.1
Corridor 1st Floor	6	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	8,736	5	None	Yes	6	LED Lamps: (1) 10W A19 Screw-In Lamp	High/Low Control	10	6,028	0.0	175	0	$28	$280	$210	2.5
Corridor 202-209	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 202-209	4	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	8,736	5	None	Yes	4	LED Lamps: (1) 8.5W A19 Screw-In Lamp	High/Low Control	9	6,028	0.0	99	0	$16	$280	$140	8.8
Corridor 202-209	2	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	8,736	5	None	Yes	2	LED Lamps: (2) 8.5W A19 Screw-In Lamps	High/Low Control	17	6,028	0.0	99	0	$16	$0	$0	0.0
Corridor 303	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 303	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	8,736		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	8,736	0.0	0	0	$0	$0	$0	0.0
Corridor 303	4	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	8,736	5	None	Yes	4	LED Lamps: (2) 8.5W A19 Screw-In Lamps	High/Low Control	17	6,028	0.0	199	0	$32	$280	$140	4.4
Corridor Basement	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor Basement	4	Incandescent: (4) 65W A21 Screw-In Lamps	Wall Switch	S	260	2,621	3, 5	Relamp	Yes	4	LED Lamps: A21 Lamps	High/Low Control	39	1,808	0.8	2,639	-1	$423	$990	$160	2.0
Corridor Basement	3	LED Lamps: (3) 13W A19 Screw-In Lamps	Wall Switch	S	39	8,736	5	None	Yes	3	LED Lamps: (3) 13W A19 Screw-In Lamps	High/Low Control	39	6,028	0.0	342	0	$55	$280	$110	3.1
Corridor Bedrooms 2nd Floor	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor Bedrooms 2nd Floor	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	8,736		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	8,736	0.0	0	0	$0	$0	$0	0.0
Corridor Bedrooms 2nd Floor	2	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	8,736		None	No	2	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	8,736	0.0	0	0	$0	$0	$0	0.0
Corridor Center 2ndFloor	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor Center 2ndFloor	1	Incandescent: (1) 40W A15 Screw-In Lamp	Wall Switch	S	40	2,621	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	6	2,621	0.0	96	0	$15	$30	$0	1.9

	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 Center 2ndFloor	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	8,736		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	8,736	0.0	0	0	$0	$0	$0	0.0
Corridor Center 2ndFloor	4	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	8,736	5	None	Yes	4	LED Lamps: (2) 8.5W A19 Screw-In Lamps	High/Low Control	17	6,028	0.0	199	0	$32	$280	$140	4.4
Entry Hall	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Entry Hall	9	Incandescent: (1) 60W A15 Screw-In Lamp	Wall Switch	S	60	2,621	3	Relamp	No	9	LED Lamps: A 15 LED Lamp	Wall Switch	9	2,621	0.4	1,299	-1	$208	$230	$10	1.1
Entry Hall	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	2,621		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	2,621	0.0	0	0	$0	$0	$0	0.0
Entry Hall	1	LED Lamps: (4) 8.5W A19 Screw-In Lamps	Wall Switch	S	34	2,621		None	No	1	LED Lamps: (4) 8.5W A19 Screw-In Lamps	Wall Switch	34	2,621	0.0	0	0	$0	$0	$0	0.0
Exterior Wall	1	Compact Fluorescent: (1) 23W A19 Screw-In Lamp	Timeclock		23	4,380	3	Relamp	No	1	LED Lamps: A19 Lamps	Timeclock	17	4,380	0.0	26	0	$5	$30	$0	6.6
Exterior Wall	1	Incandescent: (1) 65W A19 Screw-In Lamp	Timeclock		65	4,380	3	Relamp	No	1	LED Lamps: A19 Lamps	Timeclock	10	4,380	0.0	241	0	$41	$30	$0	0.7
Exterior Wall	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Timeclock		9	4,380		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Timeclock	9	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Wall	2	LED Lamps: (3) 8.5W A19 Screw-In Lamps	Wall Switch		26	8,736		None	No	2	LED Lamps: (3) 8.5W A19 Screw-In Lamps	Wall Switch	26	8,736	0.0	0	0	$0	$0	$0	0.0
Exterior Wall	1	Metal Halide: (1) 400W Lamp	Timeclock		458	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	120	4,380	0.0	1,480	0	$255	$700	$50	2.6
Foyer	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Foyer	2	Incandescent: (1) 40W B13 Screw-In Lamp	Wall Switch	S	40	2,621	3	Relamp	No	2	LED Lamps: B13 Lamps	Wall Switch	6	2,621	0.1	192	0	$31	$50	$0	1.6
Foyer	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	2,621		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	2,621	0.0	0	0	$0	$0	$0	0.0
Foyer	3	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	2,621		None	No	3	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	2,621	0.0	0	0	$0	$0	$0	0.0
Foyer Corridor	1	U-Bend Fluorescent - EST12: U T12 (34W) - 2L	Wall Switch	S	72	2,621	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,621	0.0	110	0	$18	$130	$10	6.8
Game Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Game Room	1	Incandescent: (2) 60W A19 Screw-In Lamps	Wall Switch	S	120	2,621	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	18	2,621	0.1	289	0	$46	$40	$0	0.9
Game Room	1	Incandescent: (1) 72W A19 Screw-In Lamp	Wall Switch	S	72	2,621	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	11	2,621	0.1	173	0	$28	$30	$0	1.1
Game Room	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	2,621		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	2,621	0.0	0	0	$0	$0	$0	0.0
Game Room	3	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	2,621		None	No	3	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	2,621	0.0	0	0	$0	$0	$0	0.0
Janitorial	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	874		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	874	0.0	0	0	$0	$0	$0	0.0
Kitchen 1st Floor	3	Incandescent: (1) 40W A19 Screw-In Lamp	Wall Switch	S	40	2,621	3	Relamp	No	3	LED Lamps: A19 Lamps	Wall Switch	6	2,621	0.1	289	0	$46	$80	$0	1.7
Kitchen 1st Floor	5	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	2,621	2	Relamp & Reballast	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,621	0.2	609	0	$97	$440	$50	4.0
Kitchen 1st Floor	4	U-Bend Fluorescent - EST12: U T12 (34W) - 2L	Wall Switch	S	72	2,621	2	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,621	0.1	442	0	$71	$510	$40	6.6

