



Local Government Energy Audit Report

Bill Bradley Center

July 10, 2024

Prepared for:

Ramapo College of New Jersey
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Prepared by:

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Disclaimer

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

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

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

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

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

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPB) has sponsored this Local Government Energy Audit (LGEA) report for Bill Bradley Center. This report provides you with information about your facility's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in your facility. TRC conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and to help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

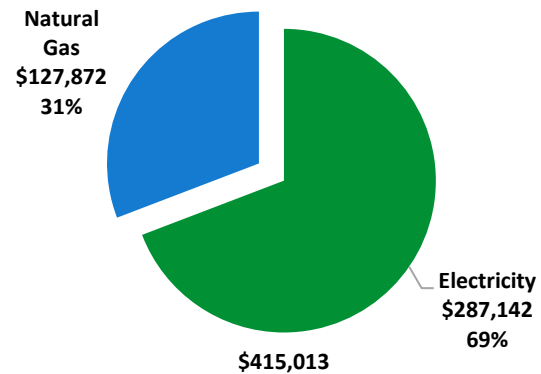


Annual Utilities

Costs: \$415,013

Electricity:
2,157,525 kWh

Natural Gas:
143,844 Therms



ENERGY STAR®
Benchmarking Score

N/A
(1-100 scale)

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

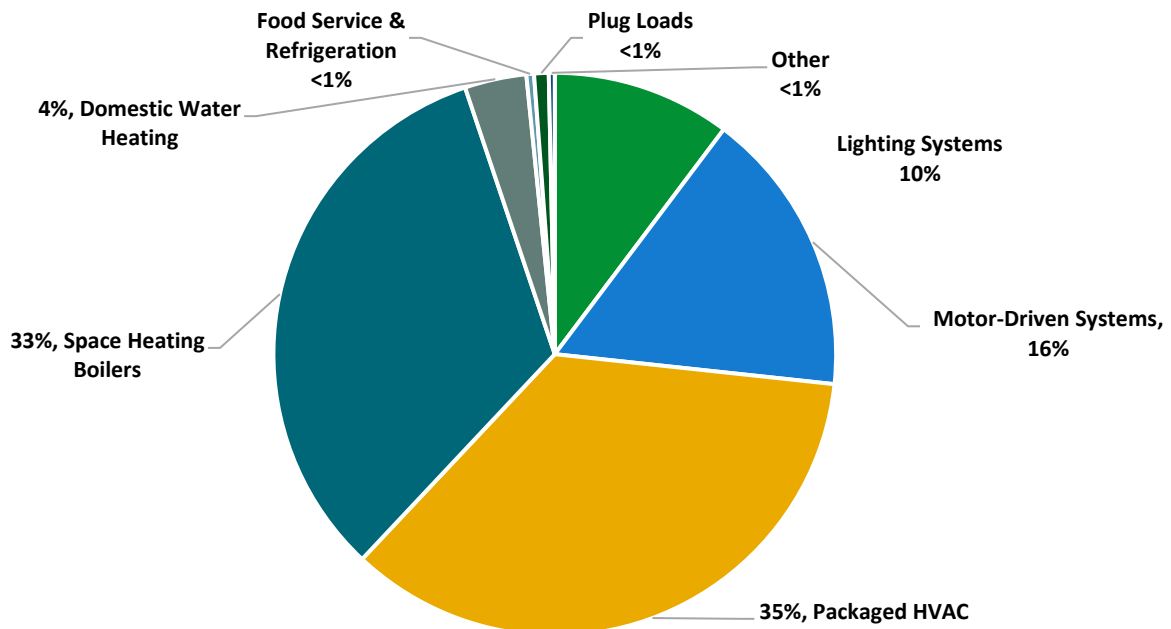


Figure 1 - Energy Use by System

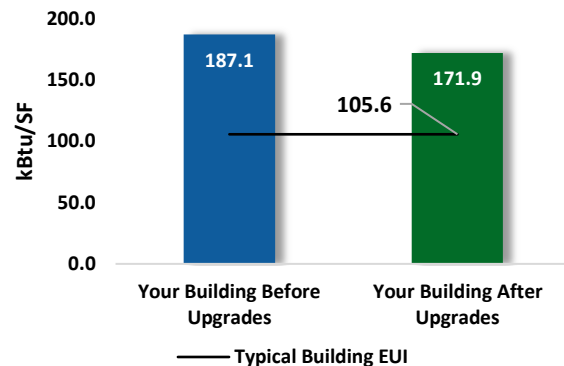
POTENTIAL IMPROVEMENTS



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

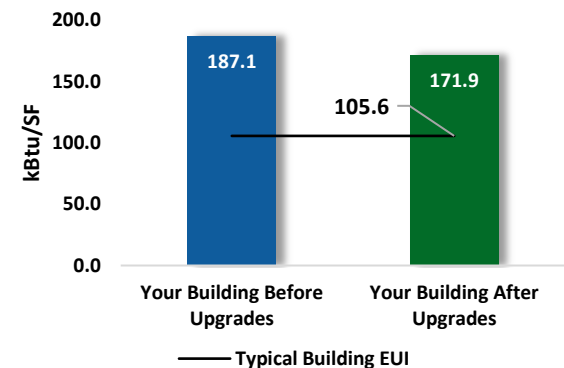
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	\$208,553
Potential Rebates & Incentives ¹	\$39,833
Annual Cost Savings	\$70,500
Annual Energy Savings	Electricity: 533,125 kWh Natural Gas: -509 Therms
Greenhouse Gas Emission Savings	265 Tons
Simple Payback	2.4 Years
Site Energy Savings (All Utilities)	8%



Scenario 2: Cost Effective Package²

Installation Cost	\$208,553
Potential Rebates & Incentives	\$39,833
Annual Cost Savings	\$70,500
Annual Energy Savings	Electricity: 533,125 kWh Natural Gas: -509 Therms
Greenhouse Gas Emission Savings	265 Tons
Simple Payback	2.4 Years
Site Energy Savings (all utilities)	8%



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			362,887	53.7	-75	\$47,627	\$119,201	\$15,398	\$103,803	2.2	356,612
ECM 1	Install LED Fixtures	Yes	162,175	24.2	-34	\$21,284	\$79,950	\$7,430	\$72,520	3.4	159,359
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	22,856	2.0	-5	\$2,999	\$2,537	\$100	\$2,437	0.8	22,456
ECM 3	Retrofit Fixtures with LED Lamps	Yes	177,857	27.6	-37	\$23,344	\$36,714	\$7,868	\$28,846	1.2	174,796
Lighting Control Measures			102,532	13.3	-21	\$13,455	\$48,565	\$20,070	\$28,495	2.1	100,738
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	84,378	10.6	-18	\$11,073	\$28,990	\$3,485	\$25,505	2.3	82,902
ECM 5	Install High/Low Lighting Controls	Yes	18,154	2.7	-4	\$2,382	\$19,575	\$16,585	\$2,990	1.3	17,836
Motor Upgrades			4,907	0.9	0	\$653	\$5,899	\$0	\$5,899	9.0	4,942
ECM 6	Premium Efficiency Motors	Yes	4,907	0.9	0	\$653	\$5,899	\$0	\$5,899	9.0	4,942
Variable Frequency Drive (VFD) Measures			56,435	3.4	0	\$7,511	\$27,922	\$3,500	\$24,422	3.3	56,829
ECM 7	Install VFDs on Constant Volume (CV) Fans	Yes	13,043	3.0	0	\$1,736	\$6,697	\$1,100	\$5,597	3.2	13,134
ECM 8	Install VFDs on Process/Pool Filtration Pumps	Yes	43,392	0.4	0	\$5,775	\$21,226	\$2,400	\$18,826	3.3	43,695
Domestic Water Heating Upgrade			0	0.0	46	\$407	\$4,326	\$765	\$3,561	8.7	5,361
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	46	\$407	\$4,326	\$765	\$3,561	8.7	5,361
Food Service & Refrigeration Measures			6,364	0.7	0	\$847	\$2,640	\$100	\$2,540	3.0	6,409
ECM 10	Replace Refrigeration Equipment	Yes	3,201	0.4	0	\$426	\$1,950	\$0	\$1,950	4.6	3,223
ECM 11	Vending Machine Control	Yes	3,163	0.4	0	\$421	\$690	\$100	\$590	1.4	3,185
TOTALS (COST EFFECTIVE MEASURES)			533,125	72.0	-51	\$70,500	\$208,553	\$39,833	\$168,720	2.4	530,891
TOTALS (ALL MEASURES)			533,125	72.0	-51	\$70,500	\$208,553	\$39,833	\$168,720	2.4	530,891

* - 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 Bill Bradley Center. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs.

TRC conducted this study as part of a comprehensive effort to assist New Jersey educational and local government facilities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

2.1 Site Overview

On October 23, 2023, TRC performed an energy audit at Bill Bradley Center 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.

Bill Bradley Center is a two-story, 116,235 square foot building built in 1973. Spaces include classrooms, gymnasiums, fitness room, locker rooms, offices, corridors, stairwells, and mechanical space. The building is equipped with solar panels that help offset grid purchase electricity use campus wide.

2.2 Building Occupancy

The facility is occupied Monday through Friday during regular business hours. Janitorial services are performed after hours.

The school is fully occupied from September through June. Typical weekday occupancy varies by events. Summer occupancy includes summer sports and continuing maintenance activities. Weekend activities vary by season.

Building Name	Weekday/Weekend	Operating Schedule
Bill Bradley Center	Weekday	8:00 AM - 10:00 PM
	Weekend	Varied

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

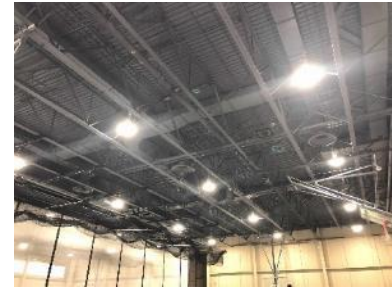
Building walls are concrete block over structural steel with a stone facade. The roof is flat and covered with black membrane and in fair condition. The flat roof is supported with steel trusses and a metal deck and finished with an insulated layer and a covering.



Building Façade



Roof



Interior Structure

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.



Windows



Exterior Doors



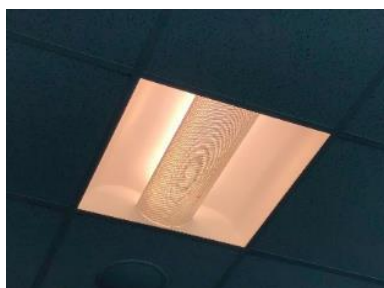
Glass Curtain Wall

2.4 Lighting Systems

The primary interior lighting is comprised of a mix of 32-Watt linear T8 and plug in biaxial compact fluorescent lamps (CFL). There are also several 40-Watt T12 fixtures and some with linear T5 high output lamps. Fixture types include 1-lamp, 2-lamp, or 3-lamp, 2-foot or 4-foot-long recessed troffer, surface mounted fixtures and 2-foot fixtures with U-bend tube lamps. Typically, T5 and T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts.

Additionally, there are some incandescent, induction, and LED fixtures.

Gymnasium areas have manually controlled high bay (HO) linear fluorescent and LED high bay fixtures. All exit signs are LED. Most fixtures are in fair condition. Interior lighting levels were generally sufficient.



CFL Recessed Troffer



LED High Bay Fixture



Surface Mount Linear Fluorescent Fixtures

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

Exterior fixtures include a mix of LED wall packs, CFL wall packs, linear fluorescent canopy lights, and high intensity discharge (HID) wall packs. Exterior fixtures are timer controlled.



LED Wall Pack



Linear Fluorescent Canopy Fixtures



HID Wall Packs

2.5 Air Handling Systems

Unitary Heating Equipment

Storage and mechanical rooms are heated by electric resistance heaters. Each are estimated at 5 kW in capacity. The units are in good condition. Equipment is controlled by manual dial thermostat.



Electric Resistance Heaters

Packaged Units

Most of the building is conditioned by 17 packaged roof top units (RTUs). The three Aeon units serving the main gym are each rated to provide a maximum of 125 tons of cooling while other units range from 10 tons to 110 tons in cooling capacity. Fifteen of the units have gas-fired burners ranging in size from 219 MBh to 1453 MBh, one Trane unit is equipped with hot water coils, and one Johnson Controls unit provides cooling only. Some of these units are equipped with economizers that are in fair condition.

