



Local Government Energy Audit Report

Rink/Athletic Center Building

April 27, 2023

Prepared for:

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Disclaimer

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

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

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

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

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

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Table of Contents

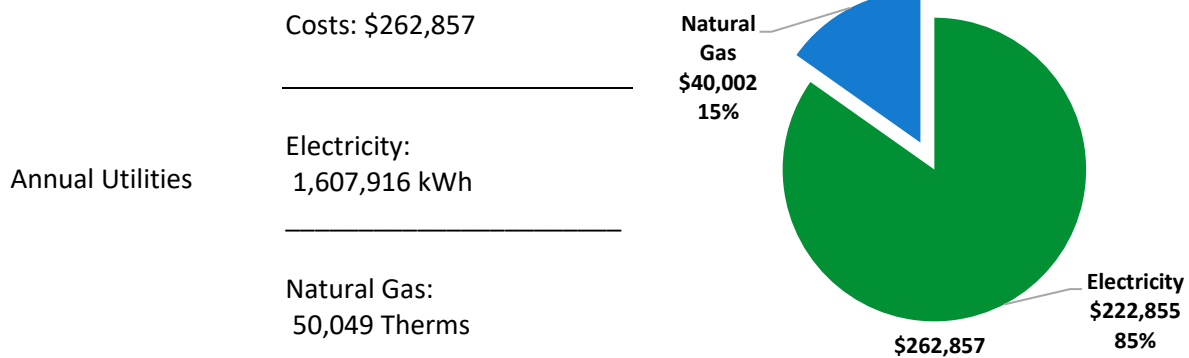
1	Executive Summary.....	1
1.1	Planning Your Project	4
	Pick Your Installation Approach	4
	Options from Your Utility Company	4
	<i>Prescriptive and Custom Rebates</i>	4
	<i>Direct Install</i>	4
	<i>Engineered Solutions</i>	4
	Options from New Jersey's Clean Energy Program	5
2	Existing Conditions.....	6
2.1	Site Overview.....	6
2.2	Building Occupancy	6
2.3	Building Envelope	6
2.4	Lighting Systems	7
2.5	Air Handling Systems.....	8
	Unitary Electric HVAC Equipment	8
	Unitary Heating Equipment.....	8
	Infrared Heating	9
	Packaged Units	9
2.6	Chilled Water Systems.....	10
2.7	Domestic Hot Water	10
2.8	Refrigeration.....	11
2.9	Plug Load and Vending Machines	11
2.10	Water-Using Systems	12
2.11	On-Site Generation.....	12
3	Energy Use and Costs	13
3.1	Electricity	15
3.2	Solar.....	16
3.3	Natural Gas.....	17
3.4	Benchmarking.....	18
	Tracking Your Energy Performance	19
4	Energy Conservation Measures	20
4.1	Lighting	23
	ECM 1: Install LED Fixtures	23
	ECM 2: Retrofit Fixtures with LED Lamps	23
4.2	Lighting Controls.....	24
	ECM 3: Install Occupancy Sensor Lighting Controls	24
	ECM 4: Install Photocell Controls	24
	ECM 5: Install High/Low Lighting Controls	25
4.3	Motors	25
	ECM 6: Premium Efficiency Motors	25

4.4	Electric Chillers	26
	ECM 7: Install High Efficiency Chillers	26
4.5	Gas-Fired Heating	27
	ECM 8: Install High Efficiency Furnaces.....	27
4.6	Domestic Water Heating	27
	ECM 9: Install Low-Flow DHW Devices.....	27
5	Energy Efficient Best Practices	28
	Energy Tracking with ENERGY STAR Portfolio Manager.....	28
	Lighting Maintenance.....	28
	Lighting Controls	28
	Motor Maintenance	29
	Thermostat Schedules and Temperature Resets	29
	Economizer Maintenance	29
	Chiller Maintenance	29
	AC System Evaporator/Condenser Coil Cleaning	29
	HVAC Filter Cleaning and Replacement	29
	Ductwork Maintenance.....	30
	Furnace Maintenance	30
	Water Heater Maintenance	30
	Water Conservation	31
	Procurement Strategies	31
6	On-site Generation	32
6.1	Solar Photovoltaic	33
6.2	Combined Heat and Power	35
7	Electric Vehicles (EV)	36
7.1	Electric Vehicle Charging	36
8	Project Funding and Incentives.....	38
8.1	Utility Energy Efficiency Programs	39
	Prescriptive and Custom	39
	Direct Install	39
	Engineered Solutions	40
8.2	New Jersey's Clean Energy Programs.....	41
	Large Energy Users	41
	Combined Heat and Power	42
	Successor Solar Incentive Program (SuSI)	43
	Energy Savings Improvement Program	44
9	Project Development	45
10	Energy Purchasing and Procurement Strategies	46
10.1	Retail Electric Supply Options.....	46
10.2	Retail Natural Gas Supply Options	46
	Appendix A: Equipment Inventory & Recommendations	A-1
	Appendix B: ENERGY STAR Statement of Energy Performance	B-1
	Appendix C: Glossary	C-1

1 EXECUTIVE SUMMARY

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

BUILDING PERFORMANCE REPORT



ENERGY STAR®
Benchmarking Score

N/A
(1-100 scale)

