



Local Government Energy Audit Report

Linden Hall

July 10, 2024

Prepared for:

Ramapo College of New Jersey
523 Route 202
Mahwah, New Jersey 07430

Prepared by:

TRC
317 George Street
New Brunswick, New Jersey 08901

Disclaimer

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

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

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

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

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

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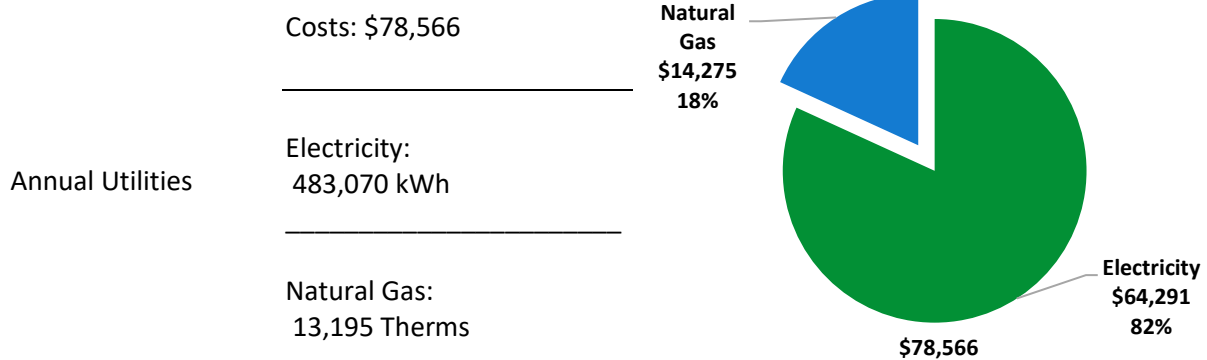
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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPB) has sponsored this Local Government Energy Audit (LGEA) report for Linden Hall. 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



ENERGY STAR®
Benchmarking Score

N/A
(1-100 scale)

A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.

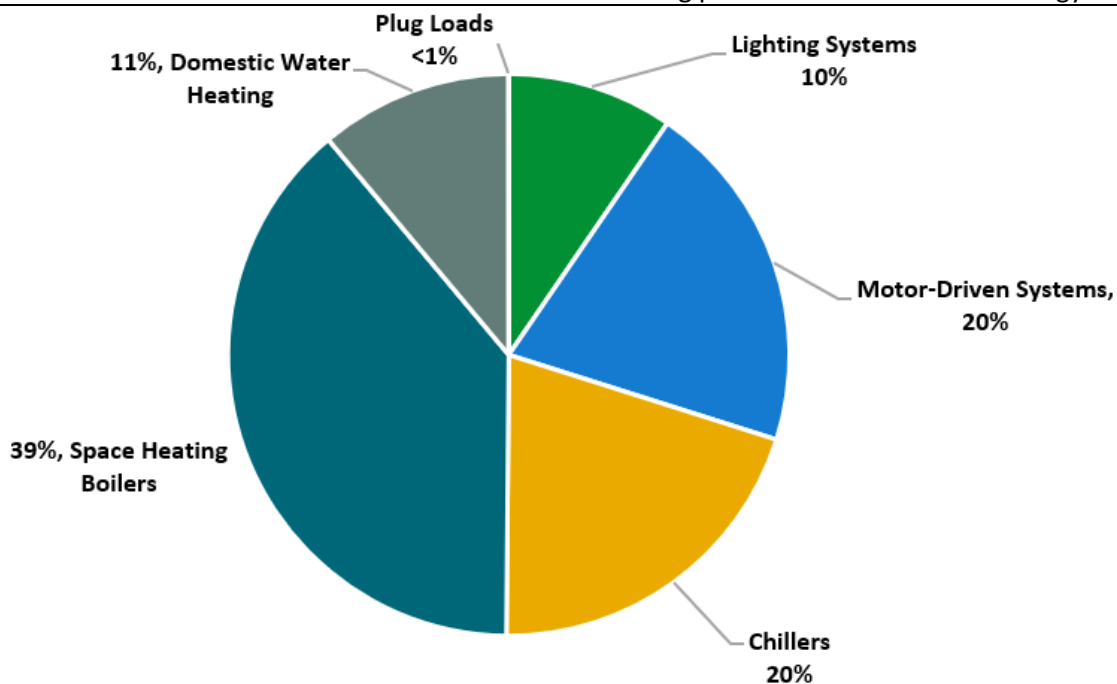


Figure 1 - Energy Use by System

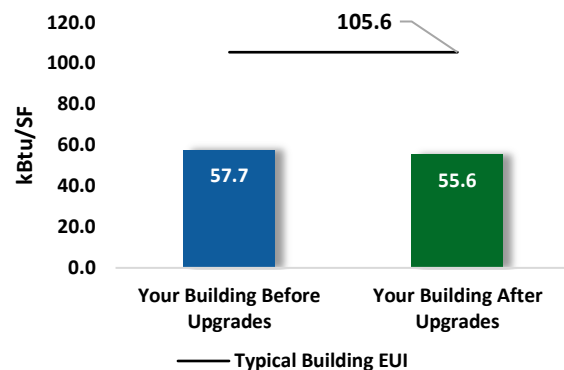
POTENTIAL IMPROVEMENTS



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

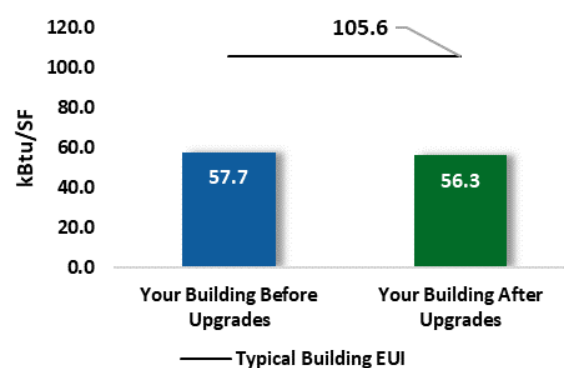
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	\$112,315
Potential Rebates & Incentives ¹	\$12,047
Annual Cost Savings	\$4,189
Annual Energy Savings	Electricity: 31,617 kWh Natural Gas: -17 Therms
Greenhouse Gas Emission Savings	16 Tons
Simple Payback	23.9 Years
Site Energy Savings (All Utilities)	4%



Scenario 2: Cost Effective Package²

Installation Cost	\$104,753
Potential Rebates & Incentives	\$11,822
Annual Cost Savings	\$3,922
Annual Energy Savings	Electricity: 29,570 kWh Natural Gas: -13 Therms
Greenhouse Gas Emission Savings	15 Tons
Simple Payback	23.7 Years
Site Energy Savings (all utilities)	3%



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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades			19,639	2.0	-1	\$2,604	\$8,822	\$1,322	\$7,500	2.9	19,667
ECM 1	Install LED Fixtures	Yes	15,111	0.0	0	\$2,011	\$5,545	\$500	\$5,045	2.5	15,217
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	551	0.2	0	\$72	\$550	\$80	\$470	6.5	541
ECM 3	Retrofit Fixtures with LED Lamps	Yes	3,977	1.8	-1	\$520	\$2,727	\$742	\$1,985	3.8	3,909
Lighting Control Measures			3,664	1.2	-1	\$479	\$10,487	\$2,535	\$7,952	16.6	3,600
ECM 4	Install Occupancy Sensor Lighting Controls	No	2,047	0.9	0	\$268	\$7,562	\$225	\$7,337	27.4	2,011
ECM 5	Install High/Low Lighting Controls	Yes	1,618	0.3	0	\$212	\$2,925	\$2,310	\$615	2.9	1,589
Electric Chiller Replacement			8,314	-7.7	0	\$1,106	\$93,006	\$8,190	\$84,816	76.7	8,372
ECM 6	Install High Efficiency Chillers	No	8,314	-7.7	0	\$1,106	\$93,006	\$8,190	\$84,816	76.7	8,372
TOTALS (COST EFFECTIVE MEASURES)			21,256	2.3	-1	\$2,815	\$11,747	\$3,632	\$8,115	2.9	21,256
TOTALS (ALL MEASURES)			31,617	-4.5	-2	\$4,189	\$112,315	\$12,047	\$100,268	23.9	31,639

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

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

Figure 2 – Evaluated Energy Improvements

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

1.1 Planning Your Project

Careful planning makes for a successful energy project. When considering this scope of work, you will have some decisions to make, such as:

- ◆ How will the project be funded and/or financed?
- ◆ Is it best to pursue individual ECMs, groups of ECMs, or use a comprehensive approach where all ECMs are installed together?
- ◆ Are there other facility improvements that should happen at the same time?