Units are typically equipped with both supply and return fans, several of which are equipped with variable frequency drives.

Refer to Appendix A for detailed information about each unit.



Rooftop Packaged Units (RTUs)



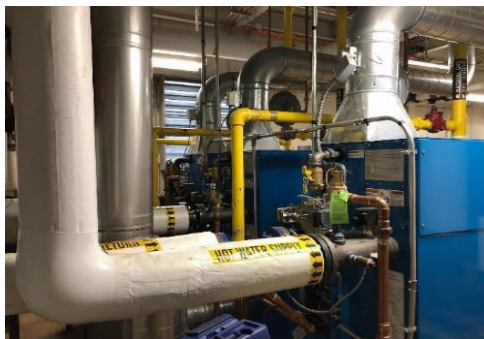
Rooftop Packaged Units (RTUs)

2.6 Heating Hot Water Systems

Three PK Thermific 2,500 MBh hot water boilers serve the building's heating load. The burners are fully modulating with a nominal efficiency of 88 percent. The boilers are configured in an automated control scheme. Multiple boilers are required under high load conditions. The hydronic distribution system is a two- pipe heating-only system.

The boilers are configured in a constant flow primary distribution with two, 25 hp constant speed hot water pumps operating with an automated control scheme.

The boilers provide hot water to fin tube radiators, fan coil units, convectors, and RTUs throughout the building. Hot water from the boiler is also run through a heat exchanger for the pool.



Hot Water Boilers



Heat Exchanger



Heating Hot Water Pumps

2.7 Building Automation System (BAS)

A BAS controls the HVAC equipment, boilers, and package units. The BAS provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, humidity, heating water loop temperatures, and chilled water loop temperatures.

The site staff expressed an interest in expanding the level of control provided by the BAS, replacing the BAS, and receiving additional training on operating the BAS.

2.8 Domestic Hot Water

Hot water is produced by two, 900 gallon, 1,200 MBh gas-fired storage water heaters, each with an efficiency of 80 percent. Additional hot water is produced by a 750 MBh hot water boiler connected to two storage tanks. Three fractional hp circulation pumps distribute water to end uses. The circulation pumps operate continuously.



Storage Tanks



Hot Water Storage Water Heaters

2.9 Refrigeration

The kitchen has several stand-up refrigerators with either solid or glass doors. There is also an energy efficient stand-up solid door refrigerator and a freezer chest. There is an ice maker in the athletic training area and one in a storage area. Most equipment is standard and in fair condition.

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



Glass Door Refrigerator



Freezer Chest

2.10 Plug Load and Vending Machines

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

There are 46 computer workstations throughout the facility and miscellaneous gym equipment. Plug loads include general cafe and office equipment.

There are two refrigerated beverage vending machines and one non-refrigerated vending machines. Vending machines are not equipped with occupancy-based controls.



Desktop Computers



Vending Machines



Clothes Dryers

There are 21 restrooms with toilets and sinks. Faucet flow rates are at 1.5 gallons per minute (gpm) or higher. There are 13 locker rooms with showers, and showerheads are rated at 2.5 gpm.

The facility includes an indoor pool not equipped with an automatic/manual pool cover. Pool heating is provided by the space heating boiler with the help of a heat exchanger. Two, 15 hp pumps circulate water through the filtration system. A measure to adjust the speed of the pool filtration pump has been evaluated. That measure and others are further explored in the “Measures for Future Consideration” portion of Section 4.0.



Kitchen Sink



Restroom Sink



Showerhead

The Center has an emergency generator that, in the event of a power outage, serves the entire building and is only used for emergency needs.



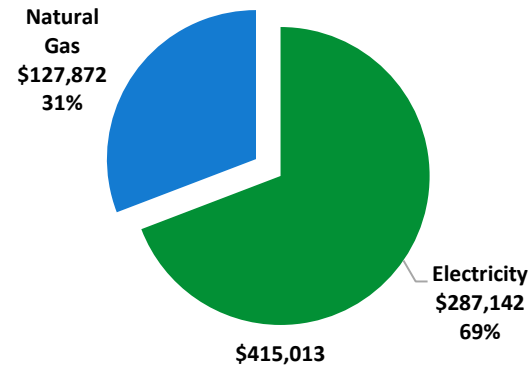
Emergency Generator



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	2,157,525 kWh	\$287,142
Natural Gas	143,844 Therms	\$127,872
Total		\$415,013



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.

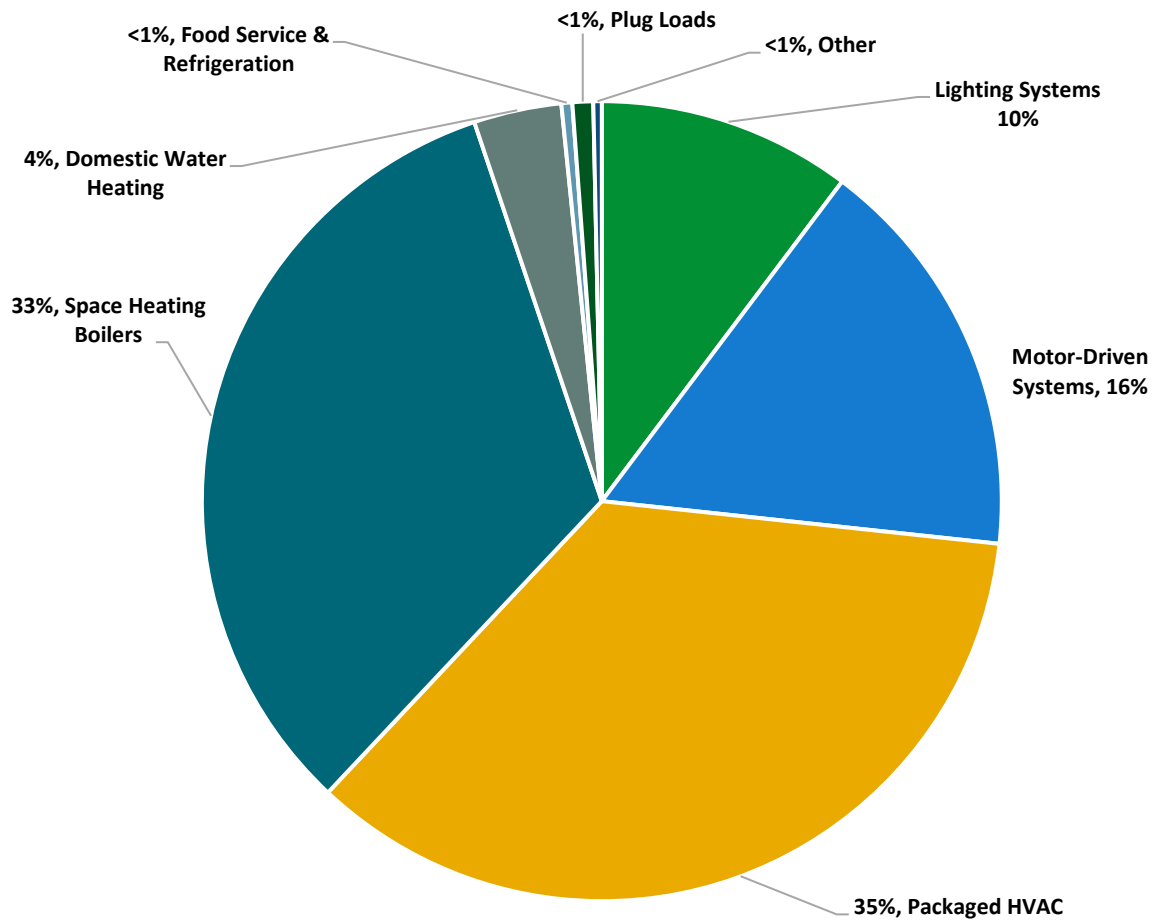
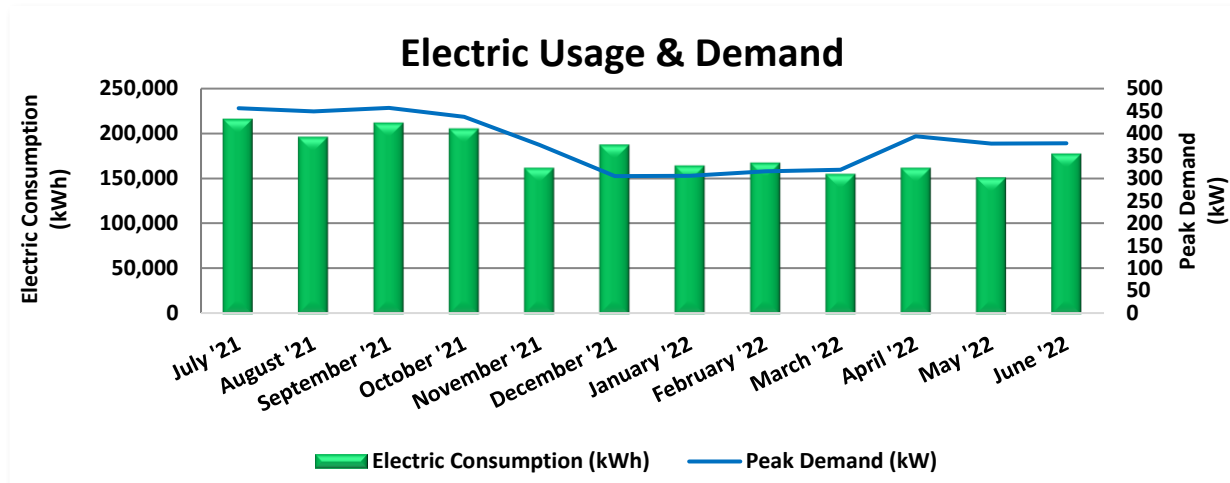


Figure 4 - Energy Balance

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.



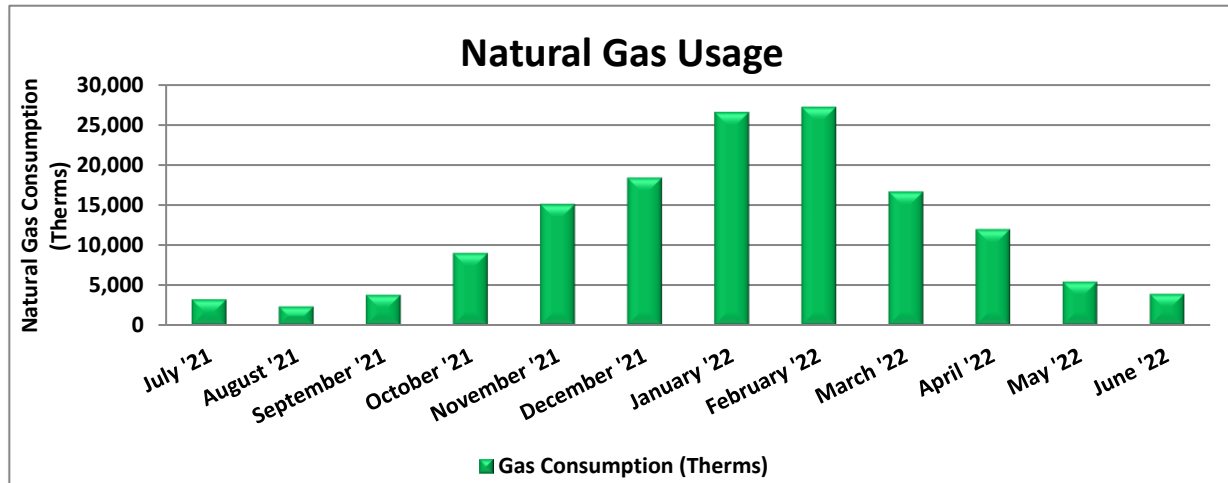
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
7/26/21	32	215,472	456		\$25,288
8/24/21	29	195,693	449		\$23,279
9/23/21	30	211,199	457		\$25,003
10/25/21	32	204,857	437		\$24,220
11/23/21	29	161,429	374		\$19,263
12/27/21	34	186,949	305		\$21,669
1/26/22	30	164,178	306		\$24,511
2/24/22	29	167,161	316		\$25,076
3/25/22	29	154,748	319		\$23,347
4/25/22	31	161,686	394		\$24,703
5/23/22	28	150,996	377		\$23,015
6/23/22	31	177,246	378		\$26,981
Totals	364	2,151,614	457	\$0	\$286,355
Annual	365	2,157,525	457	\$0	\$287,142

Notes:

- 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.
- 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.