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

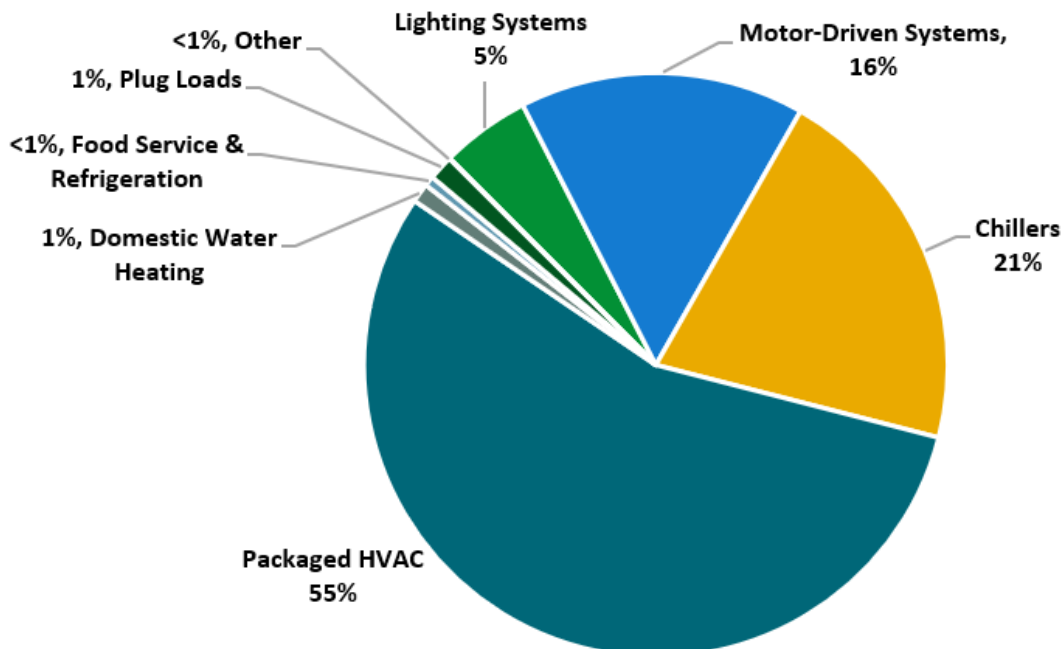


Figure 1 - Energy Use by System

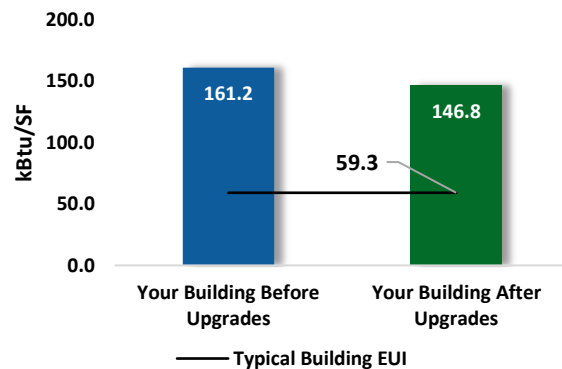
POTENTIAL IMPROVEMENTS



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

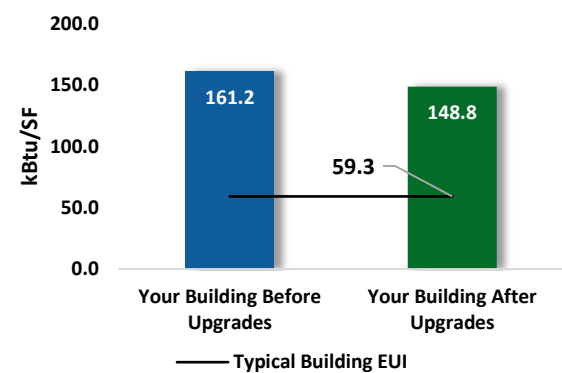
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	\$206,964
Potential Rebates & Incentives ¹	\$10,217
Annual Cost Savings	\$34,063
Annual Energy Savings	Electricity: 238,640 kWh Natural Gas: 1,236 Therms
Greenhouse Gas Emission Savings	127 Tons
Simple Payback	5.8 Years
Site Energy Savings (All Utilities)	9%



Scenario 2: Cost Effective Package²

Installation Cost	\$188,249
Potential Rebates & Incentives	\$8,717
Annual Cost Savings	\$33,016
Annual Energy Savings	Electricity: 238,576 kWh Natural Gas: -63 Therms
Greenhouse Gas Emission Savings	120 Tons
Simple Payback	5.4 Years
Site Energy Savings (all utilities)	8%



On-site Generation Potential

Photovoltaic	High
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			42,741	4.5	-10	\$5,846	\$11,205	\$3,052	\$8,153	1.4	41,904
ECM 1	Install LED Fixtures	Yes	456	0.0	0	\$63	\$399	\$100	\$299	4.7	459
ECM 2	Retrofit Fixtures with LED Lamps	Yes	42,286	4.5	-10	\$5,783	\$10,806	\$2,952	\$7,854	1.4	41,445
Lighting Control Measures			11,118	1.0	-3	\$1,521	\$6,706	\$3,065	\$3,641	2.4	10,898
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	8,199	0.7	-2	\$1,121	\$3,356	\$440	\$2,916	2.6	8,036
ECM 4	Install Photocell Controls	No	64	0.0	0	\$9	\$200	\$0	\$200	22.7	64
ECM 5	Install High/Low Lighting Controls	Yes	2,855	0.2	-1	\$390	\$3,150	\$2,625	\$525	1.3	2,798
Motor Upgrades			7,000	0.9	0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
ECM 6	Premium Efficiency Motors	Yes	7,000	0.9	0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
Electric Chiller Replacement			177,780	26.5	0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023
ECM 7	Install High Efficiency Chillers	Yes	177,780	26.5	0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023
Gas Heating (HVAC/Process) Replacement			0	0.0	130	\$1,038	\$18,515	\$1,500	\$17,015	16.4	15,209
ECM 8	Install High Efficiency Furnaces	No	0	0.0	130	\$1,038	\$18,515	\$1,500	\$17,015	16.4	15,209
Domestic Water Heating Upgrade			0	0.0	6	\$48	\$407	\$80	\$327	6.9	697
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	6	\$48	\$407	\$80	\$327	6.9	697
TOTALS (COST EFFECTIVE MEASURES)			238,576	32.8	-6	\$33,016	\$188,249	\$8,717	\$179,532	5.4	239,507
TOTALS (ALL MEASURES)			238,640	32.8	124	\$34,063	\$206,964	\$10,217	\$196,747	5.8	254,781

* - 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 (NJBPUB) has sponsored this Local Government Energy Audit (LGEA) report for Rink/Athletic Center Building. 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 November 17, 2022, TRC performed an energy audit at the Rink/Athletic Center Building located in Princeton, New Jersey. TRC met with facility staff to review the facility operations and help focus our investigation on specific energy-using systems.