Pick Your Installation Approach

Utility-run energy efficiency programs and New Jersey's Clean Energy Programs, give you the flexibility to do a little or a lot. Rebates, incentives, and financing are available to help reduce both your installation costs and your energy bills. If you are planning to take advantage of these programs, make sure to review incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives *before* purchasing materials or starting installation.

Options from Your Utility Company

Prescriptive and Custom Rebates

For facilities wishing to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the Prescriptive and Custom Rebates program. To participate, you can use internal resources or an outside firm or contractor to perform the final design of the ECM(s) and install the equipment. Program pre-approval may be required for some incentives. Contact your utility company for more details prior to project installation.

Direct Install

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

Engineered Solutions

The Engineered Solutions program provides tailored energy-efficiency assistance and turnkey engineering services to municipalities, universities, schools, hospitals, and healthcare facilities (MUSH), non-profit entities, and multifamily buildings. The program provides all professional services from audit, design, construction administration, to commissioning and measurement and verification for custom whole-building energy-efficiency projects. Engineered Solutions allows you to install as many measures as possible under a single project as well as address measures that may not qualify for other programs.

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

Options from New Jersey's Clean Energy Program

Financing and Planning Support with the Energy Savings Improvement Program (ESIP)

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the ESIP. Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as attractive financing for implementing ECMs. You have already taken the first step as an LGEA customer, because this report is required to participate in ESIP.

Resiliency with Return on Investment through Combined Heat and Power (CHP)

The CHP program provides incentives for combined heat and power (i.e., cogeneration) and waste heat to power projects. Combined heat and power systems generate power on-site and recover heat from the generation system to meet on-site thermal loads. Waste heat to power systems use waste heat to generate power. You will work with a qualified developer who will design a system that meets your building's heating and cooling needs.

Successor Solar Incentive Program (SuSI)

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

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces electric loads at commercial facilities when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. By enabling commercial facilities to reduce electric demand during times of peak demand, the grid is made more reliable, and overall transmission costs are reduced for all ratepayers. Curtailment service providers provide regular payments to medium and large consumers of electric power for their participation in demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

Large Energy User Program (LEUP)

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

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



2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Linden Hall. 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 September 27, 2023, TRC performed an energy audit at Linden Hall located in Mahwah, New Jersey. TRC met with facility staff to review the facility operations and help focus our investigation on specific energy-using systems. The building is currently unoccupied and has not been used for several years according to staff. Staff has indicated there are no plans for remodeling or construction, or for changes in facility operation.

We have analyzed conditions and developed projects based on a supported assumption that the building equipment is operating on a somewhat reduced schedule as compared to full operations: The building is served by a dedicated gas meter, and gas usage on a square footage basis is a bit below expectations for a typical (functional) educational facility in the mid-Atlantic region. Electricity use is provided by the shared campus meter which has been prorated across several buildings. Without submetering information, it is not possible to know how much electricity is currently being used at this facility. However, we have derated expected electricity use by about 35% to account for likely conditions.

It is recommended to evaluate your needs for operating ancillary equipment and to establish minimum and maximum temperature and airflow settings for your largely unoccupied building. We have included a retro commissioning measure for your future consideration to review and adjust Building Automation System settings with this in mind.

Linden Hall is an eight-story, 51,447 square foot building built in 1973. Spaces include classrooms, offices, corridors, stairwells, and mechanical space.

2.2 Building Occupancy

The facility is occupied intermittently Monday through Friday during regular business hours. Janitorial services are performed as needed. Staff indicated plans are in place to repurpose and renovate the entire building. The facility is occupied intermittently, as needed for maintenance and operations.

Building Name	Weekday/Weekend	Operating Schedule
Linden Hall	Weekday	Varied
	Weekend	Varied

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel with a brick facade. The roof is flat and covered with white membrane and in fair condition.



Building Façade



Roof

Most of the windows are double glazed and have aluminum frames with a thermal break. The glass-to-frame seals are in fair condition. The operable window weather seals are in fair condition, showing little evidence of excessive wear. Exterior doors have aluminum frames and are in fair condition with undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration.



Exterior Doors



Windows

2.4 Lighting Systems

The interior lighting system use 32-Watt linear fluorescent T8 lamps. There are also several 34-Watt T12 fixtures. Fixture types include 2-lamp, 4-foot-long recessed troffer surface mounted fixtures. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts.

Additionally, there are some compact fluorescent lamps (CFL) and LED general purpose lamps.

All exit signs are LED. Most fixtures are in fair condition. Interior lighting levels were generally sufficient.



Surface Mounted



Recessed Fixtures

Most lighting fixtures are controlled by occupancy sensors and the remainder by wall switches.



Wall Switch Occupancy Sensor

Exterior fixtures include HID floodlights, compact fluorescent lamp (CFL) wall packs, and LED wall packs. Exterior fixtures are wall switch or photocell controlled.



HID Floodlight Fixture



Wall Pack Fixture

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators are equipped with supply fan motors and electronically controlled outside air dampers and fan coil valves connected to the hot water and chilled water distribution system. They provide heating, cooling, and ventilation to offices. This system is original to the building and appears to be in fair operating condition.



Unit Ventilator



Unit Heater

2.6 Heating Hot Water Systems

Two Triad 750 MBh hot water boilers serve the building's heating load. The burners are fully-modulating with a nominal efficiency of 95 percent. The boilers are configured in an automated control scheme. Both boilers are required under high load conditions. They are in fair condition. There is no service contract in place. The hydronic distribution system is a two-pipe, heating-only system.

The boilers are configured in a constant flow primary distribution with three, 5 hp constant speed hot water pumps operating with an automated control scheme. The boilers provide hot water to unit ventilators, fan coil units, and unit heaters throughout the building.



Boiler



Heating Hot Water Pump

2.7 Chilled Water Systems

The chiller plant consists of a one, 91-ton, York, R-410A air-cooled chiller. Chilled water is distributed by four, 5 hp constant speed circulation pumps. Chilled water is distributed to fan coil and unit ventilators throughout the building.



Chiller



Chilled Water Pump

2.8 Domestic Hot Water

Some of the building's hot water is produced by a 10-gallon, 4 kW electric storage water heater. Fourteen 3.5 kW instantaneous water heaters serve restrooms throughout the building.



Instantaneous Water Heater



Storage Tank Water Heater

2.9 Plug Load and Vending Machines

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

As noted above, facility use is minimal. The current estimate of plug load use reflects that.



Hand Dryer



Water Fountain

2.10 Water-Using Systems

There are six restrooms with toilets and sinks. Faucet flow rates are at 0.5 gallons per minute (gpm) or higher.

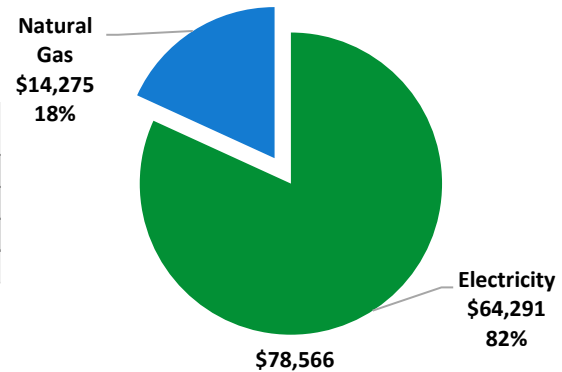


Lavatory Sink

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	483,070 kWh	\$64,291
Natural Gas	13,195 Therms	\$14,275
Total		\$78,566



An energy balance identifies and quantifies energy use in your various building systems. This can highlight areas with the most potential for improvement. This energy balance was developed using calculated energy use for each of the end uses noted in the figure.