3.2 Natural Gas

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



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
8/2/21	32	3,257	\$1,882
8/27/21	25	2,354	\$1,395
9/28/21	32	3,791	\$2,169
10/28/21	30	9,000	\$5,464
11/30/21	33	15,087	\$12,976
12/29/21	29	18,351	\$15,035
1/28/22	30	26,510	\$26,015
3/3/22	34	27,147	\$26,905
3/31/22	28	16,626	\$17,980
5/2/22	32	11,963	\$10,033
5/31/22	29	5,458	\$4,509
6/30/22	30	3,907	\$3,159
Totals	364	143,450	\$127,521
Annual	365	143,844	\$127,872

Notes:

- The average gas cost for the past 12 months is \$0.889/therm, which is the blended rate used throughout the analysis.
- Baseline usage accounts for pool heating.
- The facility 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.

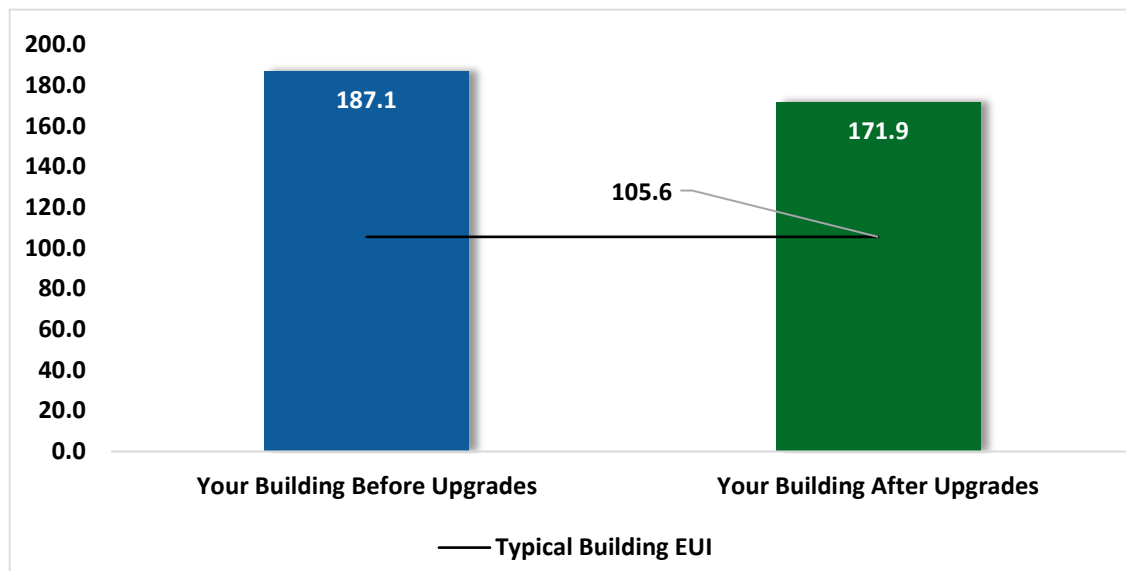


Figure 5 - Energy Use Intensity Comparison³

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			362,887	53.7	-75	\$47,627	\$119,201	\$15,398	\$103,803	2.2	356,612
ECM 1	Install LED Fixtures	Yes	162,175	24.2	-34	\$21,284	\$79,950	\$7,430	\$72,520	3.4	159,359
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	22,856	2.0	-5	\$2,999	\$2,537	\$100	\$2,437	0.8	22,456
ECM 3	Retrofit Fixtures with LED Lamps	Yes	177,857	27.6	-37	\$23,344	\$36,714	\$7,868	\$28,846	1.2	174,796
Lighting Control Measures			102,532	13.3	-21	\$13,455	\$48,565	\$20,070	\$28,495	2.1	100,738
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	84,378	10.6	-18	\$11,073	\$28,990	\$3,485	\$25,505	2.3	82,902
ECM 5	Install High/Low Lighting Controls	Yes	18,154	2.7	-4	\$2,382	\$19,575	\$16,585	\$2,990	1.3	17,836
Motor Upgrades			4,907	0.9	0	\$653	\$5,899	\$0	\$5,899	9.0	4,942
ECM 6	Premium Efficiency Motors	Yes	4,907	0.9	0	\$653	\$5,899	\$0	\$5,899	9.0	4,942
Variable Frequency Drive (VFD) Measures			56,435	3.4	0	\$7,511	\$27,922	\$3,500	\$24,422	3.3	56,829
ECM 7	Install VFDs on Constant Volume (CV) Fans	Yes	13,043	3.0	0	\$1,736	\$6,697	\$1,100	\$5,597	3.2	13,134
ECM 8	Install VFDs on Process/Pool Filtration Pumps	Yes	43,392	0.4	0	\$5,775	\$21,226	\$2,400	\$18,826	3.3	43,695
Domestic Water Heating Upgrade			0	0.0	46	\$407	\$4,326	\$765	\$3,561	8.7	5,361
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	46	\$407	\$4,326	\$765	\$3,561	8.7	5,361
Food Service & Refrigeration Measures			6,364	0.7	0	\$847	\$2,640	\$100	\$2,540	3.0	6,409
ECM 10	Replace Refrigeration Equipment	Yes	3,201	0.4	0	\$426	\$1,950	\$0	\$1,950	4.6	3,223
ECM 11	Vending Machine Control	Yes	3,163	0.4	0	\$421	\$690	\$100	\$590	1.4	3,185
TOTALS			533,125	72.0	-51	\$70,500	\$208,553	\$39,833	\$168,720	2.4	530,891

* - 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)
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ECM 5	Install High/Low Lighting Controls	18,154	2.7	-4	\$2,382	\$19,575	\$16,585	\$2,990	1.3	17,836
Motor Upgrades		4,907	0.9	0	\$653	\$5,899	\$0	\$5,899	9.0	4,942
ECM 6	Premium Efficiency Motors	4,907	0.9	0	\$653	\$5,899	\$0	\$5,899	9.0	4,942
Variable Frequency Drive (VFD) Measures		56,435	3.4	0	\$7,511	\$27,922	\$3,500	\$24,422	3.3	56,829
ECM 7	Install VFDs on Constant Volume (CV) Fans	13,043	3.0	0	\$1,736	\$6,697	\$1,100	\$5,597	3.2	13,134
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Domestic Water Heating Upgrade		0	0.0	46	\$407	\$4,326	\$765	\$3,561	8.7	5,361
ECM 9	Install Low-Flow DHW Devices	0	0.0	46	\$407	\$4,326	\$765	\$3,561	8.7	5,361
Food Service & Refrigeration Measures		6,364	0.7	0	\$847	\$2,640	\$100	\$2,540	3.0	6,409
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TOTALS		533,125	72.0	-51	\$70,500	\$208,553	\$39,833	\$168,720	2.4	530,891

* - 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		362,887	53.7	-75	\$47,627	\$119,201	\$15,398	\$103,803	2.2	356,612
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ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	22,856	2.0	-5	\$2,999	\$2,537	\$100	\$2,437	0.8	22,456
ECM 3	Retrofit Fixtures with LED Lamps	177,857	27.6	-37	\$23,344	\$36,714	\$7,868	\$28,846	1.2	174,796

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, CFL, or halogen incandescent lamps with new LED light fixtures. This measure saves energy by installing LEDs, which use less power than other technologies with a comparable light output.

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

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

Affected Building Areas: gymnasiums, corridor, lobby, and pool

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: T-12 lamps in gymnasium 3, storage gym A, and pool mechanical room

ECM 3: Retrofit Fixtures with LED Lamps

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

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

Affected Building Areas: all areas with fluorescent fixtures with T8 tubes, CFL, and incandescent lamps

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		102,532	13.3	-21	\$13,455	\$48,565	\$20,070	\$28,495	2.1	100,738
ECM 4	Install Occupancy Sensor Lighting Controls	84,378	10.6	-18	\$11,073	\$28,990	\$3,485	\$25,505	2.3	82,902
ECM 5	Install High/Low Lighting Controls	18,154	2.7	-4	\$2,382	\$19,575	\$16,585	\$2,990	1.3	17,836

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, conference room, classrooms, gymnasium, restrooms, and server 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, lobby, and stairwells

4.3 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
	Motor Upgrades	4,907	0.9	0	\$653	\$5,899	\$0	\$5,899	9.0	4,942
ECM 6	Premium Efficiency Motors	4,907	0.9	0	\$653	\$5,899	\$0	\$5,899	9.0	4,942

ECM 6: Premium Efficiency Motors

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

Affected Motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Exterior B	Bill Bradley Center	1	Supply Fan	5.0	
Exterior B	Bill Bradley Center	2	Supply Fan	7.5	
Exterior C	Bill Bradley Center	1	Supply Fan	15.0	

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

4.4 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		56,435	3.4	0	\$7,511	\$27,922	\$3,500	\$24,422	3.3	56,829
ECM 7	Install VFDs on Constant Volume (CV) Fans	13,043	3.0	0	\$1,736	\$6,697	\$1,100	\$5,597	3.2	13,134
ECM 8	Install VFDs on Process/Pool Filtration Pumps	43,392	0.4	0	\$5,775	\$21,226	\$2,400	\$18,826	3.3	43,695

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

ECM 7: Install VFDs on Constant Volume (CV) Fans

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

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

VAV system controls should not raise the supply air temperature at the expense of the fan power. A common mistake is to reset the supply air temperature to achieve energy savings, which can lead to additional air flow requirements. Supply air temperature should be kept low (e.g., 55°F) until the minimum fan speed (typically about 50%) is met. At this point, it is efficient to raise the supply air temperature as the load decreases, but not such that additional air flow and thus fan energy is required.

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

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

Affected Air Handlers: RTU-10 (supply fan)

ECM 8: Install VFDs on Process/Pool Filtration Pumps

Install VFDs to control process pumps. Process flow requirements vary considerably based on the requirements of the process. For example, pool filtration requirements may be linked to pool occupancy, in which case high- and low-speed operation may be all that is required. In some cases, sensors will be required to optimize flow. Other pumping applications may require water level or other sensing devices to optimize pump operations.

Energy savings result from reducing the pump speed during low demand periods. Ensure that your control system includes the sensors and inputs required to optimize water flow in your water supply.

Consider installing a VFD to control the pool filtration pump. Regulations require that pool water be circulated through filtering systems so that that pool water is regularly replaced by filtered water, measured by turnover. The turnover rate of a swimming pool is the amount of time it takes for the pumping and filtration systems to cycle all of the water in the pool one time, meaning all of the water in the pool has been filtered and cleaned. In cases where the turnover is higher than required by state laws or local ordinance, variable speed drives can often be used to control the speed of the circulation pumps, saving energy. In some jurisdictions, the turnover rate can be reduced when the pool is not occupied for a significant period of time.

A pool expert can measure the turnover and evaluate whether the filtration system can accommodate reduced flow. Typically, a simple timeclock and VFD can be used to operate the pool filter pump at low speed when the pool is not in use for an extended period and then return the filter pump to full speed while the pool is in use. Energy savings accrue from the hours the pump can be operated at reduced speed.

4.5 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
	Domestic Water Heating Upgrade	0	0.0	46	\$407	\$4,326	\$765	\$3,561	8.7	5,361
ECM 9	Install Low-Flow DHW Devices	0	0.0	46	\$407	\$4,326	\$765	\$3,561	8.7	5,361

ECM 9: Install Low-Flow DHW Devices

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

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

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

4.6 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		6,364	0.7	0	\$847	\$2,640	\$100	\$2,540	3.0	6,409
ECM 10	Replace Refrigeration Equipment	3,201	0.4	0	\$426	\$1,950	\$0	\$1,950	4.6	3,223
ECM 11	Vending Machine Control	3,163	0.4	0	\$421	\$690	\$100	\$590	1.4	3,185

ECM 10: Replace Refrigeration Equipment

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

ECM 11: Vending Machine Control

Vending machines operate continuously, even during unoccupied hours. Install occupancy sensor controls to reduce energy use. These controls power down vending machines when the vending machine area has been vacant for some time, and they power up the machines at necessary regular intervals or when the surrounding area is occupied. Energy savings are dependent on the vending machine and activity level in the area surrounding the machines.