Rink/Athletic Center Building is a one-story, 65,066 square foot building built in 1997. Spaces include athletic center, squash court, ice hockey rink, offices, corridors, kitchen, locker rooms, and mechanical space.

2.2 Building Occupancy

The facility is occupied throughout the week during business hours. Janitorial services are performed during business hours.

Building Name	Weekday/Weekend	Operating Schedule
Ice Hockey Rink	Weekday	5:30 AM - 11:00 PM
	Weekend	5:30 AM - 11:00 PM
Athletic Center	Weekday	6:30 AM - 11:00 PM
	Weekend	6:30 AM - 11:00 PM

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

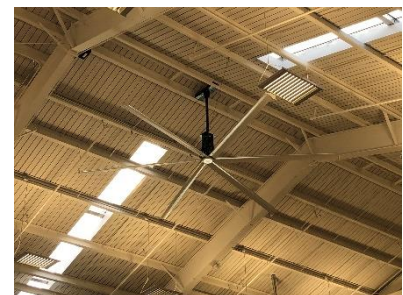
Building walls are concrete block over structural steel with a corrugated metal covering. Steel trusses support a pitched roof with a metal deck covered with a corrugated metal roofing system. Roof encloses conditioned space. The thermal barrier is at the roof.



Exterior of Athletic Center



Roof of Hockey Rink



Interior Structure of Athletic Center

Most of the windows are double glazed and have aluminum frames with a thermal break. The glass-to-frame seals are in fair condition. 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.



Hockey Rink Windows



Corridor Exterior Doors



Athletic Center Skylight

2.4 Lighting Systems

The hockey rink's primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. Fixture types include 2-lamp or 6-lamp, 4-foot long pendant and recessed fixtures. Typically, T8 fluorescent lamps use electronic ballasts. Some of the linear fixtures have been converted to operate LED tube lamps. Additionally, there are some compact fluorescent lamps (CFL) and general purpose lamps.

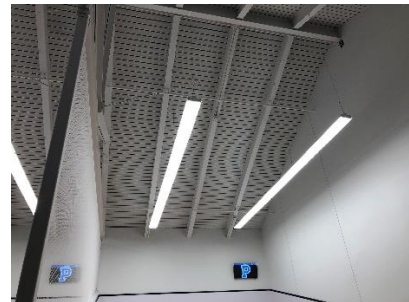
All exit signs are LED. Most fixtures are in fair condition. Interior lighting levels were generally sufficient. The athletic center, squash court, and adjacent rooms were built a few years ago with new LED lighting.



*Pendent Mount Troffer
Fluorescent Fixture*

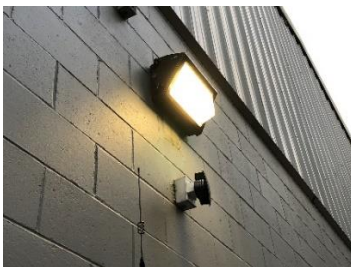


*Recessed Troffer Fluorescent
Fixture*



LED Fixture

Most lighting fixtures are controlled by occupancy sensors and the remainder by wall switches. Exterior fixtures include wall packs with high intensity discharge (HID) lamps and LED wall packs, strip lighting, and canopy lighting. Exterior fixtures are photocell controlled.



LED and HID Wall Packs

The pole mounted parking lot and walkway lighting are newer LED fixtures.



Walkway LED Light Fixtures



Parking Lot LED Light Fixtures

2.5 Air Handling Systems

Unitary Electric HVAC Equipment

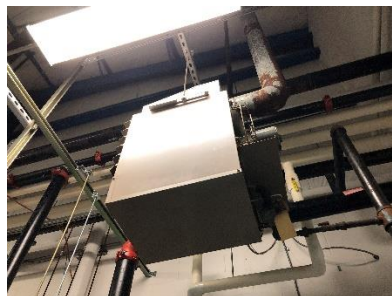
The server room uses a ductless mini split AC unit. It has a capacity of 1.5 tons and an EER of 11.46. The unit is in good condition.



Ductless Mini Split AC Unit

Unitary Heating Equipment

Hockey rink electrical room is heated by a 95 MBh suspended gas fired furnace. A mechanical room uses a 2-kw electric resistance heater. The units are in fair condition. Equipment is controlled by a manual dial thermostat.



Gas-fired Suspended Furnace



Electric Resistance Heater

Infrared Heating

The hockey rink bleachers are heated with five electric infrared heaters. They are 4.5 kw each and in good condition. The athletic center has three natural gas infrared heaters. They are estimated at 250 MBh and 650 MBh capacity and they are in good condition. The facility staff indicated they are not in use.



Athletic Center IR Heaters



Hockey Rink IR Heater

Packaged Units

Parts of the complex are served by packaged roof top units (RTUs) and furnaces. There are five gas-fired burner units ranging in size from 300 MBh to 750 MBh. Some of the units are equipped with economizers that are in good condition. One of the units has a cooling capacity of 30 tons.

Refer to Appendix A for detailed information about each unit.



Packaged RTUs



Packaged Furnaces

2.6 Chilled Water Systems

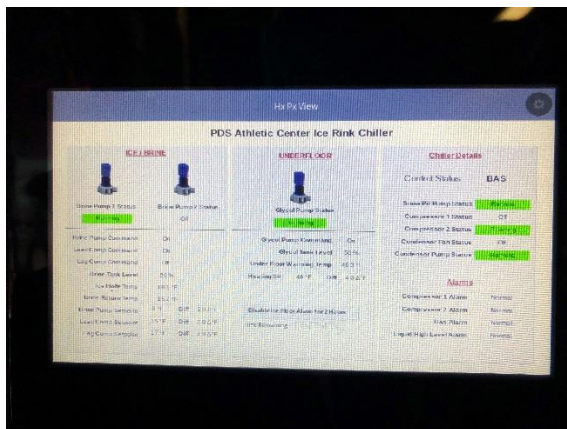
The site has one, 105-ton water-cooled reciprocating chiller used for the hockey rink. The system has two loops of chilled water. One of the loops is a brine loop that operates at temperatures around 15 degrees. It has two, 25 hp motors operating in a lead lag configuration. This loop maintains the ice for the rink. The second loop operates under the Zamboni room and slab under the rink to maintain a consistent temperature. It operates at a higher temperature and has two pumps, one, 3 hp and one, 1.5 hp.