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

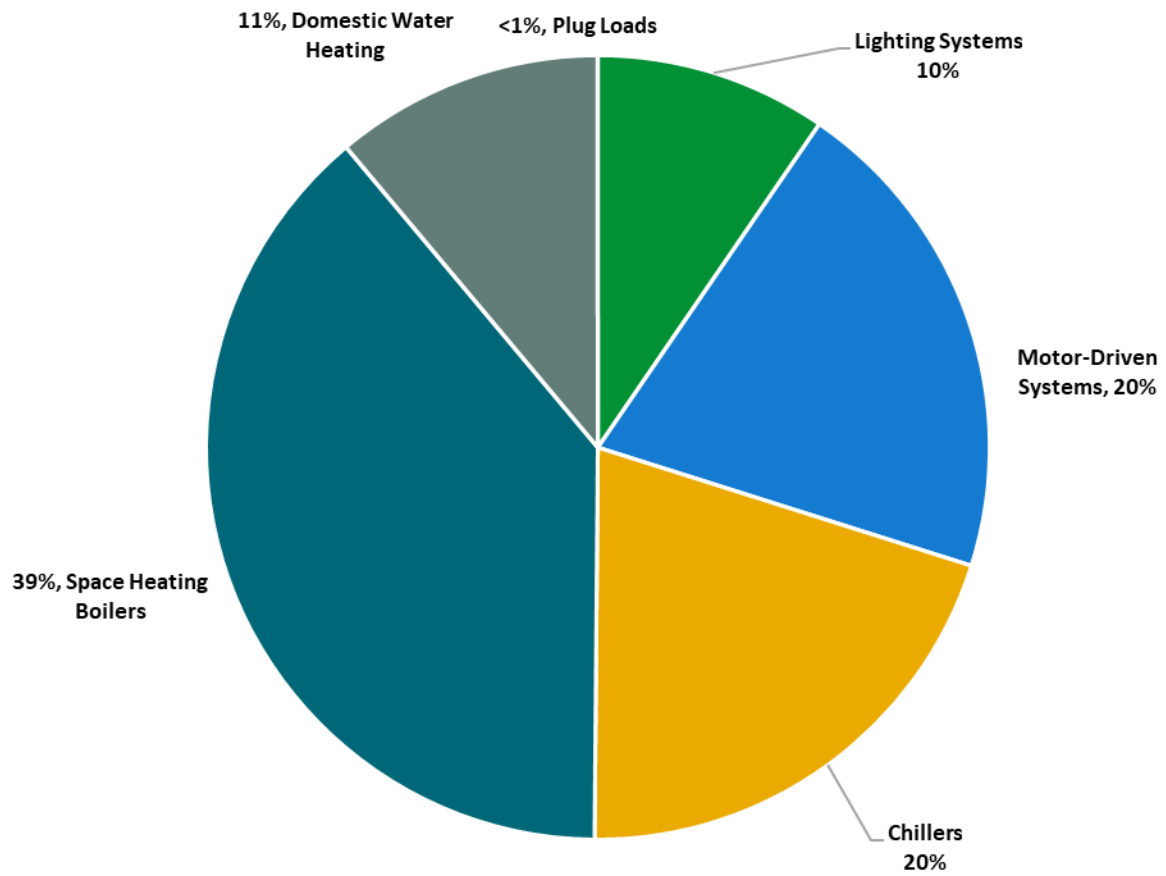
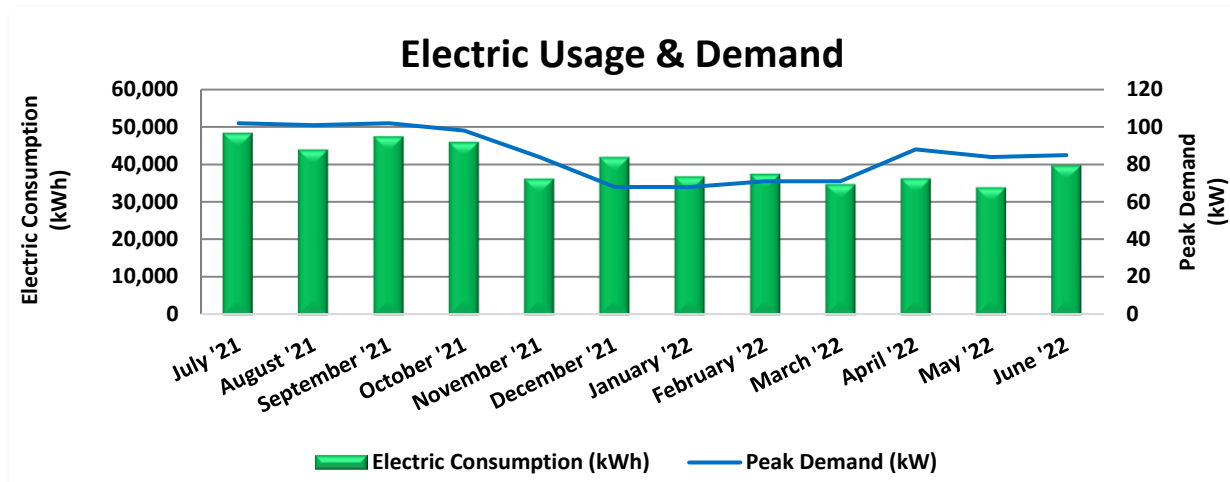


Figure 4 - Energy Balance

3.1 Electricity

Rockland Electric delivers electricity under rate class Electric Comm Prim (TOU-RE-DEL-PJM), with electric production provided by Direct Energy, a third-party supplier.



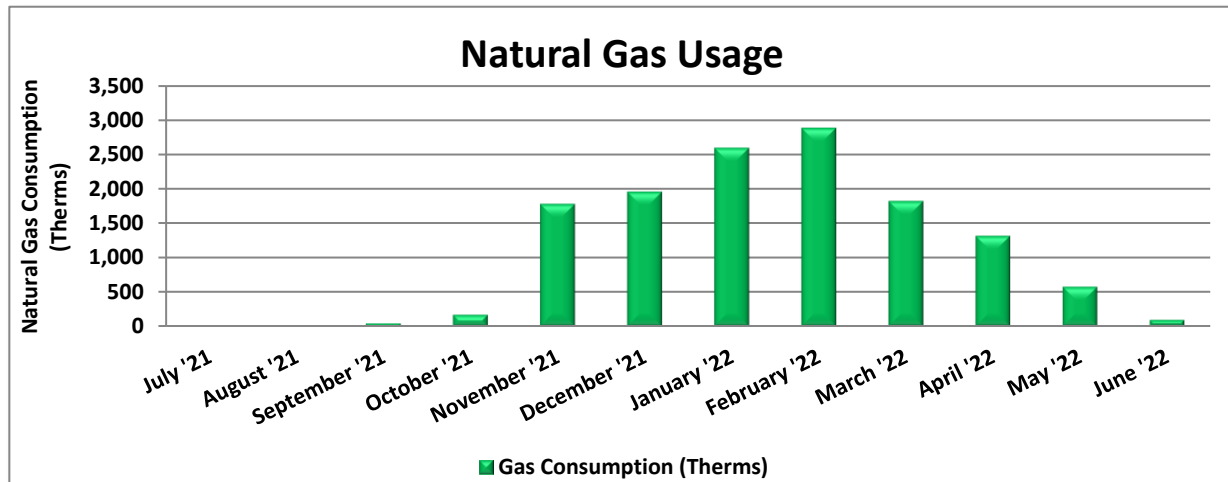
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
7/26/21	32	48,244	102		\$5,662
8/24/21	29	43,816	101		\$5,212
9/23/21	30	47,288	102		\$5,598
10/25/21	32	45,868	98		\$5,423
11/23/21	29	36,144	84		\$4,313
12/27/21	34	41,858	68		\$4,852
1/26/22	30	36,760	68		\$5,488
2/24/22	29	37,427	71		\$5,614
3/25/22	29	34,648	71		\$5,228
4/25/22	31	36,201	88		\$5,531
5/23/22	28	33,808	84		\$5,153
6/23/22	31	39,685	85		\$6,041
Totals	364	481,747	102	\$0	\$64,115
Annual	365	483,070	102	\$0	\$64,291

Notes:

- The average electric cost over the past 12 months was \$0.133/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.
- This building is served from the main campus electric meter along with several others. Energy usage (kWh) and demand (kW) was apportioned among those buildings using a formula that accounts for building area (sf) and presumed energy intensity (EUI) by building type. As noted, in this case the usage was derated to account for reduced operations.

3.2 Natural Gas

PSE&G delivers natural gas under rate class Large Volume Gas, with natural gas supply provided by UGI, a third-party supplier.