4.7 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.

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 the building which is 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.

Pool Heating System Upgrades

The facility includes a pool for which several energy savings options could be further investigated. In general, there are a few options to improve the pool water heating system. These measures are beyond the scope of this LGEA report, and it is recommended that a contractor who specializes in pool water heating systems be consulted.

- 1) *Disaggregate pool heat from main boiler.* Remove the heat exchanger and separate the pool water heating from the hydronic space heating loop. In its place, install a dedicated hot water boiler for heating pool water to limit the main boiler plant operation to the heating season. We recommend using a high efficiency gas-fired condensing unit. Pool water heating is an ideal application for this technology due to typically low return water temperatures. However, this would require significant upfront costs.
- 2) *Modify distribution loop piping.* Apply isolation valves to modify the main hot water distribution loop piping to supply hot water only to the pool heat exchanger during months the pool is in use. There may be an opportunity to adjust and improve the existing system to reduce the energy consumption associated with pumping.
- 3) *Consider the installation of a solar pool hot water system to supplement or supplant existing heating.* Solar hot water heating systems are used to preheat pool water using solar panels and heat exchangers. Because the water is pre-heated, less heating energy is required by fossil fuel sources to bring pool water up to the required temperatures.
- 4) *Reduce turnover of pool water.* Regulations require that pool water be circulated through filtering systems so that that pool water is regularly replaced by filtered water, measured by turnover. The turnover rate of a swimming pool is the amount of time it takes for the pumping and filtration systems to cycle all the water in the pool one time, meaning all the water in the pool has been filtered and cleaned. In cases where the turnover is higher than required by state laws or local ordinance, variable speed drives can often be used to control the speed of the circulation pumps, saving energy. In some jurisdictions the turnover rate can be reduced when the pool is not occupied for a significant period. A pool expert can measure the turnover and evaluate whether the filtration system can accommodate reduced flow.
- 5) *Install an automatic pool cover.* Installing a pool cover will reduce the energy use associated with conditioning the natatorium space as well as heating the pool water. Consider installing a retractable pool cover, which will reduce pool water evaporation during unoccupied periods of

time. Evaporation occurs when the pool water is heated to a temperature above the temperature of the air. Pools have high ventilation loads to control humidity. Reducing evaporation from the pool surface will result in water savings, reduced chemical treatment, and lower water heating costs due to lower humidity levels when the cover is in place. Implementation of this measure would require installation of a pool cover, a reel system, and a control system.

Install High Efficiency Energy Recovery Units (ERUs)

HVAC energy consumption in typical commercial buildings may account for 40% – 60% of the facility's energy use. Areas with high outdoor air requirements are even more energy intensive. Some of the facility types that require a higher amount of outdoor air for ventilation, which then needs to be conditioned, include swimming pools, laboratories, commercial kitchens, hospitals, and wood/metal shops. These facilities have the potential for significant energy savings by installing energy recovery units (ERU). Other applications that may have significant potential include theaters, fitness centers, and gymnasiums.

An ERU is a type of air-to-air heat exchanger that recovers energy from the exhaust air. An ERU heat exchanger transfers both sensible and latent heat⁴. One common type is a rotary enthalpy wheel. An enthalpy wheel improves the heating and cooling efficiency of an air handler or package unit by transferring energy from the exhaust air to the incoming outside air to precondition the outdoor air before it reaches the heating/cooling coil. Additional benefits for installing ERUs include reduced summer peak electrical demand, enhanced humidity control, continued operating savings, and the potential to downsize the heating and cooling capacity in comparison to traditional HVAC units. ERUs are the most cost effective on systems that use 100% outside air.

⁴ Sensible heat refers to the amount of energy needed to increase or decrease the temperature of a substance. like air, independent of phase changes, Latent heat is the heat that results from an increase or decrease in the amount of moisture held by the air. Specifically, it's the amount of energy needed to cause a phase change.

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 emissions⁵. 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.

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

Motor Controls

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

Motor Maintenance

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

Economizer Maintenance

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

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

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

Ductwork Maintenance

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

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

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

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

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.

Refrigeration Equipment Maintenance

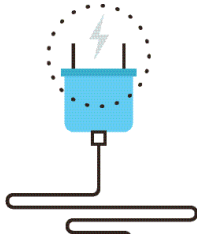
Preventative maintenance keeps commercial refrigeration equipment running reliably and efficiently. Commercial refrigerators and freezers are mission-critical equipment that can cost a fortune when they go down. Even when they appear to be working properly, refrigeration units can be consuming too much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

Maintaining your commercial refrigeration equipment can save between five and ten percent on energy costs. When condenser coils are dirty, your commercial refrigerators and freezers work harder to maintain

the temperature inside. Worn gaskets, hinges, door handles or faulty seals cause cold air to leak from the unit, forcing the unit to run longer and use more electricity.

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

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips⁶. Your local utility may offer incentives or rebates for this equipment.

Water Conservation



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

For more information regarding water conservation go to the EPA's WaterSense website⁷ or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"⁸ to get ideas for creating a water management plan and best practices for a wide range of water using systems.

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

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

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

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

⁷ <https://www.epa.gov/watersense>.

⁸ <https://www.epa.gov/watersense/watersense-work-0>.

Procurement Strategies

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

6 ON-SITE GENERATION

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

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

6.1 Solar Photovoltaic

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

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

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.

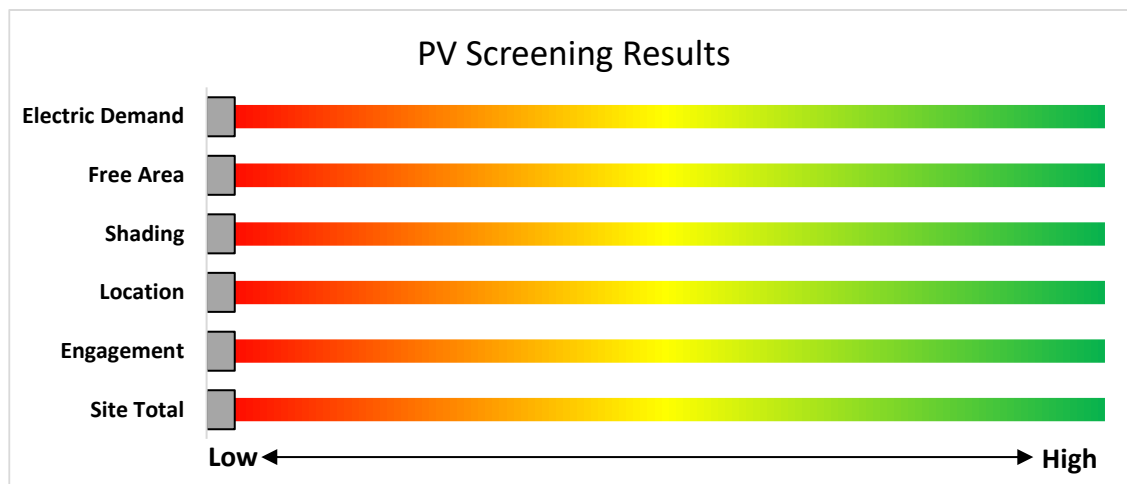


Figure 8 - Photovoltaic Screening

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

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

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

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

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.

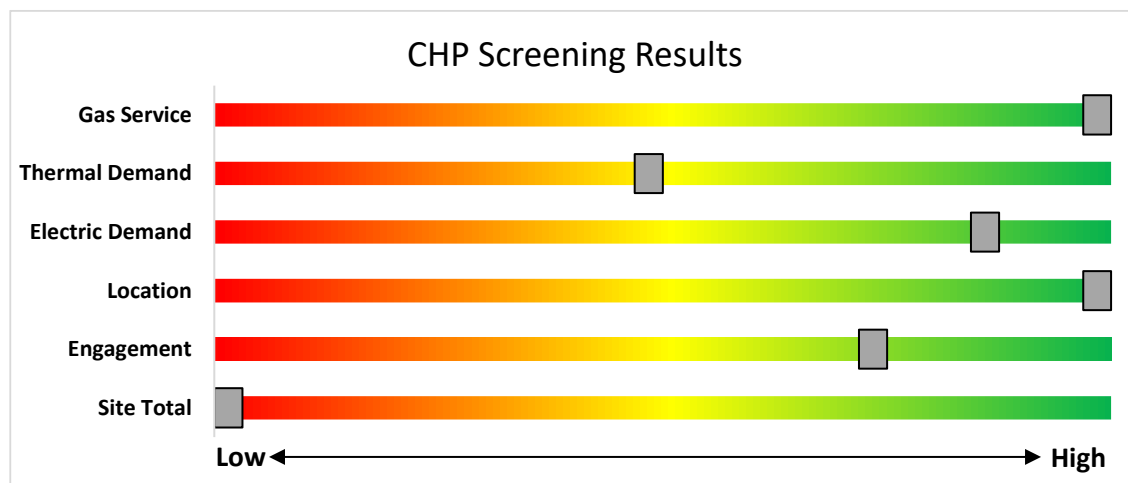


Figure 9 - Combined Heat and Power Screening

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.

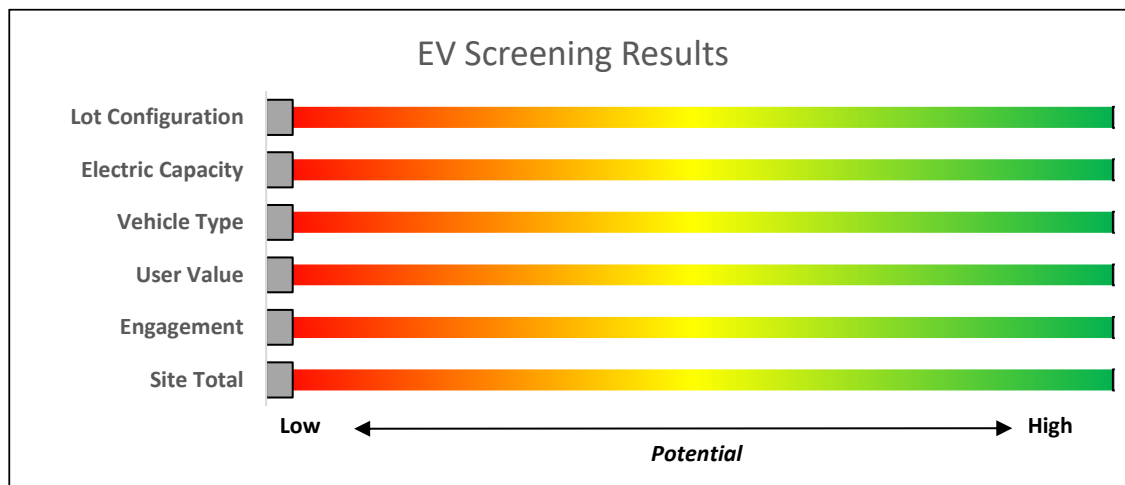


Figure 10 – EV Charger Screening

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.