Cooling Tower



Chiller



Chiller Controls



Brine Pumps

2.7 Domestic Hot Water

Hot water is produced by a 130-gallon, 499 MBh gas-fired storage water heater and a 60-gallon, 120 MBh gas-fired storage water heater, both with an efficiency of 95%.

Two fractional hp circulation pumps distribute water to end uses. The circulation pumps operate continuously. The domestic hot water pipes are insulated, and the insulation is in good condition.



Storage Tank Water Heaters

2.8 Refrigeration

The kitchen has a stand-up refrigerator/freezer with solid doors.

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



Stand-up Refrigerator



Stand-up Freezer

2.9 Plug Load and Vending Machines

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

There are three computer workstations throughout the facility. Plug loads include general cafe and office equipment. The facility has a washer and dryer for cleaning purposes.

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



Vending Machines



Vending Machines



Golf Cart Charger

2.10 Water-Using Systems

There are 12 restrooms with toilets and sinks. Faucet flow rates are at 1.5 gallons per minute (gpm) or higher. Girl's and boy's locker rooms are frequently used. The showerheads are rated at 2.5 gpm.



Lavatory Sink



Showerhead



Kitchen Sink

2.11 On-Site Generation

Rink/Athletic Center Building has a 72-kW photovoltaic (PV) array with approximately 200 panels that was installed in 2021. This system provides approximately 8% of the electricity used.



Solar Array



Battery Storage

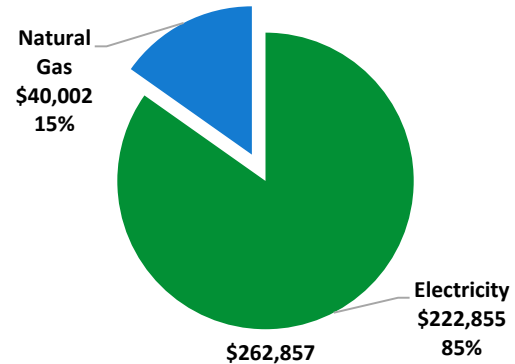


Solar Array

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	1,607,916 kWh	\$222,855
Natural Gas	50,049 Therms	\$40,002
Total		\$262,857



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.

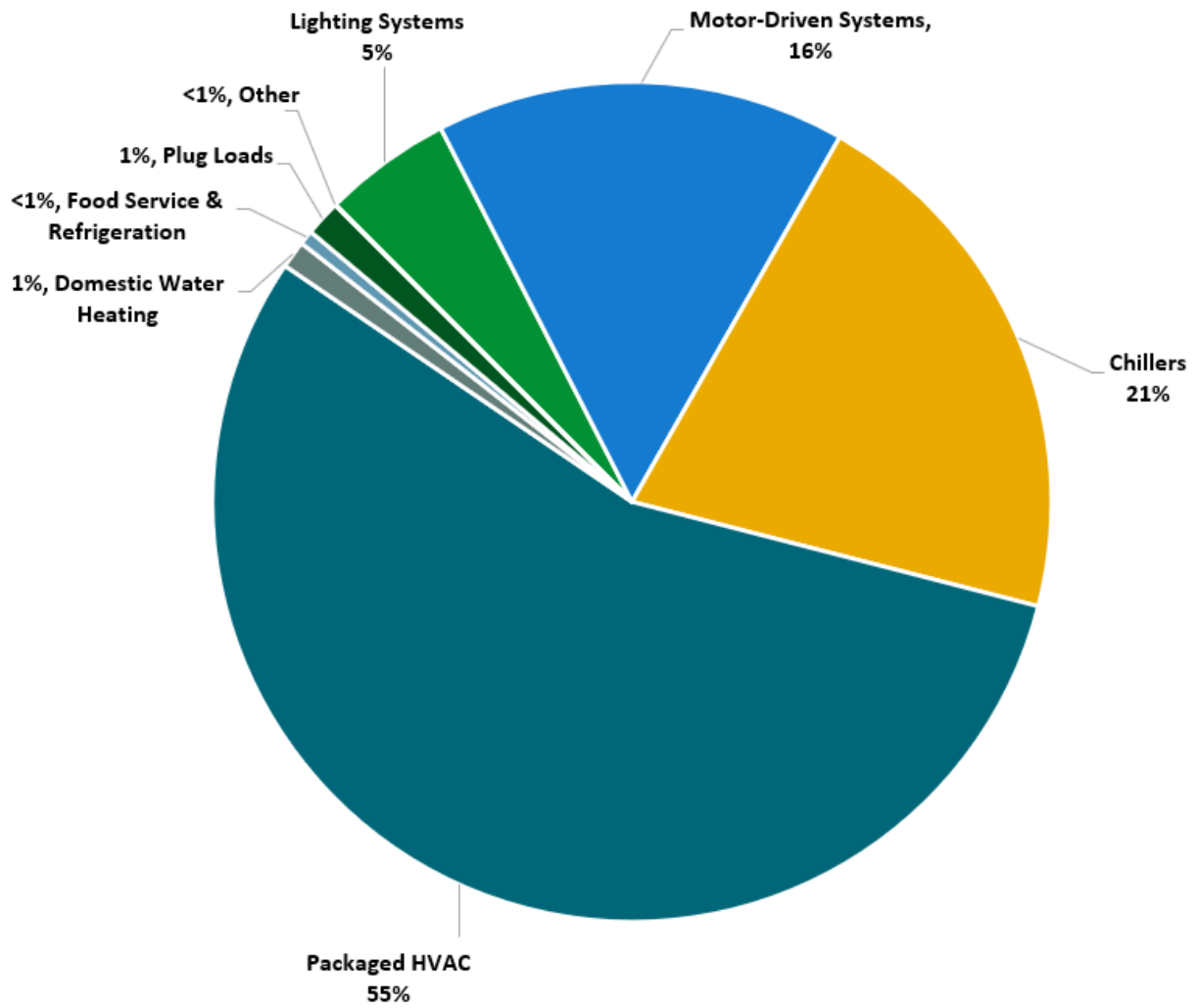
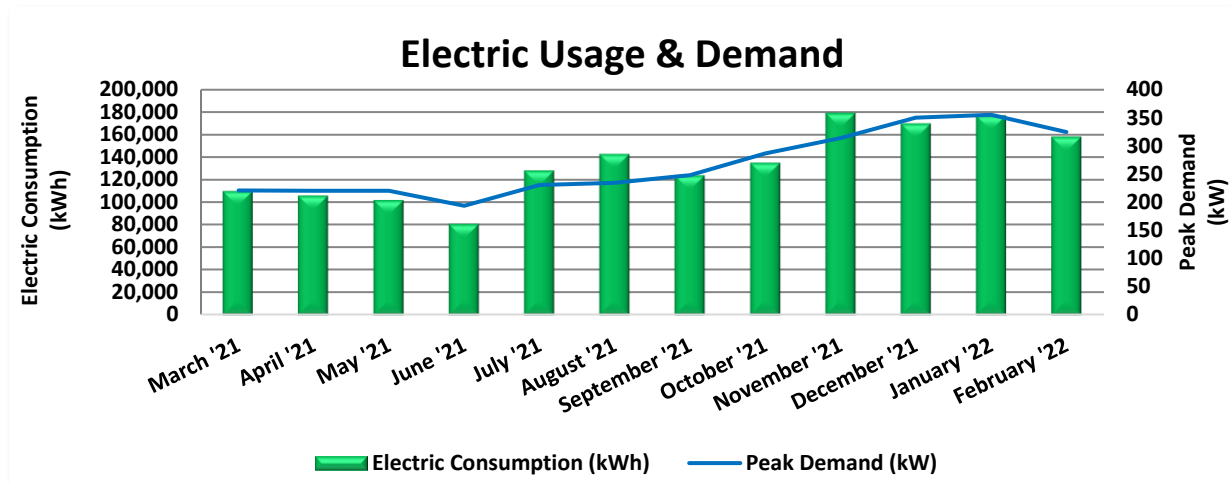