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
8/2/21	33	8	\$162
8/30/21	28	4	\$160
9/28/21	29	42	\$180
10/28/21	30	167	\$259
11/30/21	33	1,774	\$1,679
12/29/21	29	1,950	\$1,821
1/28/22	30	2,583	\$2,754
3/2/22	33	2,875	\$2,999
3/31/22	29	1,816	\$2,095
5/2/22	32	1,312	\$1,277
5/31/22	29	572	\$648
6/30/22	30	92	\$241
Totals	365	13,195	\$14,275
Annual	365	13,195	\$14,275

Notes:

- The average gas cost for the past 12 months is \$1.082/therm, which is the blended rate used throughout the analysis.
- This building has a dedicated gas meter.

3.3 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's (EPA) *Portfolio Manager*® software. Benchmarking compares your building's energy use to that of similar buildings across the country, while neutralizing variations due to location, occupancy, and operating hours. Some building types can be scored with a 1-100 ranking of a building's energy performance relative to the national building market. A score of 50 represents the national average and a score of 100 is best.

This ENERGY STAR benchmarking score provides a comprehensive snapshot of your building's energy performance. It assesses the building's physical assets, operations, and occupant behavior, which is compiled into a quick and easy-to-understand score.

Benchmarking Score

N/A

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

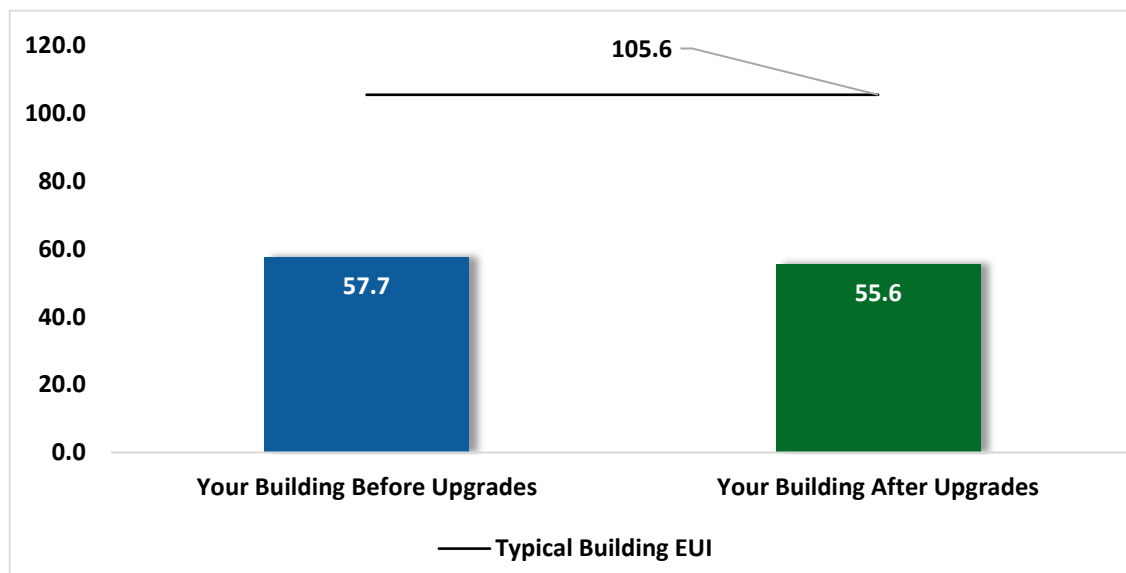


Figure 5 - Energy Use Intensity Comparison³

Energy use intensity (EUI) measures energy consumption per square foot and is the standard metric for comparing buildings' energy performance. A lower EUI means better performance and less energy consumed. Several factors can cause a building to vary from typical energy usage. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and occupant behavior all contribute to a building's energy use and the benchmarking score.

³ Based on all evaluated ECMs



Tracking Your Energy Performance

Keeping track of your energy use on a monthly basis is one of the best ways to keep energy costs in check. Update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance.

We have created a Portfolio Manager account for your facility and have already entered the monthly utility data shown above for you. Account login information for your account will be sent via email.

Free online training is available to help you use ENERGY STAR Portfolio Manager to track your building's performance at: <https://www.energystar.gov/buildings/training>.

For more information on ENERGY STAR and Portfolio Manager, visit their [website](#).

4 ENERGY CONSERVATION MEASURES

The goal of this audit report is to identify and evaluate potential energy efficiency improvements and provide information about the cost effectiveness of those improvements. Most energy conservation measures have received preliminary analysis of feasibility, which identifies expected ranges of savings. This level of analysis is typically sufficient to demonstrate project cost-effectiveness and help prioritize energy measures.

Calculations of energy use and savings are based on the current version of the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the NJBPU. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances.

Operation and maintenance costs for the proposed new equipment will generally be lower than the current costs for the existing equipment—especially if the existing equipment is at or past its normal useful life. We have conservatively assumed there to be no impact on overall maintenance costs over the life of the equipment.

Financial incentives in this report are based on the previously run state rebate program SmartStart, which has been retired. Now, all investor-owned gas and electric utility companies are offering complementary energy efficiency programs directly to their customers. Some measures and proposed upgrades may be eligible for higher incentives than those shown below. The incentives in the summary tables should be used for high-level planning purposes. To verify incentives, reach out to your utility provider or visit the [NJCEP website](#) for more information.

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Lighting Upgrades			19,639	2.0	-1	\$2,604	\$8,822	\$1,322	\$7,500	2.9	19,667
ECM 1	Install LED Fixtures	Yes	15,111	0.0	0	\$2,011	\$5,545	\$500	\$5,045	2.5	15,217
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	551	0.2	0	\$72	\$550	\$80	\$470	6.5	541
ECM 3	Retrofit Fixtures with LED Lamps	Yes	3,977	1.8	-1	\$520	\$2,727	\$742	\$1,985	3.8	3,909
Lighting Control Measures			3,664	1.2	-1	\$479	\$10,487	\$2,535	\$7,952	16.6	3,600
ECM 4	Install Occupancy Sensor Lighting Controls	No	2,047	0.9	0	\$268	\$7,562	\$225	\$7,337	27.4	2,011
ECM 5	Install High/Low Lighting Controls	Yes	1,618	0.3	0	\$212	\$2,925	\$2,310	\$615	2.9	1,589
Electric Chiller Replacement			8,314	-7.7	0	\$1,106	\$93,006	\$8,190	\$84,816	76.7	8,372
ECM 6	Install High Efficiency Chillers	No	8,314	-7.7	0	\$1,106	\$93,006	\$8,190	\$84,816	76.7	8,372
TOTALS			31,617	-4.5	-2	\$4,189	\$112,315	\$12,047	\$100,268	23.9	31,639

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

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

Figure 6 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Lighting Upgrades		19,639	2.0	-1	\$2,604	\$8,822	\$1,322	\$7,500	2.9	19,667
ECM 1	Install LED Fixtures	15,111	0.0	0	\$2,011	\$5,545	\$500	\$5,045	2.5	15,217
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	551	0.2	0	\$72	\$550	\$80	\$470	6.5	541
ECM 3	Retrofit Fixtures with LED Lamps	3,977	1.8	-1	\$520	\$2,727	\$742	\$1,985	3.8	3,909
Lighting Control Measures		1,618	0.3	0	\$212	\$2,925	\$2,310	\$615	2.9	1,589
ECM 5	Install High/Low Lighting Controls	1,618	0.3	0	\$212	\$2,925	\$2,310	\$615	2.9	1,589
TOTALS		21,256	2.3	-1	\$2,815	\$11,747	\$3,632	\$8,115	2.9	21,256

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

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

Figure 7 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Lighting Upgrades		19,639	2.0	-1	\$2,604	\$8,822	\$1,322	\$7,500	2.9	19,667
ECM 1	Install LED Fixtures	15,111	0.0	0	\$2,011	\$5,545	\$500	\$5,045	2.5	15,217
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	551	0.2	0	\$72	\$550	\$80	\$470	6.5	541
ECM 3	Retrofit Fixtures with LED Lamps	3,977	1.8	-1	\$520	\$2,727	\$742	\$1,985	3.8	3,909

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 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: all areas with fluorescent fixtures with T12 tubes

ECM 3: Retrofit Fixtures with LED Lamps

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

This measure saves energy by installing LEDs, which use less power than other lighting technologies yet provide equivalent lighting output for the space. Maintenance savings may also be available, as longer-lasting LEDs lamps will not need to be replaced as often as the existing lamps.