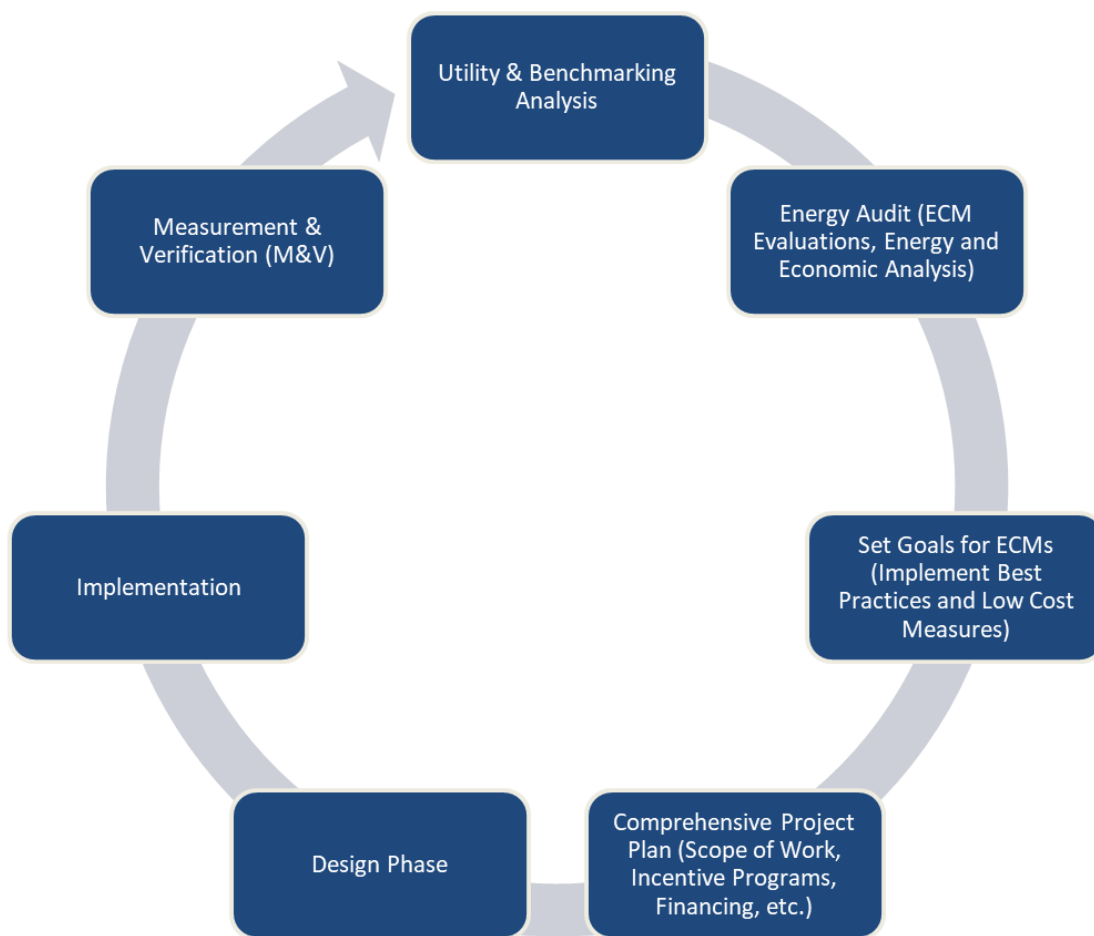


Figure 11 – Project Development Cycle

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 website⁹.

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 website¹⁰.

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

¹⁰ www.state.nj.us/bpu/commercial/shopping.html.



APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Corridor 1	3	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 5	Relamp	Yes	3	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	23	3,014	0.0	233	0	\$31	\$263	\$108	5.1
Corridor 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
Corridor Aux Gym	8	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 5	Relamp	Yes	8	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	23	3,014	0.1	620	0	\$81	\$550	\$288	3.2
Corridor Aux Gym	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 Aux Gym	5	Metal Halide: (1) 100W Lamp	Wall Switch	S	128	4,368	1, 5	Fixture Replacement	Yes	5	LED - Fixtures: Downlight Recessed	High/Low Control	30	3,014	0.4	2,578	-1	\$338	\$984	\$200	2.3
Corridor Aux Gym	6	Metal Halide: (1) 150W Lamp	Wall Switch	S	190	4,368	1, 5	Fixture Replacement	Yes	6	LED - Fixtures: Architectural Flood/Spot Luminaire	High/Low Control	45	3,014	0.7	4,582	-1	\$601	\$3,330	\$510	4.7
Corridor Coach	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 Coach	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	3, 5	Relamp	Yes	12	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	3,014	0.2	1,268	0	\$166	\$669	\$480	1.1
Corridor Home Team	7	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Wall Switch	S	42	4,368	3, 5	Relamp	Yes	7	LED Lamps: PL-L (Biax) Lamps	High/Low Control	30	3,014	0.1	716	0	\$94	\$545	\$252	3.1
Corridor Home Team	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Corridor Home Team	10	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	3, 5	Relamp	Yes	10	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	3,014	0.2	1,057	0	\$139	\$633	\$400	1.7
Corridor Main	98	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 5	Relamp	Yes	98	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	23	3,014	1.1	7,595	-2	\$997	\$5,050	\$3,528	1.5
Corridor Main	84	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Wall Switch	S	42	4,368	3, 5	Relamp	Yes	84	LED Lamps: PL-L (Biax) Lamps	High/Low Control	30	3,014	1.3	8,597	-2	\$1,128	\$4,284	\$3,024	1.1
Corridor Main	11	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	11	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Corridor Main	1	Induction: (1) 70W Lamp	Wall Switch	S	70	4,368	1, 5	Fixture Replacement	Yes	1	LED - Fixtures: High-Bay	High/Low Control	50	3,014	0.0	171	0	\$22	\$538	\$50	21.8
Corridor Main	9	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	S	27	4,368	3, 5	Relamp	Yes	9	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	3,014	0.1	854	0	\$112	\$614	\$360	2.3
Corridor Main	43	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	3, 5	Relamp	Yes	43	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	3,014	0.7	4,544	-1	\$596	\$2,585	\$1,720	1.5
Corridor Main	20	Metal Halide: (1) 100W Lamp	Wall Switch	S	128	4,368	1, 5	Fixture Replacement	Yes	20	LED - Fixtures: Downlight Recessed	High/Low Control	30	3,014	1.5	10,311	-2	\$1,353	\$3,935	\$800	2.3
Corridor Main	11	Metal Halide: (1) 150W Lamp	Wall Switch	S	190	4,368	1, 5	Fixture Replacement	Yes	11	LED - Fixtures: Architectural Flood/Spot Luminaire	High/Low Control	45	3,014	1.3	8,401	-2	\$1,102	\$6,142	\$935	4.7
Corridor Main	15	Metal Halide: (1) 50W Lamp	Wall Switch	S	72	4,368	1, 5	Fixture Replacement	Yes	15	LED - Fixtures: Downlight Recessed	High/Low Control	15	3,014	0.7	4,443	-1	\$583	\$2,951	\$600	4.0
Corridor Main	8	Metal Halide: (1) 70W Lamp	Wall Switch	S	95	4,368	1, 5	Fixture Replacement	Yes	8	LED - Fixtures: Downlight Recessed	High/Low Control	21	3,014	0.5	3,095	-1	\$406	\$1,664	\$320	3.3
Data Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	159	0	\$21	\$37	\$10	1.3
Dining Area Q151	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	\$79	\$226	\$50	2.2
Electrical Room 1 Aux Gym	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	162	0	\$21	\$189	\$40	7.0
Electrical Room 4	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,750	0.0	64	0	\$8	\$37	\$10	3.2

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
Electrical Room Pool	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,750	0.0	64	0	\$8	\$37	\$10	3.2
Electrical Room Q123	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	162	0	\$21	\$189	\$40	7.0
Elevator 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	159	0	\$21	\$37	\$10	1.3
Exterior 6	1	Compact Fluorescent: (1) 26W Biaxial Plug-In Lamp	Timeclock		26	4,380	3	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Timeclock	19	4,380	0.0	31	0	\$4	\$13	\$1	2.8
Exterior 6	20	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Timeclock		32	4,380	3	Relamp	No	20	LED Lamps: GX23 (Plug-In) Lamps	Timeclock	23	4,380	0.0	788	0	\$105	\$250	\$20	2.2
Exterior 6	15	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Timeclock		42	4,380	3	Relamp	No	15	LED Lamps: PL-L (Biax) Lamps	Timeclock	30	4,380	0.0	788	0	\$105	\$203	\$15	1.8
Exterior 6	1	LED - Fixtures: Wall Pack	Timeclock		15	4,380		None	No	1	LED - Fixtures: Wall Pack	Timeclock	15	4,380	0.0	0	0	\$0	\$0	\$0	0.0
Exterior 6	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Timeclock		62	4,380	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Timeclock	29	4,380	0.0	434	0	\$58	\$110	\$30	1.4
Exterior 6	2	Metal Halide: (1) 100W Lamp	Timeclock		128	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	30	4,380	0.0	858	0	\$114	\$525	\$100	3.7
Gymnasium 1 Aux	16	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	16	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.2	1,240	0	\$163	\$740	\$86	4.0
Gymnasium 1 Aux	12	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	12	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Gymnasium 1 Aux	26	LED - Fixtures: High-Bay	None	S	300	8,760	4	None	Yes	26	LED - Fixtures: High-Bay	Occupancy Sensor	300	6,044	1.7	23,300	-5	\$3,058	\$540	\$70	0.2
Gymnasium 1 Aux	4	LED - Fixtures: High-Bay	None	S	300	8,760	4	None	Yes	4	LED - Fixtures: High-Bay	Occupancy Sensor	300	6,044	0.3	3,585	-1	\$470	\$270	\$35	0.5
Gymnasium 3	9	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	9	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.1	698	0	\$92	\$383	\$44	3.7
Gymnasium 3	7	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Wall Switch	S	42	4,368	3, 4	Relamp	Yes	7	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.1	716	0	\$94	\$365	\$42	3.4
Gymnasium 3	15	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Wall Switch	S	42	4,368	3, 4	Relamp	Yes	15	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.2	1,535	0	\$201	\$473	\$50	2.1
Gymnasium 3	11	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	11	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Gymnasium 3	46	Halogen Incandescent: (1) 250W Screw-in Lamps	Wall Switch	S	250	4,368	1, 4	Fixture Replacement	Yes	46	LED - Fixtures: High-Bay	Occupancy Sensor	38	3,014	7.4	49,460	-10	\$6,491	\$26,859	\$2,440	3.8
Gymnasium 3	6	Halogen Incandescent: (1) 575W Screw-in Lamps	Wall Switch	S	575	4,368	1, 4	Fixture Replacement	Yes	6	LED - Fixtures: High-Bay	Occupancy Sensor	87	3,014	2.2	14,846	-3	\$1,948	\$3,245	\$335	1.5
Gymnasium 3	18	Linear Fluorescent - T12: 5' T12 (60W) - 3L	None	S	187	8,760	2, 4	Relamp & Reballast	Yes	18	LED - Linear Tubes: (3) 5' Lamps	Occupancy Sensor	60	6,044	1.9	25,254	-5	\$3,314	\$2,409	\$70	0.7
Gymnasium 3	60	Linear Fluorescent - T5HO: 4' T5HO (54W) - 6L	Wall Switch	S	358	4,368	3, 4	Relamp	Yes	60	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Occupancy Sensor	153	3,014	10.9	72,773	-15	\$9,550	\$8,529	\$1,940	0.7
Gymnasium 3	12	Metal Halide: (1) 1000W Lamp	Wall Switch	S	1,080	4,368	1, 4	Fixture Replacement	Yes	12	LED - Fixtures: High-Bay	Occupancy Sensor	300	3,014	7.5	50,335	-11	\$6,605	\$12,766	\$1,835	1.7
Gymnasium Athletic Trainer	3	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	3	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.0	233	0	\$31	\$308	\$38	8.8
Gymnasium Athletic Trainer	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	3, 4	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.6	4,237	-1	\$556	\$1,037	\$245	1.4
Janitorial Q117C	1	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Wall Switch	S	42	1,750	3	Relamp	No	1	LED Lamps: PL-L (Biax) Lamps	Wall Switch	30	1,750	0.0	23	0	\$3	\$14	\$1	4.1