Figure 4 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class Large Power & Lighting Secondary, with electric production provided by Engie, a third-party supplier.

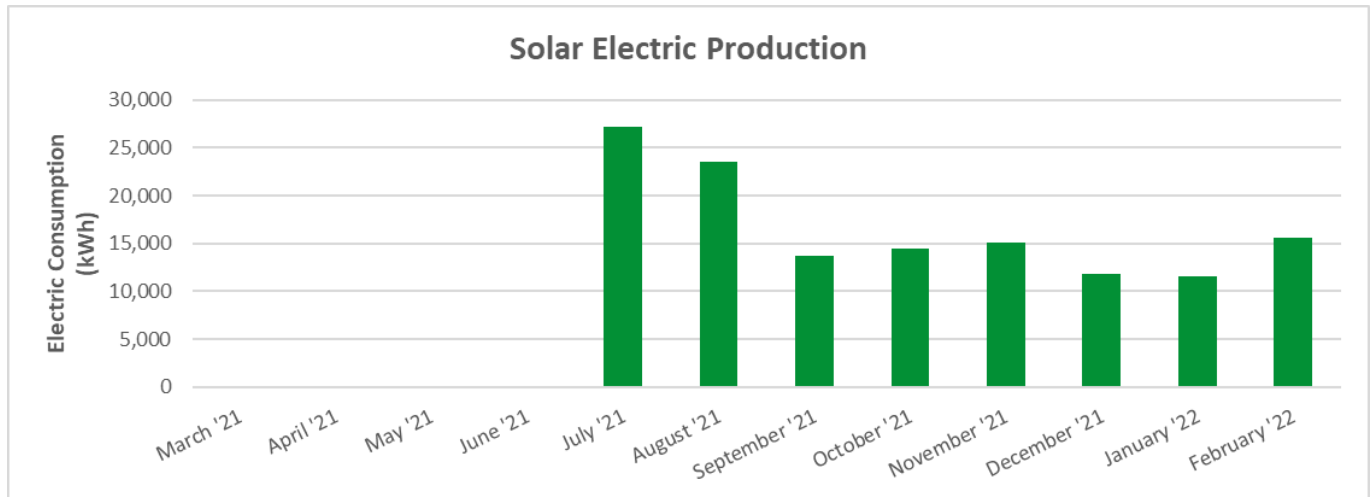


Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
4/13/21	29	109,583	221	829	14,869
5/12/21	29	105,598	220	829	14,733
6/11/21	30	101,613	220	2,608	15,697
7/14/21	33	80,537	193	1,236	13,224
8/13/21	30	127,870	230	2,943	18,603
9/13/21	31	142,348	235	2,957	20,472
10/12/21	29	123,657	248	938	16,383
11/9/21	28	134,777	287	1,085	17,941
12/10/21	31	178,676	314	1,188	23,448
1/12/22	33	169,274	350	1,326	22,622
2/10/22	29	176,452	356	1,346	23,666
3/15/22	33	157,531	324	1,228	21,198
Totals	365	1,607,916	356	\$18,514	\$222,855
Annual	365	1,607,916	356	\$18,514	\$222,855

Notes:

- Peak demand of 356 kW occurred in January 2022.
- Average demand over the past 12 months was 266 kW.
- The average electric cost over the past 12 months was \$0.139/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.
- All the electricity generated on-site is used on-site.