	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
Kitchen Main Storage	34	Compact Fluorescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	2,621	3, 4	Relamp	Yes	34	LED Lamps: A19 Lamps	Occupancy Sensor	46	1,808	1.0	3,201	-1	$512	$1,850	$140	3.3
Kitchen Main Storage	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Kitchen Main Storage	40	U-Bend Fluorescent - EST12: U T12 (34W) - 2L	Wall Switch	S	72	2,621	2, 4	Relamp & Reballast	Yes	40	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,808	1.7	5,574	-2	$892	$6,050	$510	6.2
Library	3	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	2,621	3, 4	Relamp	Yes	3	LED Lamps: A19 Lamps	Occupancy Sensor	10	1,808	0.2	493	0	$79	$410	$40	4.7
Library	3	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	2,621	4	None	Yes	3	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Occupancy Sensor	9	1,808	0.0	22	0	$4	$0	$0	0.0
Library	2	LED Lamps: (7) 8W A19 Screw-In Lamps	Wall Switch	S	56	2,621	4	None	Yes	2	LED Lamps: (7) 8W A19 Screw-In Lamps	Occupancy Sensor	56	1,808	0.0	98	0	$16	$0	$0	0.0
Living Room	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	1,748		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	1,748	0.0	0	0	$0	$0	$0	0.0
Living Room 2nd Floor	1	Incandescent: (6) 40W A15 Screw-In Lamps	Wall Switch	S	240	1,748	3	Relamp	No	1	LED Lamps: A 15 LED Lamp	Wall Switch	36	1,748	0.2	385	0	$62	$190	$10	2.9
Living Room 2nd Floor	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	1,748		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	1,748	0.0	0	0	$0	$0	$0	0.0
Main Kitchen	1	Compact Fluorescent: (1) 27W Circline/T9 Plug-In Lamp	Wall Switch	S	27	2,621	3	Relamp	No	1	LED Lamps: LED Circleline Lamp	Wall Switch	19	2,621	0.0	23	0	$4	$40	$10	8.3
Main Kitchen	2	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	S	72	2,621		None	No	2	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,621	0.0	0	0	$0	$0	$0	0.0
Pantry	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	2,621		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	2,621	0.0	0	0	$0	$0	$0	0.0
Restroom - Bedroom 1	1	Incandescent: (2) 40W A19 Screw-In Lamps	Wall Switch	S	80	2,621	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	12	2,621	0.1	192	0	$31	$40	$0	1.3
Restroom - Bedroom 1	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	2,621		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	2,621	0.0	0	0	$0	$0	$0	0.0
Restroom - Bedroom 201 2nd Floor	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom - Bedroom 210 2nd Floor	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom - Bedroom 213;2nd Floor	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom - Bedroom 2nd Floor	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom - Bedroom 2nd Floor 2	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Restroom - Bedroom Queen Suite 2nd Floor	5	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	874		None	No	5	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	874	0.0	0	0	$0	$0	$0	0.0
Restroom - Male	1	U-Bend Fluorescent - EST12: U T12 (34W) - 2L	Wall Switch	S	72	874	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	874	0.0	37	0	$6	$130	$10	20.4
Restroom - Suites	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	874		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	874	0.0	0	0	$0	$0	$0	0.0
Restroom 3rd Floor	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	874		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	874	0.0	0	0	$0	$0	$0	0.0
Stairs	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	8,736		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	8,736	0.0	0	0	$0	$0	$0	0.0
Stairs	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0