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
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	Metal Halide: (1) 150W Lamp	Wall Switch	S	190	4,368	1	Fixture Replacement	No	1	LED - Fixtures: Low-Bay	Wall Switch	45	4,368	0.1	697	0	\$91	\$547	\$50	5.4
Lobby Main	8	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 5	Relamp	Yes	8	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	23	3,014	0.1	620	0	\$81	\$325	\$233	1.1
Lobby Main	8	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Photocell	S	32	4,380	3	Relamp	No	8	LED Lamps: GX23 (Plug-In) Lamps	Photocell	23	4,380	0.1	347	0	\$46	\$100	\$8	2.0
Lobby Main	22	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 5	Relamp	Yes	22	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	23	3,014	0.3	1,705	0	\$224	\$725	\$472	1.1
Lobby Main	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Lobby Main	9	Halogen Incandescent: (1) 100W Screw-in Lamps	Wall Switch	S	100	4,368	1, 5	Fixture Replacement	Yes	9	LED - Fixtures: Low-Bay	High/Low Control	15	3,014	0.6	3,877	-1	\$509	\$5,762	\$675	10.0
Lobby Main	12	Halogen Incandescent: (1) 250W Screw-in Lamps	Wall Switch	S	250	4,368	1, 5	Fixture Replacement	Yes	12	LED - Fixtures: Downlight Pendant	High/Low Control	38	3,014	1.9	12,903	-3	\$1,693	\$2,046	\$285	1.0
Lobby Main	6	Incandescent: (1) 60W PAR20 Screw-In Lamp	Wall Switch	S	60	4,368	3, 5	Relamp	Yes	6	LED Lamps: PAR20 Lamps	High/Low Control	9	3,014	0.2	1,551	0	\$203	\$357	\$222	0.7
Lobby Main	18	Incandescent: (1) 75W PAR30 Screw-In Lamp	Wall Switch	S	75	4,368	3, 5	Relamp	Yes	18	LED Lamps: PAR30 Lamps	High/Low Control	12	3,014	0.9	5,770	-1	\$757	\$868	\$504	0.5
Lobby Main	15	LED Lamps: (1) 30W Flood Light	Wall Switch	S	30	4,368	5	None	Yes	15	LED Lamps: (1) 30W Flood Light	High/Low Control	30	3,014	0.1	670	0	\$88	\$450	\$450	0.0
Lobby Welcome Desk	4	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 5	Relamp	Yes	4	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	23	3,014	0.0	310	0	\$41	\$275	\$144	3.2
Lobby Welcome Desk	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
Locker Room Field Hockey	5	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	5	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.1	388	0	\$51	\$333	\$40	5.8
Locker Room Field Hockey	2	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Wall Switch	S	42	4,368	3, 4	Relamp	Yes	2	LED Lamps: PL-L (Bi-ax) Lamps	Occupancy Sensor	30	3,014	0.0	205	0	\$27	\$143	\$22	4.5
Locker Room Field Hockey	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	634	0	\$83	\$380	\$65	3.8
Locker Room Field Hockey	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	\$159	\$489	\$95	2.5
Locker Room General	1	Compact Fluorescent: (2) 40W Biaxial Plug-In Lamps	None	S	80	4,368	3	Relamp	No	1	LED Lamps: PL-L (Bi-ax) Lamps	None	56	4,368	0.0	115	0	\$15	\$27	\$2	1.7
Locker Room General	7	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Wall Switch	S	42	4,368	3, 4	Relamp	Yes	7	LED Lamps: PL-L (Bi-ax) Lamps	Occupancy Sensor	30	3,014	0.1	716	0	\$94	\$365	\$42	3.4
Locker Room General	13	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Wall Switch	S	42	4,368	3, 4	Relamp	Yes	13	LED Lamps: PL-L (Bi-ax) Lamps	Occupancy Sensor	30	3,014	0.2	1,330	0	\$175	\$446	\$48	2.3
Locker Room General	4	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	None	S	42	4,368	3, 4	Relamp	Yes	4	LED Lamps: PL-L (Bi-ax) Lamps	Occupancy Sensor	30	3,014	0.1	409	0	\$54	\$324	\$39	5.3
Locker Room General	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Locker Room General	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	845	0	\$111	\$416	\$75	3.1
Locker Room General	10	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	10	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.2	1,057	0	\$139	\$453	\$85	2.7
Locker Room General	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,513	0	\$199	\$544	\$110	2.2

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
Locker Room General	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	S	93	8,760	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	6,044	0.2	2,428	-1	\$319	\$219	\$60	0.5
Locker Room Men's Official	3	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Occupancy Sensor	S	42	3,014	3	Relamp	No	3	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.0	119	0	\$16	\$41	\$3	2.4
Locker Room Men's Official	2	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	None	S	42	4,368	3, 4	Relamp	Yes	2	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.0	205	0	\$27	\$27	\$2	0.9
Locker Room Men's Official	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	8,760	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,044	0.1	809	0	\$106	\$343	\$55	2.7
Locker Room Men's Official	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	8,760	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,044	0.1	809	0	\$106	\$343	\$55	2.7
Locker Room Men's Official	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	8,760	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,044	0.1	1,618	0	\$212	\$416	\$75	1.6
Locker Room Men's Official	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,014	3	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	328	0	\$43	\$110	\$30	1.8
Locker Room Men's Q113D	5	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	5	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.1	388	0	\$51	\$333	\$40	5.8
Locker Room Men's Q113D	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
Locker Room Men's Q113D	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	3, 4	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.4	2,724	-1	\$357	\$763	\$170	1.7
Locker Room Men's Team A	2	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.0	155	0	\$20	\$25	\$2	1.1
Locker Room Men's Team A	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
Locker Room Men's Team A	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.3	1,816	0	\$238	\$599	\$125	2.0
Locker Room Mens Cross Country	4	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	4	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.0	310	0	\$41	\$320	\$39	6.9
Locker Room Mens Cross Country	3	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Wall Switch	S	42	4,368	3, 4	Relamp	Yes	3	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.0	307	0	\$40	\$41	\$3	0.9
Locker Room Mens Cross Country	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	634	0	\$83	\$380	\$65	3.8
Locker Room Mens Cross Country	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	\$159	\$489	\$95	2.5
Locker Room Mens Home	11	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Occupancy Sensor	S	32	3,014	3	Relamp	No	11	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.1	328	0	\$43	\$138	\$11	2.9
Locker Room Mens Home	8	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Occupancy Sensor	S	42	3,014	3	Relamp	No	8	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.1	318	0	\$42	\$108	\$8	2.4
Locker Room Mens Home	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	3,014	3	Relamp	No	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	464	0	\$61	\$146	\$40	1.7
Locker Room Mens Home	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	3, 4	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.5	3,026	-1	\$397	\$818	\$185	1.6
Locker Room Visiting	5	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Wall Switch	S	42	4,368	3, 4	Relamp	Yes	5	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.1	512	0	\$67	\$338	\$40	4.4
Locker Room Visiting	7	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	7	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	740	0	\$97	\$398	\$70	3.4
Locker Room Visiting	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.3	1,816	0	\$238	\$599	\$125	2.0
Locker Room Women's Cross Country	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.3	1,816	0	\$238	\$599	\$125	2.0

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
Locker Room Women's Home	16	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Occupancy Sensor	S	42	3,014	3	Relamp	No	16	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.1	637	0	\$84	\$216	\$16	2.4
Locker Room Women's Home	5	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	None	S	42	4,368	3, 4	Relamp	Yes	5	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.1	512	0	\$67	\$338	\$40	4.4
Locker Room Women's Home	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	8,760	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,044	0.3	3,642	-1	\$478	\$599	\$125	1.0
Locker Room Women's Home	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,014	3	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.3	1,313	0	\$172	\$438	\$120	1.8
Locker Room Women's Home	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	S	93	8,760	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	6,044	0.1	1,214	0	\$159	\$110	\$30	0.5
Locker Room Women's Official	3	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Occupancy Sensor	S	42	3,014	3	Relamp	No	3	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.0	119	0	\$16	\$41	\$3	2.4
Locker Room Women's Official	2	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	None	S	42	4,368	3, 4	Relamp	Yes	2	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.0	205	0	\$27	\$27	\$2	0.9
Locker Room Women's Official	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	8,760	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,044	0.1	1,618	0	\$212	\$416	\$75	1.6
Locker Room Women's Official	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,014	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.0	164	0	\$22	\$55	\$15	1.8
Locker Room Women's Official	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	S	93	8,760	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	None	44	8,760	0.0	477	0	\$63	\$55	\$15	0.6
Locker Room Women's Soccer	7	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Occupancy Sensor	S	42	3,014	3	Relamp	No	7	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.1	278	0	\$37	\$95	\$7	2.4
Locker Room Women's Soccer	2	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	None	S	42	4,368	3, 4	Relamp	Yes	2	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.0	205	0	\$27	\$27	\$2	0.9
Locker Room Women's Soccer	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	8,760	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,044	0.1	1,214	0	\$159	\$380	\$65	2.0
Locker Room Women's Soccer	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	8,760	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,044	0.1	1,618	0	\$212	\$416	\$75	1.6
Locker Room Women's Soccer	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,014	3	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	821	0	\$108	\$274	\$75	1.8
Locker Room Women's Soccer	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	S	93	8,760	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	None	44	8,760	0.0	477	0	\$63	\$55	\$15	0.6
Locker Room Women's Staff	6	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Occupancy Sensor	S	42	3,014	3	Relamp	No	6	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.1	239	0	\$31	\$81	\$6	2.4
Locker Room Women's Staff	2	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	None	S	42	4,368	3, 4	Relamp	Yes	2	LED Lamps: PL-L (Biax) Lamps	Occupancy Sensor	30	3,014	0.0	205	0	\$27	\$27	\$2	0.9
Locker Room Women's Staff	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	8,760	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,044	0.1	1,214	0	\$159	\$380	\$65	2.0
Locker Room Women's Staff	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,014	3	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	985	0	\$129	\$329	\$90	1.8
Locker Room Women's Staff	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	S	93	8,760	3, 4	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	6,044	0.0	607	0	\$80	\$325	\$50	3.4
Mechanical 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
Mechanical 1	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.2	647	0	\$85	\$562	\$115	5.3
Mechanical 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,750	0.0	64	0	\$8	\$37	\$10	3.2
Mechanical 4	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	242	0	\$32	\$380	\$65	9.9

Existing Conditions							Proposed Conditions							Energy Impact & Financial Analysis							
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical 4 Generator Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	162	0	\$21	\$189	\$40	7.0
Mechanical Q167	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.2	566	0	\$74	\$526	\$105	5.7
Office - Enclosed Q106A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,060	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,111	0.1	283	0	\$37	\$189	\$40	4.0
Office - Enclosed Q114	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,060	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,060	0.0	111	0	\$15	\$37	\$10	1.8
Office - Enclosed Q115A	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,060	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,111	0.1	636	0	\$83	\$434	\$80	4.2
Office - Enclosed Q116	1	Compact Fluorescent: (1) 32W Biacial Plug-In Lamp	Wall Switch	S	32	3,060	3, 4	Relamp	Yes	1	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	2,111	0.0	54	0	\$7	\$13	\$1	1.6
Office - Enclosed Q116	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,060	3, 4	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,111	0.0	141	0	\$19	\$153	\$30	6.6
Office - Enclosed Q120A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,060	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,111	0.1	283	0	\$37	\$189	\$40	4.0
Office - Enclosed Q130	2	Compact Fluorescent: (1) 32W Biacial Plug-In Lamp	Occupancy Sensor	S	32	2,110	3	Relamp	No	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	2,110	0.0	42	0	\$5	\$25	\$2	4.2
Office - Enclosed Q130	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,110	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,110	0.0	77	0	\$10	\$37	\$10	2.6
Office - Enclosed Q131	2	Compact Fluorescent: (1) 32W Biacial Plug-In Lamp	Occupancy Sensor	S	32	2,110	3	Relamp	No	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	2,110	0.0	42	0	\$5	\$25	\$2	4.2
Office - Enclosed Q131	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,110	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,110	0.0	77	0	\$10	\$37	\$10	2.6
Office - Enclosed Q132	2	Compact Fluorescent: (1) 32W Biacial Plug-In Lamp	Occupancy Sensor	S	32	2,110	3	Relamp	No	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	2,110	0.0	42	0	\$5	\$25	\$2	4.2
Office - Enclosed Q132	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,110	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,110	0.0	77	0	\$10	\$37	\$10	2.6
Office - Enclosed Q133	2	Compact Fluorescent: (1) 32W Biacial Plug-In Lamp	Occupancy Sensor	S	32	2,110	3	Relamp	No	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	2,110	0.0	42	0	\$5	\$25	\$2	4.2
Office - Enclosed Q133	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,110	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,110	0.0	77	0	\$10	\$37	\$10	2.6
Office - Enclosed Q134	2	Compact Fluorescent: (1) 32W Biacial Plug-In Lamp	Occupancy Sensor	S	32	2,110	3	Relamp	No	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	2,110	0.0	42	0	\$5	\$25	\$2	4.2
Office - Enclosed Q134	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,110	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,110	0.0	77	0	\$10	\$37	\$10	2.6
Office - Enclosed Q137	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,110	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,110	0.0	77	0	\$10	\$37	\$10	2.6
Office - Enclosed Q138	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,110	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,110	0.0	77	0	\$10	\$37	\$10	2.6
Office - Enclosed Q142	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,060	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,060	0.0	167	0	\$22	\$55	\$15	1.8
Office - Enclosed Q143A	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,060	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,111	0.1	424	0	\$56	\$380	\$65	5.7
Pool 1	4	Compact Fluorescent: (1) 32W Biacial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	4	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.0	310	0	\$41	\$320	\$39	6.9
Pool 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
Pool 1	21	Induction: (1) 150W Lamp	Wall Switch	S	150	4,368	1, 4	Fixture Replacement	Yes	21	LED - Fixtures: High-Bay	Occupancy Sensor	100	3,014	1.2	8,173	-2	\$1,073	\$10,745	\$1,120	9.0