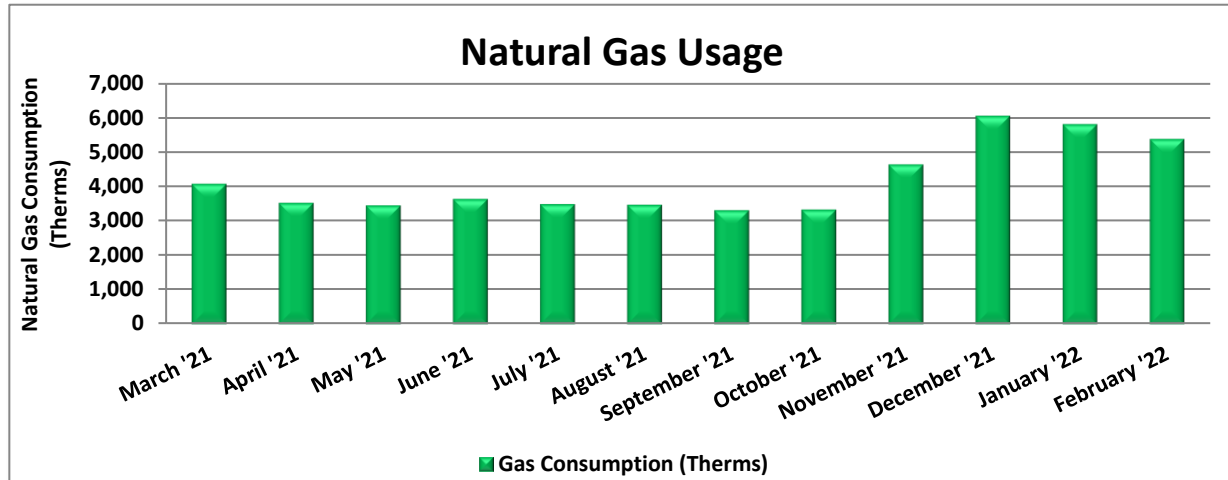
3.2 Solar



Electric Billing Data for Rink/Athletic Center Building			
Period Ending	Days in Period	Electric Usage (kWh)	Total Electric Cost
4/13/21	29	0	\$0
5/12/21	29	0	\$0
6/11/21	30	0	\$0
7/14/21	33	0	\$0
8/13/21	30	27,225	\$2,723
9/13/21	31	23,496	\$2,350
10/12/21	29	13,735	\$1,374
11/9/21	28	14,409	\$1,441
12/10/21	31	15,079	\$1,508
1/12/22	33	11,785	\$1,179
2/10/22	29	11,607	\$1,161
3/15/22	33	15,606	\$1,561
Totals	365	132,942	\$13,295
Annual	365	132,942	\$13,295

3.3 Natural Gas

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



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
4/13/21	29	4,069	\$3,132
5/12/21	29	3,521	\$2,731
6/11/21	30	3,447	\$2,389
7/13/21	32	3,634	\$2,526
8/13/21	31	3,479	\$2,409
9/13/21	31	3,461	\$2,398
10/12/21	29	3,300	\$2,317
11/9/21	28	3,319	\$3,082
12/10/21	31	4,627	\$4,047
1/12/22	33	6,034	\$5,123
2/10/22	29	5,793	\$5,105
3/15/22	33	5,366	\$4,742
Totals	365	50,049	\$40,002
Annual	365	50,049	\$40,002

Notes:

- The average gas cost for the past 12 months is \$0.799/therm, which is the blended rate used throughout the analysis.

3.4 Benchmarking

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

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

Benchmarking Score

N/A

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

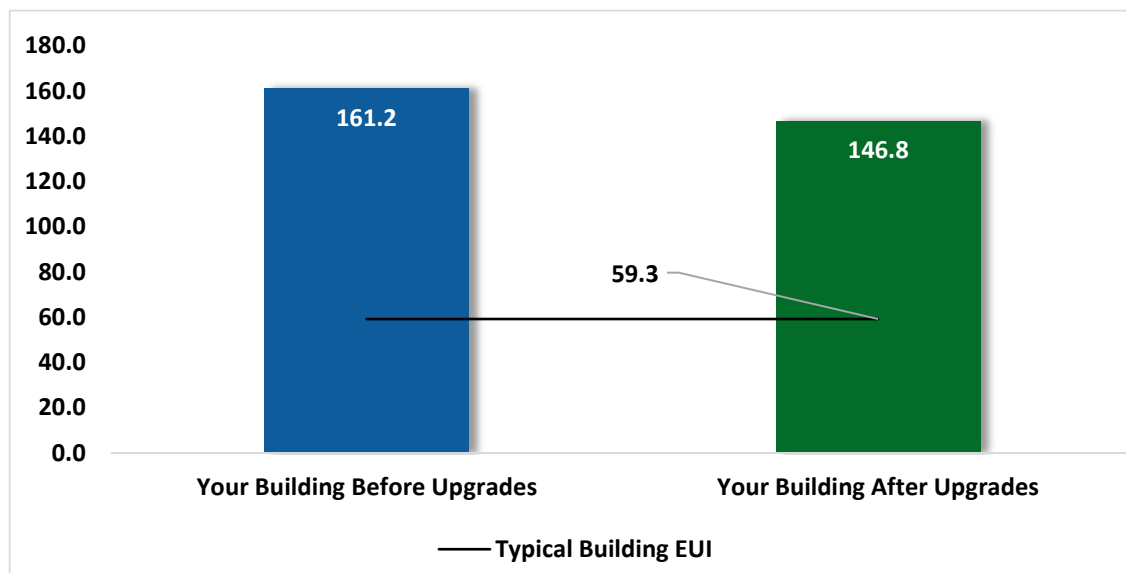


Figure 5 - Energy Use Intensity Comparison³

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			42,741	4.5	-10	\$5,846	\$11,205	\$3,052	\$8,153	1.4	41,904
ECM 1	Install LED Fixtures	Yes	456	0.0	0	\$63	\$399	\$100	\$299	4.7	459
ECM 2	Retrofit Fixtures with LED Lamps	Yes	42,286	4.5	-10	\$5,783	\$10,806	\$2,952	\$7,854	1.4	41,445
Lighting Control Measures			11,118	1.0	-3	\$1,521	\$6,706	\$3,065	\$3,641	2.4	10,898
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	8,199	0.7	-2	\$1,121	\$3,356	\$440	\$2,916	2.6	8,036
ECM 4	Install Photocell Controls	No	64	0.0	0	\$9	\$200	\$0	\$200	22.7	64
ECM 5	Install High/Low Lighting Controls	Yes	2,855	0.2	-1	\$390	\$3,150	\$2,625	\$525	1.3	2,798
Motor Upgrades			7,000	0.9	0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
ECM 6	Premium Efficiency Motors	Yes	7,000	0.9	0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
Electric Chiller Replacement			177,780	26.5	0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023
ECM 7	Install High Efficiency Chillers	Yes	177,780	26.5	0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023
Gas Heating (HVAC/Process) Replacement			0	0.0	130	\$1,038	\$18,515	\$1,500	\$17,015	16.4	15,209
ECM 8	Install High Efficiency Furnaces	No	0	0.0	130	\$1,038	\$18,515	\$1,500	\$17,015	16.4	15,209
Domestic Water Heating Upgrade			0	0.0	6	\$48	\$407	\$80	\$327	6.9	697
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	6	\$48	\$407	\$80	\$327	6.9	697
TOTALS			238,640	32.8	124	\$34,063	\$206,964	\$10,217	\$196,747	5.8	254,781