	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
Stairs	4	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	8,736		None	No	4	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	8,736	0.0	0	0	$0	$0	$0	0.0
Stairs	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	8,736		None	No	2	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	8,736	0.0	0	0	$0	$0	$0	0.0
Stairs Main	1	Incandescent: (6) 40W B13 Screw-In Lamps	Wall Switch	S	240	8,736	3	Relamp	No	1	LED Lamps: B13 Lamps	Wall Switch	36	8,736	0.2	1,925	-1	$308	$160	$0	0.5
Stairs Main	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	8,736		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	8,736	0.0	0	0	$0	$0	$0	0.0
Storage	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	S	9	874		None	No	1	LED Lamps: (1) 8.5W A19 Screw-In Lamp	Wall Switch	9	874	0.0	0	0	$0	$0	$0	0.0
Storage	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	874	3	Relamp	No	1	LED Lamps: A21 Lamps	Wall Switch	10	874	0.0	52	0	$8	$50	$0	6.0
Storage	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	874	3	Relamp	No	1	LED Lamps: A21 Lamps	Wall Switch	10	874	0.0	52	0	$8	$50	$0	6.0
Storage	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	874	3	Relamp	No	1	LED Lamps: A21 Lamps	Wall Switch	10	874	0.0	52	0	$8	$50	$0	6.0
Storage	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	874		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	874	0.0	0	0	$0	$0	$0	0.0
Vestibule Main Entrance	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	2,621	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	2,621	0.0	156	0	$25	$30	$0	1.2
Vestibule Main Entrance	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	S	17	2,621		None	No	1	LED Lamps: (2) 8.5W A19 Screw-In Lamps	Wall Switch	17	2,621	0.0	0	0	$0	$0	$0	0.0
Walk In Refrigerator Basement	1	Incandescent: (1) 65W A19 Screw-In Lamp	Wall Switch	S	65	1,311	3	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	10	1,311	0.0	78	0	$12	$30	$0	2.4
Walk In Refrigerator Basement	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	1,311		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	1,311	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
Roof	Dishwasher Room	1	Exhaust Fan	0.75	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Fist Floor Attic	2	Exhaust Fan	0.33	65.0%	No			W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Basement Boiler Room 2	Heating HWP - Ball Hall & Other Rented Spaces	2	Heating Hot Water Pump	0.50	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
1st Floor Kitchen	Kitchen Hood Exhaust Fan	1	Kitchen Hood Exhaust Fan	0.50	70.0%	No			W	3,500		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Main Kitchen	Makeup Air -Main Kitcehn	1	Makeup Air Fan	0.50	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Elevator Room	Hydraulic Elevator Motor	1	Other	25.00	77.0%	No			W	400		No	77.0%	No		0.0	0	0	$0	$0	$0	0.0
Corridor Basement	Lift Motor	1	Other	0.50	70.0%	No			W	400		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Basement Boiler Room	Basement Boiler Room	1	Supply Fan	0.75	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
1st Floor Kitchen	Kitchen 1st Floor	1	Supply Fan	0.75	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	AHU-1 - Ball Hall	1	Supply Fan	15.00	91.7%	No	Baldor	215T	W	1,978	6	No	91.7%	Yes	1	4.3	9,052	0	$1,556	$9,900	$1,200	5.6
Attic	FCU - Ball Hall	1	Supply Fan	1.00	84.0%	No			W	2,745		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Basement Boiler Room 2	Hydronic Heating System - Ball Hall	1	Combustion Air Fan	0.50	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Ground	Ball Hall	4	Supply Fan	0.50	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Basement Boiler Room 1	Manor Section	1	Combustion Air Fan	0.75	70.0%	No			W	2,745		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Dishwasher Room	Dishwasher	1	Other	2.00	72.0%	No			W	500		No	72.0%	No		0.0	0	0	$0	$0	$0	0.0
Dishwasher Room	Dishwasher	2	Other	0.50	70.0%	No			W	500		No	70.0%	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
Dining Rom	Dining Rom	2	Window AC	1.00		9.50		Frigidaire	FAK124R1V	W		No							0.0	0	0	$0	$0	$0	0.0
Great Hall	Great Hall	2	Window AC	1.00		9.50		Frigidaire	FAK124R1V	W		No							0.0	0	0	$0	$0	$0	0.0
Living Room	Living Room	2	Window AC	1.00		9.50		Electrolux	FAK123JIV4	W		No							0.0	0	0	$0	$0	$0	0.0
Queen Suite Living Room	Queen Suite Living Room	1	Window AC	1.17		9.50		DeLonghi	PACEL390HLWK-6ALBK	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom	Bedroom	1	Window AC	0.42		11.00		Midea	MAW05M1WBL	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 1	Bedroom 1	1	Window AC	1.00		9.50		Electrolux	FAK123JIV4	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 1 2nd Floor	Bedroom 1 2nd Floor	1	Window AC	0.75		9.50		Royal Sovereign	770389	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 201 2nd Floor	Bedroom 201 2nd Floor	1	Window AC	0.83		9.50		Electrolux	FAK104R1V	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 204 2nd Floor	Bedroom 204 2nd Floor	1	Window AC	0.83		9.50		Electrolux	FAK104R1V	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 205 2nd Floor	Bedroom 205 2nd Floor	1	Window AC	0.83		9.50		Electrolux	FAK104R1V	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 207 2nd Floor	Bedroom 207 2nd Floor	1	Window AC	0.83		9.50		Electrolux	FAK104R1V	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 208 2nd Floor	Bedroom 208 2nd Floor	1	Window AC	0.83		9.50		Electrolux	FAK104R1V	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 209 2nd Floor	Bedroom 209 2nd Floor	1	Window AC	0.83		9.50		Electrolux	FAK104R1V	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 210 2nd Floor	Bedroom 210 2nd Floor	1	Window AC	0.83		9.50		Haier	HPB10XCR	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 213 2nd Floor	Bedroom 213 2nd Floor	1	Window AC	0.83		9.50				W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 3 2nd Floor	Bedroom 3 2nd Floor	1	Window AC	0.83		9.50		Electrolux	FAK104R1V	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 301	Bedroom 301	1	Window AC	0.83		9.50		Honeywell	H10CESWK	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 302	Bedroom 302	1	Window AC	0.83		9.50		Haier	HPB10XCR	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 303	Bedroom 303	1	Window AC	0.83		9.80		Amana	APN10J	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 304	Bedroom 304	1	Window AC	0.42		9.70		Electrolux	FRA052XT7	W		No							0.0	0	0	$0	$0	$0	0.0