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
Pool 1	6	Metal Halide: (1) 100W Lamp	Wall Switch	S	128	4,368	1, 4	Fixture Replacement	Yes	6	LED - Fixtures: Downlight Pendant	Occupancy Sensor	30	3,014	0.5	3,093	-1	\$406	\$1,181	\$65	2.7
Restroom - Female	4	Compact Fluorescent: (2) 32W Biaxial Plug-In Lamps	Wall Switch	S	64	4,368	3, 4	Relamp	Yes	4	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	45	3,014	0.1	633	0	\$83	\$370	\$43	3.9
Restroom - Female	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.4	2,421	-1	\$318	\$708	\$155	1.7
Restroom - Female	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	\$79	\$226	\$50	2.2
Restroom - Male 1 Q113D	5	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	5	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.1	388	0	\$51	\$333	\$40	5.8
Restroom - Male 1 Q113D	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.2	1,268	0	\$166	\$489	\$95	2.4
Restroom - Male 3	2	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.0	155	0	\$20	\$141	\$22	5.9
Restroom - Male 3	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.4	2,421	-1	\$318	\$708	\$155	1.7
Restroom - Male 3	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	\$79	\$226	\$50	2.2
Restroom - Male Shower	13	Compact Fluorescent: (1) 26W Biaxial Plug-In Lamp	Wall Switch	S	26	4,368	3, 4	Relamp	Yes	13	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	19	3,014	0.1	805	0	\$106	\$433	\$48	3.6
Restroom - Male Shower	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
Restroom - Unisex 1	2	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.0	155	0	\$20	\$25	\$2	1.1
Restroom - Unisex 1	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.0	317	0	\$42	\$325	\$50	6.6
Restroom - Unisex 2	2	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.0	155	0	\$20	\$25	\$2	1.1
Restroom - Unisex 2	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.0	317	0	\$42	\$325	\$50	6.6
Server Room Q113C	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.1	404	0	\$53	\$189	\$40	2.8
Server Room Q125	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.1	605	0	\$79	\$380	\$65	4.0
Storage 19	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	242	0	\$32	\$226	\$30	6.1
Storage Gym A	1	Linear Fluorescent - EST12: 4' T12 (34W) - 4L	Wall Switch	S	144	1,750	2	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,750	0.1	166	0	\$22	\$118	\$20	4.5
Storage Gym B	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	162	0	\$21	\$189	\$20	8.0
Storage Gym C	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.2	485	0	\$64	\$489	\$60	6.7
Storage Q106	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	162	0	\$21	\$189	\$20	8.0
Storage Q113J	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,750	3, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,208	0.1	242	0	\$32	\$226	\$30	6.1
Storage Q116A	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,750	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,208	0.2	485	0	\$64	\$489	\$60	6.7
Storage Q118	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	162	0	\$21	\$189	\$20	8.0

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
Storage Q119	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,750	3, 4	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,208	0.4	970	0	\$127	\$708	\$120	4.6
Storage Q122	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,750	3, 4	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,208	0.0	121	0	\$16	\$55	\$15	2.5
Storage Q122	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,208	0.0	76	0	\$10	\$188	\$10	18.0
Storage Q135A	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,750	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,750	0.0	95	0	\$13	\$55	\$15	3.2
Storage Q136A	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,750	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,750	0.0	95	0	\$13	\$55	\$15	3.2
Storage Q158B	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
Storage Q158B	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.2	485	0	\$64	\$489	\$60	6.7
Storage Q160A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	162	0	\$21	\$189	\$20	8.0
Storage Q161	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.2	647	0	\$85	\$562	\$80	5.7
Classroom Q225	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.4	2,421	-1	\$318	\$708	\$155	1.7
Computer Lab Q223	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.1	807	0	\$106	\$416	\$75	3.2
Conference Skyline	6	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	6	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.1	465	0	\$61	\$345	\$41	5.0
Conference Skyline	20	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	20	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.2	1,550	0	\$203	\$790	\$90	3.4
Conference Skyline	10	Compact Fluorescent: (1) 22W Circline/T9 Plug-In Lamp	Wall Switch	S	22	4,368	1, 4	Fixture Replacement	Yes	10	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	16	3,014	0.1	527	0	\$69	\$2,704	\$185	36.5
Conference Skyline	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	5	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 5	Relamp	Yes	5	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	23	3,014	0.1	388	0	\$51	\$288	\$180	2.1
Corridor	29	Compact Fluorescent: (1) 42W Biaxial Plug-In Lamp	Wall Switch	S	42	4,368	3, 5	Relamp	Yes	29	LED Lamps: PL-L (Bi-ax) Lamps	High/Low Control	30	3,014	0.4	2,968	-1	\$389	\$1,517	\$1,044	1.2
Corridor	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Corridor	4	Incandescent: (1) 50W R16 Screw-In Lamp	Wall Switch	S	50	4,368	3, 5	Relamp	Yes	4	LED Lamps: R16 Lamps	High/Low Control	8	3,014	0.1	855	0	\$112	\$305	\$148	1.4
Corridor	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3, 5	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,014	0.0	202	0	\$26	\$37	\$10	1.0
Corridor	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3, 5	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,014	0.6	4,035	-1	\$530	\$1,630	\$900	1.4
Electrical Room 6	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.2	485	0	\$64	\$489	\$95	6.2
Electrical Room Q201	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,750	0.0	64	0	\$8	\$37	\$10	3.2
Gymnasium Fitness Rm	8	Compact Fluorescent: (2) 13W Biaxial Plug-In Lamps	Wall Switch	S	26	4,368	3, 4	Relamp	Yes	8	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	19	3,014	0.1	495	0	\$65	\$200	\$16	2.8
Gymnasium Fitness Rm	50	Compact Fluorescent: (2) 40W Biaxial Plug-In Lamps	Wall Switch	S	80	4,368	3, 4	Relamp	Yes	50	LED Lamps: PL-L (Bi-ax) Lamps	Occupancy Sensor	56	3,014	1.5	9,936	-2	\$1,304	\$2,430	\$240	1.7

Existing Conditions							Proposed Conditions							Energy Impact & Financial Analysis							
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Office - Open Plan Athletic Dept	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
Restroom - Female	2	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.0	155	0	\$20	\$25	\$2	1.1
Restroom - Female	3	Linear Fluorescent - T8: 3' T8 (25W) - 2L	Wall Switch	S	48	4,368	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 3' Lamps	Occupancy Sensor	21	3,014	0.1	483	0	\$63	\$380	\$65	5.0
Restroom - Female	2	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.0	155	0	\$20	\$25	\$2	1.1
Restroom - Female	3	Linear Fluorescent - T8: 3' T8 (25W) - 2L	Wall Switch	S	48	4,368	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 3' Lamps	Occupancy Sensor	21	3,014	0.1	483	0	\$63	\$380	\$65	5.0
Restroom - Male 4	2	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.0	155	0	\$20	\$25	\$2	1.1
Restroom - Male 4	3	Linear Fluorescent - T8: 3' T8 (25W) - 2L	Wall Switch	S	48	4,368	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 3' Lamps	Occupancy Sensor	21	3,014	0.1	483	0	\$63	\$380	\$65	5.0
Restroom - Male 5	2	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch	S	32	4,368	3, 4	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	23	3,014	0.0	155	0	\$20	\$25	\$2	1.1
Restroom - Male 5	3	Linear Fluorescent - T8: 3' T8 (25W) - 2L	Wall Switch	S	48	4,368	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 3' Lamps	Occupancy Sensor	21	3,014	0.1	483	0	\$63	\$380	\$65	5.0
Server Room Q222	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.1	404	0	\$53	\$189	\$40	2.8
Storage Q158C	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	162	0	\$21	\$189	\$20	8.0
Storage Q221A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	162	0	\$21	\$189	\$20	8.0
Storage Q228A	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	242	0	\$32	\$226	\$30	6.1
Storage Q229A	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,750	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	323	0	\$42	\$416	\$40	8.9
Mechanical Pool	6	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	1,750	2, 4	Relamp & Reballast	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.2	600	0	\$79	\$683	\$95	7.5
Mechanical Pool	2	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	1,750	2, 4	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,208	0.1	200	0	\$26	\$254	\$40	8.1
Stairs Q205	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Stairs Q205	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	4,368	3, 5	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,014	0.2	1,009	0	\$132	\$408	\$225	1.4
Stairs Q240	4	Compact Fluorescent: (1) 32W Biaxial Plug-In Lamp	Wall Switch		32	4,368	3, 5	Relamp	Yes	4	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	23	3,014	0.0	310	0	\$41	\$275	\$144	3.2
Stairs Q240	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

Motor Inventory & Recommendations

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Q167	Bill Bradley Center	2	Combustion Air Fan	0.5	70.0%	No	GE	SKC37HN3898AU	W	2,745		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical Pool	Bill Bradley Center	1	Exhaust Fan	1.5	74.3%	No	Dayton	3N013BD	W	2,745		No	74.3%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Exhaust Fan	0.3	65.0%	No	Penn Ventilation	DX12B	W	2,745		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	2	Exhaust Fan	0.8	70.0%	No	Penn Ventilation	DX16B	W	2,745		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Exhaust Fan	0.5	70.0%	No	Penn Ventilation	DX14B	W	2,745		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Exhaust Fan	0.3	65.0%	No	Penn Ventilation	DX-11B	W	2,745		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior C	Bill Bradley Center	2	Exhaust Fan	0.5	70.0%	No	Unknown	Unknown	W	2,745		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior D	Bill Bradley Center	2	Exhaust Fan	0.3	65.0%	No	Unknown	Unknown	W	2,745		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior D	Bill Bradley Center	1	Exhaust Fan	0.3	65.0%	No	Penn Ventilation	DX-11B	W	2,745		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior D	Bill Bradley Center	2	Exhaust Fan	0.5	70.0%	No	Penn Ventilation	DX14B	W	2,745		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior D	Bill Bradley Center	1	Exhaust Fan	0.8	70.0%	No	Penn Ventilation	DX16B	W	2,745		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical 1	Bill Bradley Center	2	Heating Hot Water Pump	25.0	92.4%	No	Marathon	AVE 234TTDC4026BB	W	2,560		No	92.4%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical 1	Bill Bradley Center	3	Heating Hot Water Pump	2.0	86.5%	No	Baldor	VEJMM3157T	W	3,410		No	86.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical 1	Bill Bradley Center	2	DHW Circulation Pump	0.8	70.0%	No	Bell & Gossett	R Q J 5617D60F	W	8,760		No	70.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical Q167	Bill Bradley Center	1	DHW Circulation Pump	0.3	65.0%	No	US Motors	S55JXDYE-2681	W	8,760		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Elevator 1	Bill Bradley Center	1	Other	30.0	74.0%	No	US Motors	Unknown	W	100		No	74.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Gymnasium 3	Bill Bradley Center	7	Other	0.1	65.0%	No	Unknown	Unknown	W	100		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical Pool	Bill Bradley Center	2	Pool Filtration Pump	15.0	89.5%	No	Unimont	Unknown	W	4,380	8	No	92.4%	Yes	2	0.4	43,392	0	\$5,775	\$21,226	\$2,400	3.3
Exterior B	Bill Bradley Center	5	Return Fan	3.0	87.5%	No	AO Smith	P56C37A27	W	4,000		No	87.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	2	Return Fan	2.0	84.0%	No	AO Smith	P56C36A27	W	4,000		No	84.0%	No		0.0	0	0	\$0	\$0	\$0	0.0