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

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

Figure 6 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Lighting Upgrades		42,741	4.5	-10	\$5,846	\$11,205	\$3,052	\$8,153	1.4	41,904
ECM 1	Install LED Fixtures	456	0.0	0	\$63	\$399	\$100	\$299	4.7	459
ECM 2	Retrofit Fixtures with LED Lamps	42,286	4.5	-10	\$5,783	\$10,806	\$2,952	\$7,854	1.4	41,445
Lighting Control Measures		11,054	1.0	-3	\$1,512	\$6,506	\$3,065	\$3,441	2.3	10,834
ECM 3	Install Occupancy Sensor Lighting Controls	8,199	0.7	-2	\$1,121	\$3,356	\$440	\$2,916	2.6	8,036
ECM 5	Install High/Low Lighting Controls	2,855	0.2	-1	\$390	\$3,150	\$2,625	\$525	1.3	2,798
Motor Upgrades		7,000	0.9	0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
ECM 6	Premium Efficiency Motors	7,000	0.9	0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
Electric Chiller Replacement		177,780	26.5	0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023
ECM 7	Install High Efficiency Chillers	177,780	26.5	0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023
Domestic Water Heating Upgrade		0	0.0	6	\$48	\$407	\$80	\$327	6.9	697
ECM 9	Install Low-Flow DHW Devices	0	0.0	6	\$48	\$407	\$80	\$327	6.9	697
TOTALS		238,576	32.8	-6	\$33,016	\$188,249	\$8,717	\$179,532	5.4	239,507

* - 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		42,741	4.5	-10	\$5,846	\$11,205	\$3,052	\$8,153	1.4	41,904
ECM 1	Install LED Fixtures	456	0.0	0	\$63	\$399	\$100	\$299	4.7	459
ECM 2	Retrofit Fixtures with LED Lamps	42,286	4.5	-10	\$5,783	\$10,806	\$2,952	\$7,854	1.4	41,445

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

ECM 1: Install LED Fixtures

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

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

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

Affected Building Areas: exterior fixtures

ECM 2: Retrofit Fixtures with LED Lamps

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

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

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

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		11,118	1.0	-3	\$1,521	\$6,706	\$3,065	\$3,641	2.4	10,898
ECM 3	Install Occupancy Sensor Lighting Controls	8,199	0.7	-2	\$1,121	\$3,356	\$440	\$2,916	2.6	8,036
ECM 4	Install Photocell Controls	64	0.0	0	\$9	\$200	\$0	\$200	22.7	64
ECM 5	Install High/Low Lighting Controls	2,855	0.2	-1	\$390	\$3,150	\$2,625	\$525	1.3	2,798

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 3: Install Occupancy Sensor Lighting Controls

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

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

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

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

Affected Building Areas: offices, locker room, field house, restrooms, and storage rooms

ECM 4: Install Photocell Controls

We evaluated installing photocells to eliminate exterior lighting use during daytime periods.

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

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

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

Affected Building Areas: exterior fixtures

ECM 5: Install High/Low Lighting Controls

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

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

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

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

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

Affected Building Areas: hallways

4.3 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		7,000	0.9	0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
ECM 6	Premium Efficiency Motors	7,000	0.9	0	\$970	\$8,631	\$0	\$8,631	8.9	7,049

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.

The potential savings from installing new fan coils with electronically commutated (EC) motors was evaluated. EC motors are generally more efficient than other fractional hp motors and have the capability of operating at variable speeds. In general, replacing the fan coils should be considered a capital improvement measure that has the potential to provide energy savings and improve occupant comfort.

Affected Motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Mechanical 1	Ice Hockey Rink	1	Chilled Water Pump	25.0	Brine Pump
Exterior 1	Ice Hockey Rink	1	Supply Fan	20.0	Dehumidification Unit
Exterior 1	Ice Hockey Rink	2	Exhaust Fan	7.5	Dehumidification Unit

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 Electric Chillers

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
	Electric Chiller Replacement	177,780	26.5	0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023
ECM 7	Install High Efficiency Chillers	177,780	26.5	0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023

ECM 7: Install High Efficiency Chillers

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

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

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

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

4.5 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		0	0.0	130	\$1,038	\$18,515	\$1,500	\$17,015	16.4	15,209
ECM 8	Install High Efficiency Furnaces	0	0.0	130	\$1,038	\$18,515	\$1,500	\$17,015	16.4	15,209

ECM 8: Install High Efficiency Furnaces

Replace standard efficiency furnaces with condensing furnaces. Improved combustion technology and heat exchanger design optimize heat recovery from the combustion gases, which can significantly improve furnace efficiency. Savings result from improved system efficiency.

Note: these units produce acidic condensate that require proper drainage.

Affected Units: locker rooms

4.6 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		0	0.0	6	\$48	\$407	\$80	\$327	6.9	697
ECM 9	Install Low-Flow DHW Devices	0	0.0	6	\$48	\$407	\$80	\$327	6.9	697

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.