		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 (kBtu/hr)	Cooling Mode Efficiency (SEER/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
Bedroom 305	Bedroom 305	1	Window AC	0.42		11.00		Midea	MAW05M1WBL	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 306	Bedroom 306	1	Window AC	0.42		11.00		Midea	MAW05M1WBL	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 307	Bedroom 307	1	Window AC	0.83		9.50		Haier	HPB10XCR	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 308	Bedroom 308	1	Window AC	0.67		9.50		Vissani	VPFD05YCLW	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom 309	Bedroom 309	1	Window AC	1.00		9.00		LG	LP12000GXR	W		No							0.0	0	0	$0	$0	$0	0.0
Bedroom Queen Suite 2nd Floor	Bedroom Queen Suite 2nd Floor	1	Window AC	1.00		9.00		LG	LP12000GXR	W		No							0.0	0	0	$0	$0	$0	0.0
Game Room	Game Room	1	Window AC	0.83		9.20		LG	LP1010SNR	W		No							0.0	0	0	$0	$0	$0	0.0
Living Room 2nd Floor	Living Room 2nd Floor	1	Window AC	1.17		9.50		DeLonghi	PACEL390HLWK-6ALBK	W		No							0.0	0	0	$0	$0	$0	0.0
Attic	FCU - Ball Hall	1	Fan Coil	4.00		12.00		SpacePak	ESP4860FH4	W		No							0.0	0	0	$0	$0	$0	0.0
Exterior Ground	AHU-1 Condensing Unit	1	Split-System	5.00		13.00		Lennox	TCD60S31	W		No							0.0	0	0	$0	$0	$0	0.0
Lobby Restroom - Men	Lobby Restroom - Men	1	Electric Resistance Heat		17.06		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Bedrooms	Bedrooms	4	Electric Resistance Heat		17.06		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Exterior Ground	Ball Hall	4	Package Unit	4.00		13.00		Lennox	TCA48S2DN1P	B	7	Yes	4	Package Unit	4.00		16.00		1.4	2,038	0	$350	$32,600	$1,600	88.5