Affected Building Areas: all areas with fluorescent fixtures with T8 tubes and CFLs

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Lighting Control Measures		3,664	1.2	-1	\$479	\$10,487	\$2,535	\$7,952	16.6	3,600
ECM 4	Install Occupancy Sensor Lighting Controls	2,047	0.9	0	\$268	\$7,562	\$225	\$7,337	27.4	2,011
ECM 5	Install High/Low Lighting Controls	1,618	0.3	0	\$212	\$2,925	\$2,310	\$615	2.9	1,589

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: offices, classrooms, and mechanical rooms

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: hallways

4.3 Electric Chillers

#	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 ₂ e Emissions Reduction (lbs)
	Electric Chiller Replacement	8,314	-7.7	0	\$1,106	\$93,006	\$8,190	\$84,816	76.7	8,372
ECM 6	Install High Efficiency Chillers	8,314	-7.7	0	\$1,106	\$93,006	\$8,190	\$84,816	76.7	8,372

ECM 6: Install High Efficiency Chillers

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

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

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

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

Replacing the chiller has a long payback based on energy savings and may not be justifiable based simply on energy considerations. However, the chiller is nearing the end of its normal useful life. Typically, the marginal cost of purchasing a high-efficiency chiller can be justified by the marginal savings from the improved efficiency. When the chiller is eventually replaced, consider purchasing equipment that exceed the minimum efficiency required by building codes.

4.4 Measures for Future Consideration

There are additional opportunities for improvement that Ramapo College of New Jersey 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.

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

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

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

Retro-Commissioning Study

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

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

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

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

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

Electric Sub Metering

Electricity use varies in different facilities, and plant operators need to perform their own investigations and analyses to understand how their facilities consume energy. Facility staff expressed interest in sub metering key buildings, which are currently served by a master meter. Utility bills indicate how much energy a facility uses across the entire facility, but submetering provides more detailed data on the energy consumption of specific systems and even on individual pieces of equipment, depending on how extensively meters are installed. Electric submeters alone do not save energy, but they are a useful tool under the right circumstances. Electric sub-meters can provide facility staff with real-time energy use data for specific buildings, information that enhances the potential for greater energy management activities. Revenue grade submeters are a tool that allow operators to better understand how and where electricity is used at the facility. Better resolution of system energy use can lead to operational changes or even equipment modifications or replacement, which often result in reduced energy use, which often result in reduced energy use.

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 emissions⁴. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Lighting Maintenance



- Clean lamps, reflectors and lenses of dirt, dust, oil, and smoke buildup every six to twelve months. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust. Together, this can reduce total light output by up to 60% while still drawing full power.
- In addition to routine cleaning, developing a maintenance schedule can ensure that maintenance is performed regularly, and it can reduce the overall cost of fixture re-lamping and re-ballasting. Group re-lamping and re-ballasting maintains lighting levels and minimizes the number of site visits by a lighting technician or contractor, decreasing the overall cost of maintenance.

Lighting Controls

As part of a lighting maintenance schedule, test lighting controls to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight and photocell sensors, maintenance involves cleaning sensor lenses and confirming that setpoints and sensitivity are configured properly. Adjust exterior lighting time clock controls seasonally as needed to match your lighting requirements.

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

Motor Maintenance

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

Thermostat Schedules and Temperature Resets



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

Economizer Maintenance

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

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

Chiller Maintenance

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

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.

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 tubes to improve heat transfer.

Furnace Maintenance

Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should check for gas / carbon monoxide leaks; change the air and fuel filters; check components for cracks, corrosion, dirt, or debris build-up; ensure the ignition system is working properly; test and adjust operation and safety controls; inspect electrical connections; and lubricate motors and bearings.

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 in order 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.

Water Conservation



Installing dual flush or low-flow toilets and low-flow/waterless urinals are ways to reduce water use. The EPA WaterSense® ratings for urinals is 0.5 gallons per flush (gpf) and for flush valve toilets is 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

For more information regarding water conservation go to the EPA's WaterSense website⁵ or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"⁶ to get ideas for creating a water management plan and best practices for a wide range of water using systems.

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

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

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

Procurement Strategies

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

⁵ <https://www.epa.gov/watersense>.

⁶ <https://www.epa.gov/watersense/watersense-work-0>.

6 ON-SITE GENERATION

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

Preliminary screenings were performed to determine if an on-site generation measure could be a cost-effective solution for your facility. Before deciding to install an on-site generation system, we recommend conducting a feasibility study to analyze existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

6.1 Solar Photovoltaic

Photovoltaic (PV) panels convert sunlight into electricity. Individual panels are combined into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is then connected to the building's electrical distribution system.

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

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

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

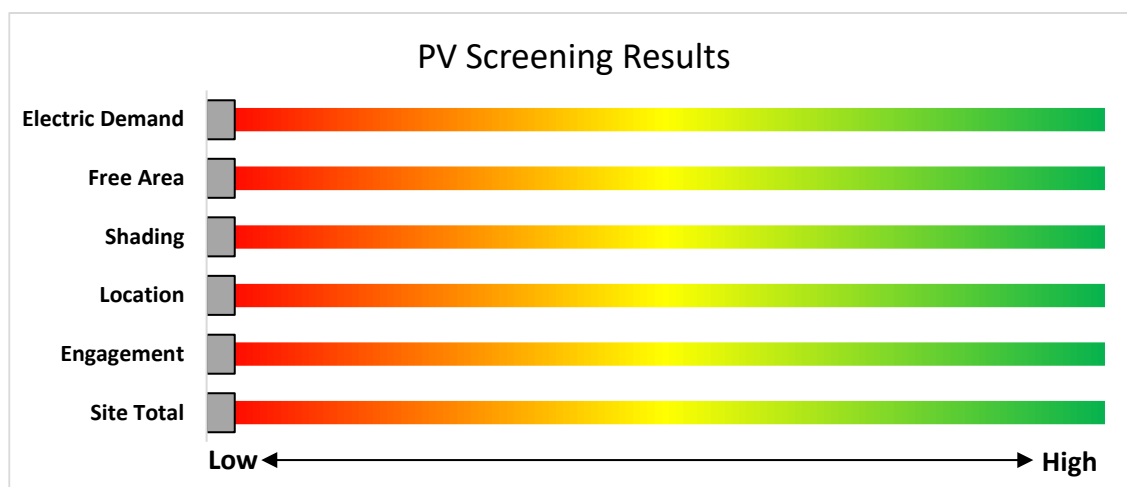


Figure 8 - Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

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

Get more information about solar power in New Jersey or find a qualified solar installer who can help you decide if solar is right for your building:

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

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

6.2 Combined Heat and Power

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

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

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

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has no potential for installing a cost-effective CHP system.

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

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

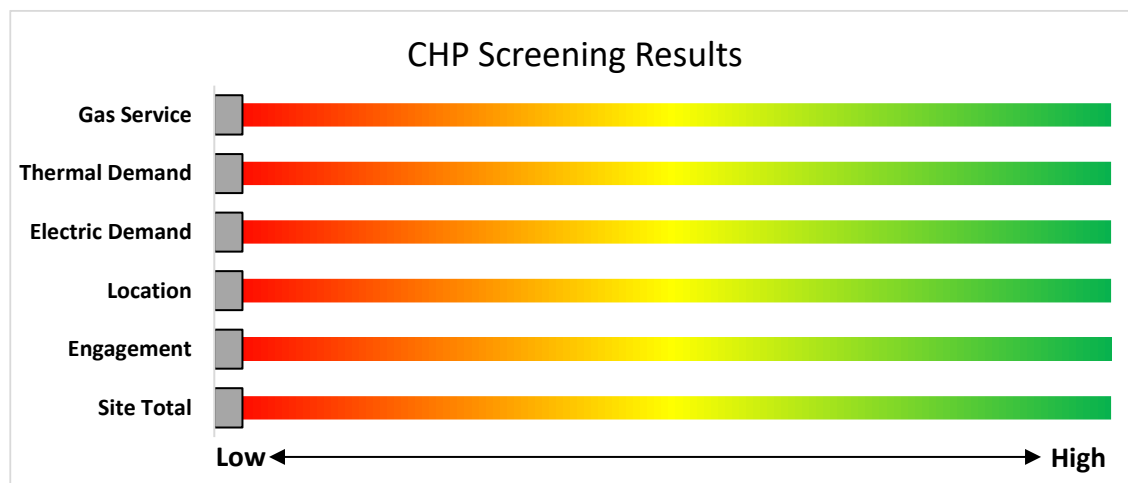


Figure 9 - Combined Heat and Power Screening

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

7 ELECTRIC VEHICLES (EV)

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

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

7.1 Electric Vehicle Charging

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

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

The preliminary assessment of EV charging at the facility shows that there is no potential for adding EV chargers to the facility's parking, based on potential costs of installation and other site factors.