		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
Exterior C	Bill Bradley Center	1	Return Fan	7.5	91.0%	No	Unknown	Unknown	W	4,000		No	91.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior D	Bill Bradley Center	1	Return Fan	3.0	87.5%	No	AO Smith	P56C37A27	W	4,000		No	87.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior E	Bill Bradley Center	1	Return Fan	15.0	92.4%	No	Baldor	EM2333T	W	4,000		No	92.4%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior A	Bill Bradley Center	1	Return Fan	10.0	91.7%	No	Baldor	EM2511T	W	4,000		No	91.7%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior A	Bill Bradley Center	1	Return Fan	10.0	91.7%	No	Baldor	Unknown	W	4,000		No	91.7%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Return Fan	7.5	91.7%	No	Baldor	EM2506T	W	4,000		No	91.7%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Return Fan	25.0	93.5%	Yes	Baldor	EM2532T	W	4,000		No	93.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior A	Bill Bradley Center	4	Supply Fan	10.0	91.7%	No	Baldor	EM2411T	W	4,000		No	91.7%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	2	Supply Fan	7.5	91.0%	No	Baldor	EM3311T	W	4,000		No	91.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Supply Fan	20.0	92.4%	No	Baldor	EM2528T	W	4,000		No	92.4%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Supply Fan	5.0	89.5%	Yes	Baldor	HD98	W	4,000		No	89.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Supply Fan	10.0	89.5%	No	AO Smith	G-390773-01	W	4,000	7	No	91.7%	Yes	1	3.0	13,043	0	\$1,736	\$6,697	\$1,100	3.2
Exterior B	Bill Bradley Center	3	Supply Fan	7.5	91.0%	No	Weg	007180T3E213T-S	W	4,000		No	91.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Supply Fan	5.0	77.0%	No	AO Smith	G-390789-01	B	4,000	6	Yes	89.5%	No		0.4	2,030	0	\$270	\$1,009	\$0	3.7
Exterior B	Bill Bradley Center	1	Supply Fan	40.0	94.1%	Yes	Baldor	EM25401	W	4,000		No	94.1%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	2	Supply Fan	7.5	88.5%	No	AO Smith	G-390772-01	W	4,000	6	Yes	91.0%	No		0.2	1,042	0	\$139	\$2,717	\$0	19.6
Exterior B	Bill Bradley Center	1	Supply Fan	10.0	91.7%	Yes	Unknown	Unknown	W	4,000		No	91.7%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior C	Bill Bradley Center	1	Supply Fan	15.0	93.0%	No	Baldor	EM2513T	W	4,000		No	93.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior C	Bill Bradley Center	1	Supply Fan	15.0	88.5%	No	Marathon	ZVJ 254TTDR5031AAL	W	4,000	6	Yes	93.0%	No		0.3	1,835	0	\$244	\$2,172	\$0	8.9
Exterior D	Bill Bradley Center	1	Supply Fan	7.5	91.0%	No	Baldor	EM3311T	B	4,000		No	91.0%	No		0.0	0	0	\$0	\$0	\$0	0.0



		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
Exterior D	Bill Bradley Center	1	Supply Fan	10.0	90.2%	No	Baldor	Unknown	W	4,000		No	90.2%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior E	Bill Bradley Center	1	Supply Fan	30.0	93.6%	No	Baldor	EM4104T	W	4,000		No	93.6%	No		0.0	0	0	\$0	\$0	\$0	0.0
Bill Bradley Center	Bill Bradley Center	7	Other	0.1	65.0%	No	Unknown	Unknown	W	100		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Athletic Trainer	Athletic Trainer	2	Other	0.3	65.0%	No	Whitehall	S-110-M	W	100		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Bill Bradley Center	Bill Bradley Center	4	Fan Coil Unit	0.3	65.0%	No	Marathon	B389	W	2,745		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0

Packaged HVAC Inventory & Recommendations

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior B	Bill Bradley Center	1	Electric Resistance Heat		5.12		1 COP	Marley	1504D	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior A	Main Gym	1	Package Unit	125.00	1,453.00	11.30	0.81 AFUE	Aaon	RL-125-3-0-0B04-352	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior A	Main Gym	2	Package Unit	125.00	1,453.00	11.30	0.81 AFUE	Aaon	Unknown	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Package Unit	40.00	437.00	10.50	0.81 AFUE	Aaon	RK-40-3-E0-312	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Package Unit	40.00	635.00	10.50	0.81 AFUE	Aaon	RK-40-3-E0-332	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Package Unit	25.00	316.00	10.90	0.81 AFUE	Aaon	RM--025-3-0-AA02	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Package Unit	110.00	903.00	11.30	0.82 AFUE	Aaon	RL-110-3-0-0B04	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Package Unit	10.50	284.00	11.00	0.81 AFUE	Aaon	RM-010-3-0-AB02-352	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Package Unit	40.00	437.00	10.50	0.81 AFUE	Aaon	RK-40-3-E0-312	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Package Unit	100.00	705.00	11.30	0.81 AFUE	Aaon	RL-100-3-0-0B04	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Package Unit	20.00	219.00	12.00	0.81 AFUE	Aaon	20-3-0-AB02-342	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior B	Bill Bradley Center	1	Package Unit	10.00	219.00	12.00	0.81 AFUE	Aaon	010-3-0-AB02	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior C	Bill Bradley Center	1	Package Unit	50.00		9.00		Johnson Controls	YPAL050CVE46B BF	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior C	Bill Bradley Center	1	Package Unit	50.00	600.00	9.00		Trane	SLHCC504H256A 59D1A01GRTXY 4	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior D	Bill Bradley Center	1	Package Unit	40.00	437.00	10.50	0.81 AFUE	Aaon	RK-40-3-E0-312	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior D	Bill Bradley Center	1	Package Unit	50.00	632.00	10.50	0.81 AFUE	Aaon	50-3-0-AA04	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior E	Bill Bradley Center	1	Package Unit	51.00	600.00	9.00	0.8 AFUE	Johnson Controls	YPAL051GVE46B BFX	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Bill Bradley Center	Bill Bradley Center	3	Unit Heater		17.06		1 COP	Unknown	Unknown	W		No							0.0	0	0	\$0	\$0	\$0	0.0



Space Heating Boiler Inventory & Recommendations

		Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical 1	Bill Bradley Center	3	Non-Condensing Hot Water Boiler	2,200	PK Thermific	N2500-MFD	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
Mechanical 1	Bill Bradley Center	1	Boiler	PK Thermific	D750-MFD	W		No						0.0	0	0	\$0	\$0	\$0	0.0
Mechanical Q167	Bill Bradley Center	2	Storage Tank Water Heater (> 50 Gal)	PVI	1500 N 900A-TP	W		No						0.0	0	0	\$0	\$0	\$0	0.0

Low-Flow Device Recommendations

		Recommendation Inputs				Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Bill Bradley Center	9	3	Faucet Aerator (Kitchen)	2.20	1.50	0.0	0	1	\$5	\$22	\$6	3.0
Bill Bradley Center	9	15	Faucet Aerator (Lavatory)	2.50	0.50	0.0	0	8	\$74	\$108	\$54	0.7
Bill Bradley Center	9	47	Showerhead	2.50	1.50	0.0	0	37	\$327	\$4,197	\$705	10.7

Commercial Refrigerator/Freezer Inventory & Recommendations

Existing Conditions						Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Dining Area Q151	1	Freezer Chest	GE	Unknown	No	10	Yes	0.4	3,201	0	\$426	\$1,950	\$0	4.6
Dining Area Q151	2	Stand-Up Refrigerator, Glass Door (16 - 30 cu. ft.)	Unknown	Unknown	No		No	0.0	0	0	\$0	\$0	\$0	0.0
Locker Room Q116A	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Vendo	VR12	No		No	0.0	0	0	\$0	\$0	\$0	0.0
Bill Bradley Center	2	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	TRUE	GDM-12	No		No	0.0	0	0	\$0	\$0	\$0	0.0
Dining Area Q151	1	Stand-Up Refrigerator, Solid Door (≤15 cu. ft.)	Turbo Air	MSR-23NM	Yes		No	0.0	0	0	\$0	\$0	\$0	0.0

Commercial Ice Maker Inventory & Recommendations

Existing Conditions						Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Storage Q119	1	Ice Making Head (≥450 lbs/day), Continuous	Hoshizaki	KM-901MWH	No		No	0.0	0	0	\$0	\$0	\$0	0.0
Athletic Trainer	1	Ice Making Head (≥450 lbs/day), Continuous	Hoshizaki	F-450MAJ	No		No	0.0	0	0	\$0	\$0	\$0	0.0

Plug Load Inventory

Existing Conditions						
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified ?	Manufacturer	Model
Computer Lab Q223	1	Mini Refrigerator	200	No	Unknown	Unknown
Bill Bradley Center	2	Clothes Dryer	30,000	No	Belco	Unknown
Office - Enclosed Q143A	2	Clothes Washer	1,000	No	Wascomat	W655
Storage Q118	1	Clothes Washer	1,000	No	Wascator	W-184
Bill Bradley Center	3	Coffee Machine	1,000	No	Unknown	Unknown
Bill Bradley Center	46	Desktop	200	Yes	Dell	Unknown
Storage Q119	1	Large Fan	220	No	Dayton	13V399
Bill Bradley Center	8	Fan	150	No	Varied	Varied
Bill Bradley Center	6	Microwave	1,000	No	Varied	Varied
Dining Area Q151	1	Hot Dog Roller	1,400	No	Oldemidway	Pro 30
Dining Area Q151	2	Popcorn Maker	1,760	No	Paragon	Theater pop12
Athletic Trainer	1	Hot Pack Heater	1,000	No	Chattanooga	M-4
Bill Bradley Center	34	Hand Dryer	1,500	No	Varied	Varied
Computer Lab Q223	1	Air Purifier	150	No	Morento	Unknown
Fitness Room	28	Misc Gym Equipment	100	No	Varied	Varied
Bill Bradley Center	18	Printer	150	Yes	Varied	Varied
Athletic Dept Open Office	1	Copier	1,500	Yes	Unknown	Unknown
Bill Bradley Center	3	Projector	250	Yes	Varied	Varied
Bill Bradley Center	9	Mini Refrigerator	126	No	Varied	Varied
Bill Bradley Center	16	Television	150	No	Varied	Varied
Bill Bradley Center	3	Television	100	No	Varied	Varied
Athletic Dept Open Office	1	Water Cooler	150	No	Unknown	Unknown
Bill Bradley Center	7	Water Fountain	716	No	Varied	Varied

Vending Machine Inventory & Recommendations

Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis							
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	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 Main	1	Non-Refrigerated	11	Yes	0.0	343	0	\$46	\$230	\$0	5.0
Corridor Main	1	Glass Fronted Refrigerated	11	Yes	0.1	1,209	0	\$161	\$230	\$50	1.1
Corridor	1	Refrigerated	11	Yes	0.2	1,612	0	\$215	\$230	\$50	0.8


Miscellaneous Fuel Inventory



Existing Conditions						
Location	Quantity	Equipment Description	Input Capacity per Unit (MBh)	ENERGY STAR Qualified ?	Manufacturer	Model
Office - Enclosed Q143A	2	Clothes Dryer	175.0	No	American Dryer Corp	ADG758V
Mechanical 4	1	Generator	389.0	No	Cummins	GGH-5629676

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Ramapo College of New Jersey (Campus) 505 Ramapo Valley Road & 523 Route 202 Mahwah, New Jersey 07430	Ramapo College of New Jersey 505 Ramapo Valley Road Mahwah, NJ 07430 (201) 684-7666	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)	73,580,913 (38%)	National Median Site EUI (kBtu/ft²)	105.6
	Electric - Solar (kBtu)	17,652,538 (9%)	National Median Source EUI (kBtu/ft²)	180.6
	Natural Gas (kBtu)	102,253,203 (53%)	% 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, that 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.