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
Basement Boiler Room 2	Hydronic Heating System - Ball Hall	1	Non-Condensing Hot Water Boiler	1,087	Crown Boiler	24-08WO00R	W		No						0.0	0	0	$0	$0	$0	0.0
Basement Boiler Room 1	Steam Heating - Manor Section	1	Forced Draft Steam Boiler	1,755	PB Heat LLC	TCII-07-W/S	W		No						0.0	0	0	$0	$0	$0	0.0

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Basement Boiler Room	Main Domestic Water Heater	8	2	2.00	0.0	0	2	$42	$30	$0	0.7

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Dishwasher Room	Dishwasher Booster Heater	1	Booster Water Heater			W		No						0.0	0	0	$0	$0	$0	0.0
Basement Boiler Room	Main Domestic Water Heater	1	Storage Tank Water Heater (> 50 Gal)	A.O. Smith	COF-385A 941	W		No						0.0	0	0	$0	$0	$0	0.0
Mechanical Room	Restrooms - Lobby	1	Storage Tank Water Heater (≤ 50 Gal)	A.O. Smith	EJCS 20 200	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Various Restrooms	9	24	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	11	$316	$200	$100	0.3
Restrooms - Lobby	9	5	Faucet Aerator (Lavatory)	2.20	0.50	0.0	695	0	$120	$40	$20	0.2
Kitchens	9	6	Faucet Aerator (Kitchen)	2.20	1.50	0.0	0	1	$33	$50	$10	1.2

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions				Proposed Conditions				Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Manufacturer	Model	ECM #	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	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 Walk In Cooler	1	Cooler (35F to 55F)	Bohn		10, 11	Yes	No	Yes	0.2	2,326	0	$400	$3,550	$240	8.3
Back Porch	1	Medium Temp Freezer (0F to 30F)	Master Bilt	CM-136-50	10, 11	Yes	No	Yes	0.0	640	0	$110	$2,430	$120	21.0
Walk In Refrigerator Basement	1	Medium Temp Freezer (0F to 30F)	HTP		10, 11	Yes	Yes	Yes	0.1	2,702	0	$465	$3,820	$250	7.7

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Foyer	1	Refrigerator Chest			No		No	0.0	0	0	$0	$0	$0	0.0
Foyer Corridor	1	Refrigerator Chest			No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1st Floor	1	Refrigerator Chest	Beverage Air		Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1st Floor	1	Refrigerator Chest			No		No	0.0	0	0	$0	$0	$0	0.0
Bar 1st Floor	1	Stand-Up Refrigerator, Glass Door (16 - 30 cu. ft.)			No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1st Floor	1	Stand-Up Refrigerator, Glass Door (16 - 30 cu. ft.)	Metalfrio	NG27CHC	No		No	0.0	0	0	$0	$0	$0	0.0
Back Porch	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Atosa	MBF8507GR	No		No	0.0	0	0	$0	$0	$0	0.0
Foyer Corridor	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Atosa	MBF8507GR	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1st Floor	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Glenco Star	PQ-2R	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1st Floor	1	Stand-Up Freezer, Solid Door (>50 cu. ft.)	McCall	4002	No		No	0.0	0	0	$0	$0	$0	0.0