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

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

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

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



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

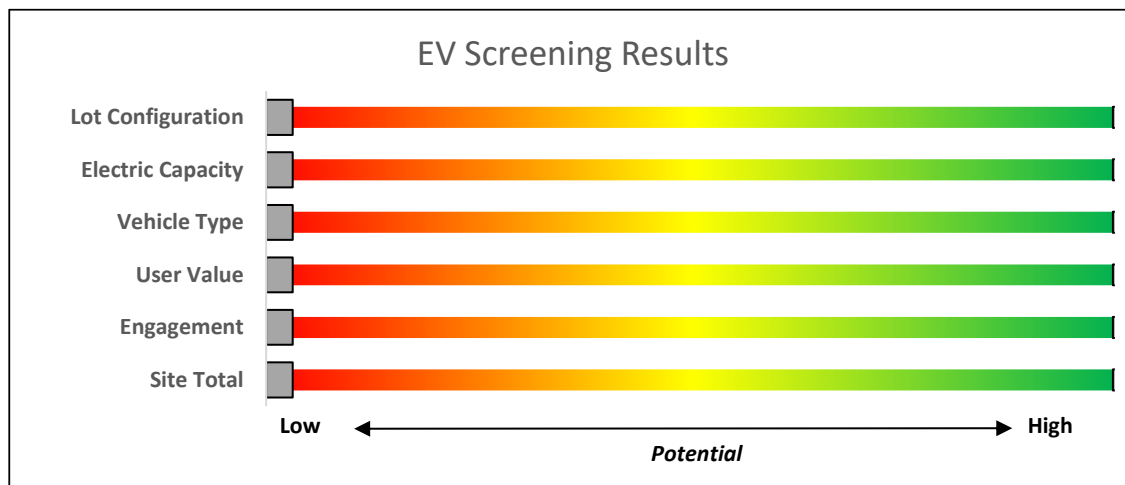


Figure 10 – EV Charger Screening

Electric Vehicle Programs Available

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

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

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

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

8 PROJECT FUNDING AND INCENTIVES

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



Program areas to be served by the Utilities:

- Existing Buildings (residential, commercial, industrial, government)
- Efficient Products
 - HVAC
 - Appliance Rebates
 - Appliance Recycling

Proposed New Programs & Features:

- Dedicated multi-family program
- More financing options
- Quick home energy check-ups



Program areas staying with NJCEP:

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

8.1 Utility Energy Efficiency Programs

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

Prescriptive and Custom

The Prescriptive and Custom rebate program through your utility provider offers incentives for installing prescriptive and custom energy efficiency measures at your facility. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades. This program serves most common equipment types and sizes.

Equipment Examples

Lighting

Lighting Controls

HVAC Equipment

Refrigeration

Gas Heating

Gas Cooling

Commercial Kitchen Equipment

Food Service Equipment

Variable Frequency Drives

Electronically Commutate Motors

Variable Frequency Drives

Plug Loads Controls

Washers and Dryers

Agricultural

Water Heating

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

Direct Install

Direct Install is a turnkey program available to existing small to medium-sized facilities with an average peak electric demand that does not exceed 200 kW or less over the recent 12-month period. You work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives, and controls.

Incentives

The program pays up to 70% of the total installed cost of eligible measures.

How to Participate

To participate in Direct Install, you will work with a participating contractor. The contractor will be paid the measure incentives directly by the program, which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the Direct Install program, subject to program rules and eligibility, while the remaining percent of the cost is paid to the contractor by the customer.

Engineered Solutions

The Engineered Solutions Program provides tailored energy-efficiency assistance and services to municipalities, universities, schools, hospitals and healthcare facilities (MUSH), non-profit entities, and multifamily buildings. Customers receive expert guided services, including investment-grade energy auditing, engineering design, installation assistance, construction administration, commissioning, and measurement and verification (M&V) services to support the implementation of cost-effective and comprehensive efficiency projects. Engineered Solutions is generally a good option for medium to large sized facilities with a peak demand over 200 kW looking to implement as many measures as possible under a single project to achieve deep energy savings. Engineered Solutions has an added benefit of addressing measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program loan also use this program. Incentives for this program are based on project scope and energy savings achieved.

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

8.2 New Jersey's Clean Energy Programs

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

Large Energy Users

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

Incentives

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

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

How to Participate

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

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

Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

Successor Solar Incentive Program (SuSI)

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

Administratively Determined Incentive (ADI) Program

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

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

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

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

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

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

Competitive Solar Incentive Program

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

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

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

Energy Savings Improvement Program

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

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

How to Participate

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

- (1) Use an energy services company or "ESCO."
- (2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
- (3) Use a hybrid approach of the two options described above where the ESCO is used for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

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

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

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

9 PROJECT DEVELOPMENT

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

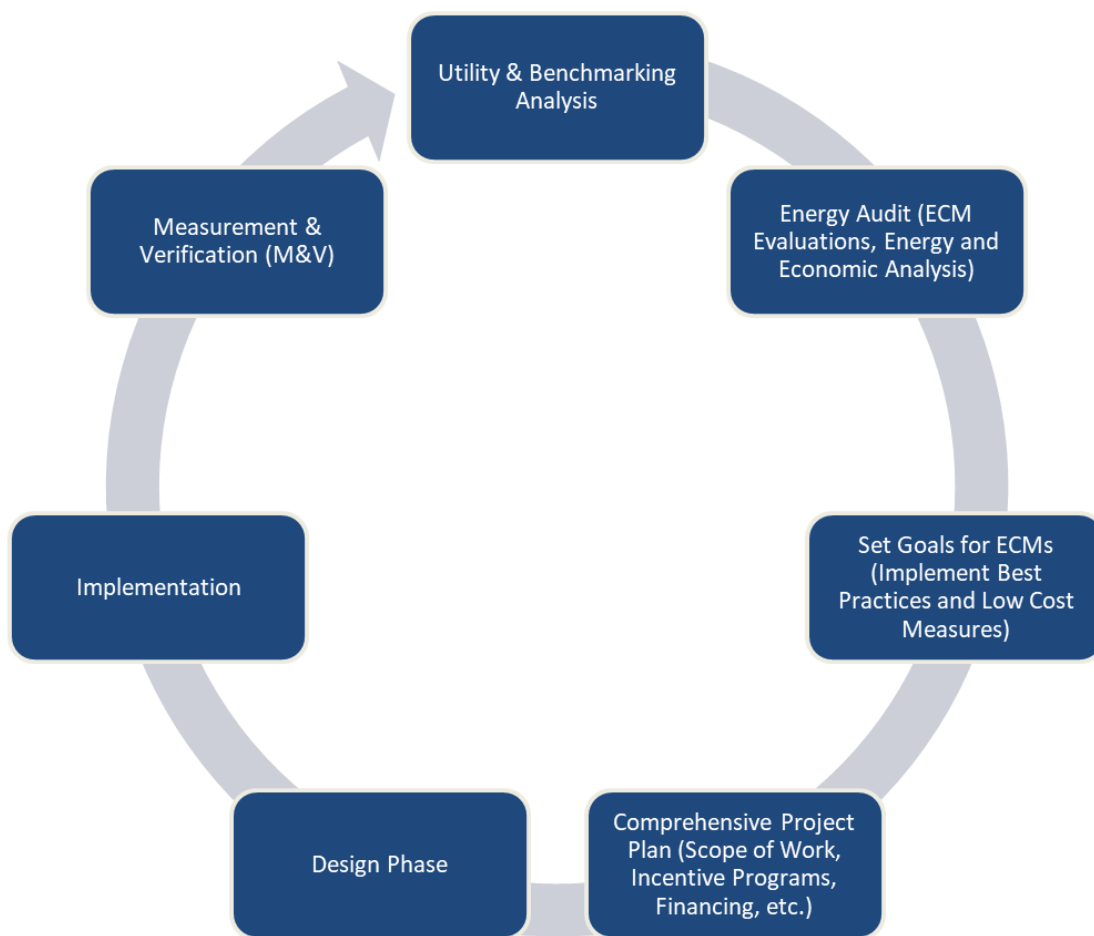


Figure 11 – Project Development Cycle

10 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

10.1 Retail Electric Supply Options

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. Though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third-party supplier, consider shopping for a reduced rate from third-party electric suppliers. If your facility already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party electric suppliers is available at the NJBPU website⁷.

10.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market based and fluctuate monthly. The utility provides basic gas supply service to customers who choose not to buy from a third-party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier typically depends on whether a customer prefers budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third-party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility does not already purchase natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility already purchases natural gas from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party natural gas suppliers is available at the NJBPU website⁸.

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

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



APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis							
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years	
Boiler Room	2	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	1,456	2, 4	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	167	0	\$22	\$254	\$40	9.8	
Classroom 113	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	
Classroom 113	16	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	1,456	4	None	Yes	16	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.1	238	0	\$31	\$270	\$35	7.5	
Classroom 113B	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	
Classroom 113B	26	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	1,456	4	None	Yes	26	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.2	387	0	\$51	\$540	\$70	9.3	
Corridor 1A	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 1A	10	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	S	30	1,100		None	No	10	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	30	1,100	0.0	0	0	\$0	\$0	\$0	0.0	
Corridor 1B	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 1B	9	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	S	30	1,100		None	No	9	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	30	1,100	0.0	0	0	\$0	\$0	\$0	0.0	
Electrical Room 111A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	135	0	\$18	\$189	\$40	8.5	
Elevator 112	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	135	0	\$18	\$189	\$40	8.5	
Exterior 1	4	High-Pressure Sodium: (1) 400W Lamp	Photocell		465	4,380	1	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	120	4,380	0.0	6,044	0	\$804	\$2,218	\$200	2.5	
Exterior 4	1	Compact Fluorescent: (2) 26W Biaxial Plug-In Lamps	Photocell		52	4,380	3	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Photocell	37	4,380	0.0	66	0	\$9	\$25	\$2	2.6	
Exterior 4	6	High-Pressure Sodium: (1) 400W Lamp	Photocell		465	4,380	1	Fixture Replacement	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	120	4,380	0.0	9,067	0	\$1,207	\$3,327	\$300	2.5	
Exterior 4	12	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch		9	1,456		None	No	12	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	1,456	0.0	0	0	\$0	\$0	\$0	0.0	
Exterior 4	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Photocell		9	4,380		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Photocell	9	4,380	0.0	0	0	\$0	\$0	\$0	0.0	
Janitorial 4	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	S	10	1,456		None	No	1	LED Lamps: (1) 10W A19 Screw-In Lamp	Wall Switch	10	1,456	0.0	0	0	\$0	\$0	\$0	0.0	
Lobby 4	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	
Lobby 4	18	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	4,380	5	None	Yes	18	LED - Fixtures: Ambient 2x2 Fixture	High/Low Control	30	3,022	0.1	807	0	\$106	\$675	\$630	0.4	
Lobby 4	4	LED - Fixtures: Ceiling Mount	Occupancy Sensor	S	20	4,380		None	No	4	LED - Fixtures: Ceiling Mount	Occupancy Sensor	20	4,380	0.0	0	0	\$0	\$0	\$0	0.0	
Mechanical 117A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	135	0	\$18	\$189	\$40	8.5	
Office - Enclosed 101	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0	
Office - Enclosed 101A	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	34	1,456		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	34	1,456	0.0	0	0	\$0	\$0	\$0	0.0	
Office - Enclosed 101B	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0	
Office - Enclosed 102	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	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
Office - Enclosed 106	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 106A	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 110	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 111	5	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	5	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 120	10	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	30	1,005		None	No	10	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 121	10	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	30	1,005		None	No	10	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 122	10	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	30	1,005		None	No	10	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 123	10	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	30	1,005		None	No	10	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 124	10	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	30	1,005		None	No	10	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 125	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	30	1,456		None	No	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 125	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	30	1,456		None	No	4	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 126	6	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	30	1,005		None	No	6	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Restroom - Female 2	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	30	1,005		None	No	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Restroom - Male 2	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	30	1,005		None	No	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Restroom - Unisex 1	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	30	1,005		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Restroom - Unisex 2	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	30	1,005		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Storage 103	4	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	30	1,005		None	No	4	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Storage 104	6	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	30	1,005		None	No	6	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Storage 107	10	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	30	1,456	4	None	Yes	10	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	30	1,005	0.1	149	0	\$19	\$270	\$0	13.9
Storage 108	10	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	30	1,456	4	None	Yes	10	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	30	1,005	0.1	149	0	\$19	\$270	\$0	13.9
Storage 109	10	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	S	30	1,005		None	No	10	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Storage 125B	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	135	0	\$18	\$189	\$20	9.6
Corridor 5	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 5	10	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	S	30	1,100		None	No	10	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	30	1,100	0.0	0	0	\$0	\$0	\$0	0.0
Corridor 6	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

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 6	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	1,825		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	1,825	0.0	0	0	\$0	\$0	\$0	0.0
Corridor 6	8	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	S	30	1,100		None	No	8	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	30	1,100	0.0	0	0	\$0	\$0	\$0	0.0
Janitorial 3	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,456	0.0	53	0	\$7	\$37	\$10	3.8
Lobby 3	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
Lobby 3	12	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	S	34	4,380	5	None	Yes	12	LED - Fixtures: Ambient 2x4 Fixture	High/Low Control	34	3,022	0.1	609	0	\$80	\$450	\$420	0.4
Office - Enclosed 202	1	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	S	30	1,005		None	No	1	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 202A	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	1,456		None	No	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 203	6	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	1,456		None	No	6	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 204	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	35	1,005		None	No	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	35	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 204A	4	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	30	1,005		None	No	4	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 204B	4	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	30	1,005		None	No	4	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 205	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	35	1,005		None	No	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	35	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 205A	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	35	1,005		None	No	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	35	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 206	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	35	1,005		None	No	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	35	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 207	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	35	1,005		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	35	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 208	3	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	30	1,456		None	No	3	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 208A	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	1,456		None	No	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 208B	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	1,456		None	No	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 209	3	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	30	1,456		None	No	3	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 209A	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	1,456		None	No	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 209B	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	1,456		None	No	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 210	3	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	30	1,456		None	No	3	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 210A	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	1,456		None	No	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 210B	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	1,456		None	No	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	30	1,456	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 211	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	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
Office - Enclosed 212	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 213	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 216	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 217	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 218	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 219	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	30	1,005		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 219	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 220	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 221	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	30	1,005		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 221	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 222	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 223	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	30	1,005		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 223	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 224	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 225	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	S	30	1,005		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed 225	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	1	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Restroom - Female 1	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Restroom - Male 1	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	34	1,005		None	No	3	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	34	1,005	0.0	0	0	\$0	\$0	\$0	0.0
Server Room 201	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,456	0.0	53	0	\$7	\$37	\$10	3.8
Server Room 201	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	135	0	\$18	\$189	\$40	8.5
Storage 226	4	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	1,456	2, 4	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	333	0	\$44	\$545	\$40	11.6
Corridor 1	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 1	9	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	1,825	5	None	Yes	9	LED Lamps: (1) 9W A19 Screw-In Lamp	High/Low Control	9	1,259	0.0	50	0	\$7	\$450	\$315	20.5
Corridor 2	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 2	9	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	1,825	5	None	Yes	9	LED Lamps: (1) 9W A19 Screw-In Lamp	High/Low Control	9	1,259	0.0	50	0	\$7	\$450	\$315	20.5