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Bar 1st Floor	1	Self-Contained Unit (<175 lbs/day), Batch	Scotsman		No		No	0.0	0	0	$0	$0	$0	0.0
Basement Heater Room	1	Self-Contained Unit (≥175 lbs/day), Batch	Manitowoc	IYO906A-261	No		No	0.0	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	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
Main Kitchen	2	Gas Combination Oven/Steam Cooker (<15 Pans)		Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1st Floor	1	Electric Convection Oven (Full Size)	Blodgett	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Main Kitchen	1	Electric Convection Oven (Full Size)	Garland	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1st Floor	1	Gas Fryer		Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Main Kitchen	1	Gas Fryer	Frymaster	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Main Kitchen	1	Gas Griddle (3 Feet Width)		Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1st Floor	1	Insulated Food Holding Cabinet (Full Size)		Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen 1st Floor	1	Gas Fryer	American Range	Unknown	No		No	0.0	0	0	$0	$0	$0	0.0
Main Kitchen	1	Other	Groen	Unknown	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
Aux Kitchen	1	Clothes Washer	1,200	Yes	GE	PTW600BSR1WS
Aux Kitchen	1	Clothes Dryer	1,500	No	Unimac	UT075N0MB1G1 W01
Skylight Manor	2	Coffee Machine	900	No		
Skylight Manor	3	Commercial Coffee Machine	1,350	No		
Skylight Manor	1	Dehumidifier	180	No		
Skylight Manor	2	Desktop	150	No		
Skylight Manor	2	Microwave	1,000	No		
Skylight Manor	1	Printer/Copier (Large)	600	No		
Skylight Manor	1	Refrigerator (Mini)	153	No		
Skylight Manor	28	Television	120	No		
Skylight Manor	1	Water Cooler	92	No		
Skylight Manor	1	Ceiling Fan	250	No		
Skylight Manor	1	Commercial Brewer	7,500	No	Cecilware	FE200

Custom (High Level) Measure Analysis

Electric Tank Water Heater to HPWH

NOTE: HPWH calculation should not be used for existing water heaters with a storage capacity greater than 120 gal or less than 30 gal.

Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis										
Description	Area(s)/System(s) Served	SF of Area Served	Fuel Type	Input Capacity per Unit (kW)	Tank Capacity per Unit (Gal)	Description	COP	Tank Capacity per Unit (Gal)	Estimated Unit Cost	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Base Incentives	Enhanced Incentives	Total Incentives	Total Net Cost	Payback w/o Incentives in Years	Payback w/ Incentives in Years
Storage Tank Water Heater (≤ 50 Gal)	Restrooms - Lobby	5,000	Electric	2.5	19	Heat Pump Water Heater	2.5	19	$2,091.00	0.00	2,022	0	$348	$2,500	$0	$0	$0	$2,500	7.18	7.18
			Electric																	
			Electric																	

Oil Tank Water Heater to HPWH

NOTE: HPWH calculation should not be used for existing water heaters with a storage capacity greater than 120 gal or less than 30 gal.

Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis										
Description	Area(s)/System(s) Served	SF of Area Served	Fuel Type	Input Capacity per Unit (MBH)	Tank Capacity per Unit (Gal)	Description	COP	Tank Capacity per Unit (Gal)	Estimated Unit Cost	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Base Incentives	Enhanced Incentives	Total Incentives	Total Net Cost	Payback w/o Incentives in Years	Payback w/ Incentives in Years
Storage Tank Water Heater (> 50 Gal)	Main Domestic Water Heater	15,000	No. 2 fuel oil	385.0	75	Heat Pump Water Heater	2.5	10	$2,091.00	0.00	-3,236	35	$415	$2,500	$0	$0	$0	$2,500	6.02	6.02
			Natural Gas																	
			Natural Gas																	

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]

Ringwood State Park - Skyland Manor

Primary Property Type: Other - Public Services
Gross Floor Area (ft²): 38,560
Built: 1926

For Year Ending: November 30, 2022
Date Generated: November 10, 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
Ringwood State Park - Skyland Manor 5 Morris Road Ringwood, New Jersey 07456	State of New Jersey 428 East State Street Trenton, NJ 08625 (609) 940-4129	New Jersey Board of Public Utilities State Energy Services 44 South Clinton Ave Trenton, NJ 08625 6096339666 BPU.EnergyServices@bpu.nj.gov

Property ID: 28406903
Unique Building Identifier (UBID): 87H74QG6+3P4-13-14-15-15

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
68.8 kBtu/ft²

Source EUI
120.4 kBtu/ft²

Annual Energy by Fuel	
Fuel Oil (No. 2) (kBtu)	1,305,535 (49%)
Electric - Grid (kBtu)	1,095,836 (41%)
Propane (kBtu)	253,304 (10%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	51
National Median Source EUI (kBtu/ft²)	89.3
% Diff from National Median Source EUI	35%
Annual Emissions	
Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	212

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.