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
Janitorial 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,456	0.0	53	0	\$7	\$37	\$10	3.8
Lobby 1	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Lobby 1	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	4,380		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	4,380	0.0	0	0	\$0	\$0	\$0	0.0
Storage 10	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 11	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 12	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 13	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 14	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 15	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 16	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 17	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 18	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	269	0	\$35	\$416	\$40	10.7
Storage 9	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	269	0	\$35	\$416	\$40	10.7
Corridor 1	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 1	9	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	1,825	5	None	Yes	9	LED Lamps: (1) 9W A19 Screw-In Lamp	High/Low Control	9	1,259	0.0	50	0	\$7	\$450	\$315	20.5
Corridor 2	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 2	9	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	1,825	5	None	Yes	9	LED Lamps: (1) 9W A19 Screw-In Lamp	High/Low Control	9	1,259	0.0	50	0	\$7	\$450	\$315	20.5
Janitorial 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,456	0.0	53	0	\$7	\$37	\$10	3.8
Lobby 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
Lobby 1	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	4,380		None	No	1	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	9	4,380	0.0	0	0	\$0	\$0	\$0	0.0
Mechanical 1	2	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	1,456	2, 4	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	167	0	\$22	\$254	\$40	9.8
Storage 10	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 11	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 12	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 13	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2



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
Storage 14	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 15	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 16	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 17	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	202	0	\$26	\$380	\$30	13.2
Storage 9	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	269	0	\$35	\$416	\$40	10.7

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
Linden Hall - Boiler Room	Linden Hall	2	Chilled Water Pump	5.0	87.5%	No	Marathon	5VA184TTDB4026AAX	W	1,373		No	87.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Linden Hall - Mechanical 1	Linden Hall	2	Chilled Water Pump	5.0	87.5%	No	Marathon	5VA184TTDB4026AAX	W	1,373		No	87.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Linden Hall - Exterior 2	Linden Hall	1	Exhaust Fan	0.5	70.0%	No	ACME	PRN135	W	2,745		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Linden Hall - Boiler Room	Linden Hall	1	Heating Hot Water Pump	5.0	87.5%	No	Emerson	R357	W	2,920		No	87.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Linden Hall - Boiler Room	Linden Hall	1	Heating Hot Water Pump	5.0	87.5%	No	Baldor	M3218T	W	2,920		No	87.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Linden Hall - Mechanical 1	Linden Hall	1	Heating Hot Water Pump	5.0	87.5%	No	Baldor	M3218T	W	2,920		No	87.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Linden Hall - Mechanical 1	Linden Hall	1	Heating Hot Water Pump	0.8	70.0%	No	Marathon	UVL56T17D5540A	W	2,190		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Linden Hall - Mechanical 1	Linden Hall	1	Heating Hot Water Pump	0.8	70.0%	No	Century	7-P56AA64A01-01	W	2,190		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Linden Hall - Elevator 112	Linden Hall	1	Other	30.0	70.0%	No	Dover Elevators	EP9530	W	100		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Linden Hall	Linden Hall	18	Supply Fan	0.0	65.0%	Yes	Reznor	WS18/24	W	5,840		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Linden Hall - Boiler Room	Linden Hall	1	Other	3.0	86.5%	No	Control Air, INC.	AMP-25	W	2,745		No	86.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Linden Hall	Linden Hall	66	Supply Fan	0.2	65.0%	No	Trane	FCCB0801KAWF0A00BB3M0000D200EL400BFEO0000000	W	4,380		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0



Electric Chiller Inventory & Recommendations

		Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Linden Hall - Exterior 4	Linden Hall	1	Air-Cooled Scroll Chiller	91.00	York	YLAA0091HE17XCASDXXATXBLXCXX44SX1XXXHXXXSAXXXX1XXXXXNBXXXXX	W	6	Yes	1	Air-Cooled Scroll Chiller	Variable	91.00	1.24	0.74	-7.7	8,314	0	\$1,106	\$93,006	\$8,190	76.7

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
Boiler Room	Linden Hall	2	Condensing Hot Water Boiler	713	Triad	T C-750	W		No						0.0	0	0	\$0	\$0	\$0	0.0

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
Linden Hall	Linden Hall	14	Tankless Water Heater	Eemax	SP3512	W		No						0.0	0	0	\$0	\$0	\$0	0.0
Janitorial 4	Linden Hall	1	Storage Tank Water Heater (≤ 50 Gal)	AO Smith	DEL-10 102	W		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
Office - Enclosed 125	1	Microwave	1,000	No	Unknown	Unknown
Linden Hall	6	Hand Dryer	1,500	No	Air Max	DXM5-973A
Classroom113B	1	Projector	150	No	Unknown	Unknown
Office - Enclosed 125	1	Mini Refrigerator	126	No	Unknown	Unknown
Office - Enclosed 212	1	Television	125	Yes	Samsung	Unknown
Linden Hall	2	Water Fountain	125	No	Elkay	EZFSTL8

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.



ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

Ramapo College of New Jersey (Campus)

Primary Property Type: College/University
Gross Floor Area (ft²): 1,894,712
Built: 1973

For Year Ending: May 31, 2022
Date Generated: February 07, 2024

N/A

ENERGY STAR®
Score¹

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 Ramapo College of New Jersey (Campus) 505 Ramapo Valley Road & 523 Route 202 Mahwah, New Jersey 07430	Property Owner Ramapo College of New Jersey 505 Ramapo Valley Road Mahwah, NJ 07430 (201) 684-7666	Primary Contact Mike Cunningham 505 Ramapo Valley Road Mahwah, NJ 07430 (201) 684-7666 mcunning@ramapo.edu	
Property ID: 26333864			

Energy Consumption and Energy Use Intensity (EUI)			
Site EUI	Annual Energy by Fuel	National Median Comparison	
102.1 kBtu/ft²	Electric - Grid (kBtu)	National Median Site EUI (kBtu/ft²)	105.6
	Electric - Solar (kBtu)	National Median Source EUI (kBtu/ft²)	180.6
	Natural Gas (kBtu)	% Diff from National Median Source EUI	-3%
Source EUI		Annual Emissions	
174.7 kBtu/ft²		Total (Location-Based) GHG Emissions (Metric Tons CO2e/year)	7,720

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	<i>British thermal unit</i> : 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	<i>Combined heat and power</i> . Also referred to as cogeneration.
COP	<i>Coefficient of performance</i> : 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	<i>Demand control ventilation</i> : a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
US DOE	<i>United States Department of Energy</i>
EC Motor	<i>Electronically commutated motor</i>
ECM	<i>Energy conservation measure</i>
EER	<i>Energy efficiency ratio</i> : a measure of efficiency in terms of cooling energy provided divided by electric input.
EUI	<i>Energy Use Intensity</i> : 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	<i>United States Environmental Protection Agency</i>
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
GHG	<i>Greenhouse gas</i> 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	<i>Gallons per flush</i>

gpm	<i>Gallon per minute</i>
HID	<i>High intensity discharge</i> : high-output lighting lamps such as high-pressure sodium, metal halide, and mercury vapor.
hp	<i>Horsepower</i>
HPS	<i>High-pressure sodium</i> : a type of HID lamp.
HSPF	<i>Heating seasonal performance factor</i> : a measure of efficiency typically applied to heat pumps. Heating energy provided divided by seasonal energy input.
HVAC	<i>Heating, ventilating, and air conditioning</i>
IHP 2014	US DOE Integral Horsepower rule. The current ruling regarding required electric motor efficiency.
IPLV	<i>Integrated part load value</i> : a measure of the part load efficiency usually applied to chillers.
kBtu	One thousand British thermal units
kW	<i>Kilowatt</i> : equal to 1,000 Watts.
kWh	<i>Kilowatt-hour</i> : 1,000 Watts of power expended over one hour.
LED	<i>Light emitting diode</i> : a high-efficiency source of light with a long lamp life.
LGEA	<i>Local Government Energy Audit</i>
Load	The total power a building or system is using at any given time.
Measure	A single activity, or installation of a single type of equipment, which is implemented in a building system to reduce total energy consumption.
MH	<i>Metal halide</i> : a type of HID lamp.
MBh	<i>Thousand Btu per hour</i>
MBtu	<i>One thousand British thermal units</i>
MMBtu	<i>One million British thermal units</i>
MV	<i>Mercury Vapor</i> : a type of HID lamp.
NJBPU	<i>New Jersey Board of Public Utilities</i>
NJCEP	<i>New Jersey's Clean Energy Program</i> : 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	<i>Photovoltaic</i> : refers to an electronic device capable of converting incident light directly into electricity (direct current).

SEER	<i>Seasonal energy efficiency ratio</i> : a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	<i>Statement of energy performance</i> : 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)	<i>Solar renewable energy credit</i> : 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 1/8 th 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	<i>Variable air volume</i>
VFD	<i>Variable frequency drive</i> : 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.