5 ENERGY EFFICIENT BEST PRACTICES

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

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

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

Energy Tracking with ENERGY STAR Portfolio Manager



You've heard it before—you cannot manage what you do not measure. ENERGY STAR Portfolio Manager is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions⁴. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Lighting Maintenance



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

Lighting Controls

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

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

Motor Maintenance

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

Thermostat Schedules and Temperature Resets



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

Economizer Maintenance

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

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

Chiller Maintenance

Service chillers regularly to keep them operating properly. Chillers are responsible for a substantial portion of a commercial building's overall energy usage, and when they do not work well, there is usually a noticeable increase in energy bills and increased occupant complaints. Regular diagnostics and service can save 5% to 10% of the cost of operating your chiller. If you already have a maintenance contract in place, your existing service company should be able to provide these services.

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

Ductwork Maintenance

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

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

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

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

Furnace Maintenance

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

Water Heater Maintenance

The lower the supply water temperature that is used for hand washing sinks, the less energy is needed to heat the water. Reducing the temperature results in energy savings and the change is often unnoticeable to users. Be sure to review the domestic water temperature requirements for sterilizers and dishwashers as you investigate reducing the supply water temperature.

Also, preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. At least once a year, follow manufacturer instructions to drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Annual checks should include checks for:

- Leaks or heavy corrosion on the pipes and valves.
- Corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot, or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional.
- For electric water heaters, look for signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank.

- For water heaters more than three years old, have a technician inspect the sacrificial anode annually.

Water Conservation



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

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

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

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

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

Procurement Strategies

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

⁵ <https://www.epa.gov/watersense>.

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

6 ON-SITE GENERATION

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

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

6.1 Solar Photovoltaic

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

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has high potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential. A PV array located on the roof may be feasible. If you are interested in pursuing the installation of PV, we recommend conducting a full feasibility study.

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

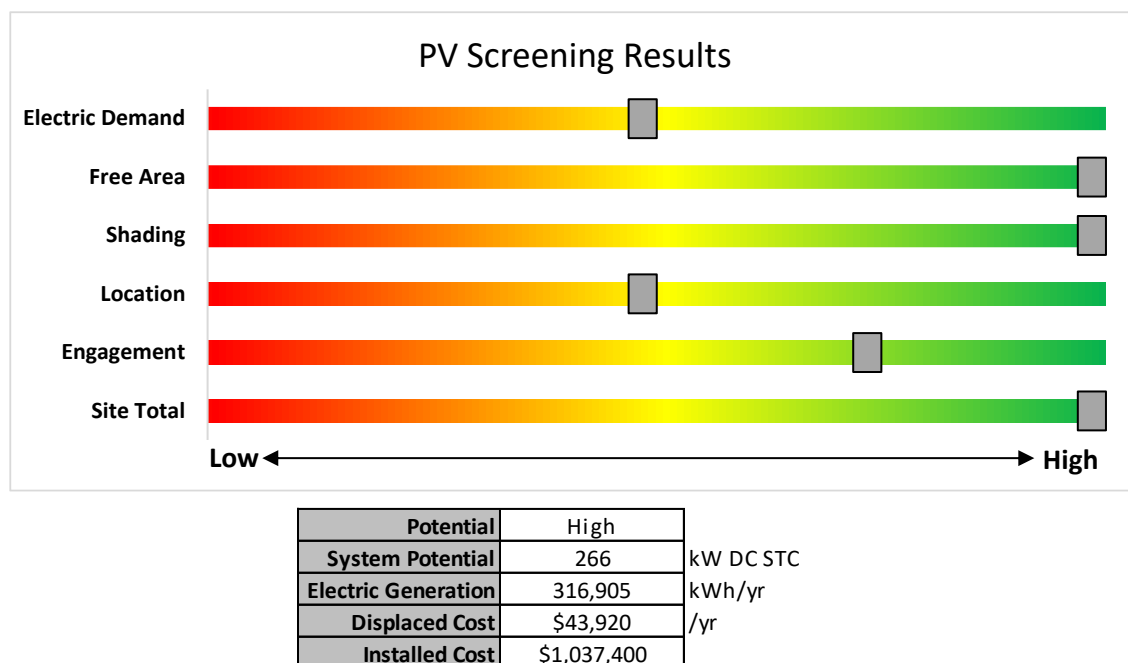


Figure 8 - Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

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

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

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

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

6.2 Combined Heat and Power

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

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

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

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

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

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

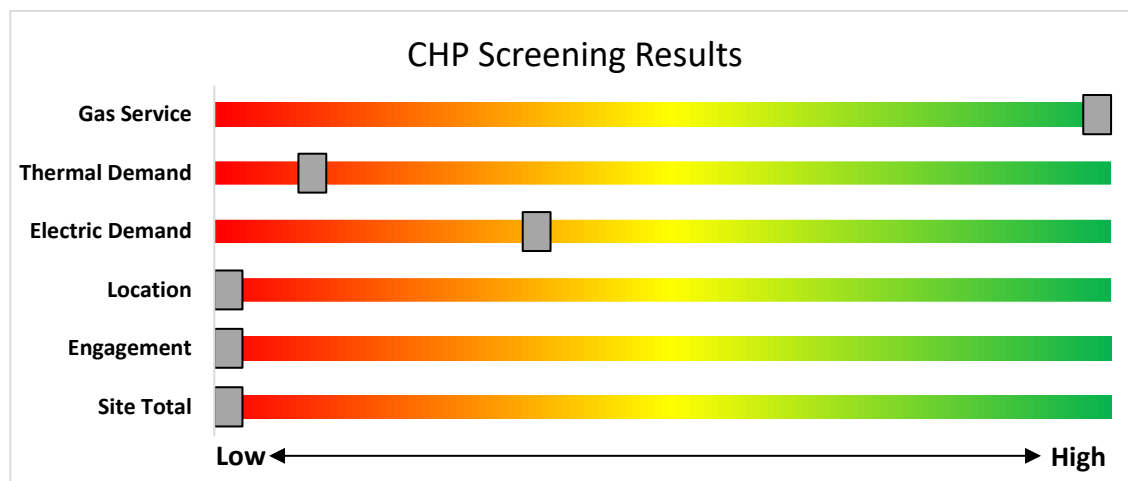


Figure 9 - Combined Heat and Power Screening

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

7 ELECTRIC VEHICLES (EV)

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

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

7.1 Electric Vehicle Charging

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

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

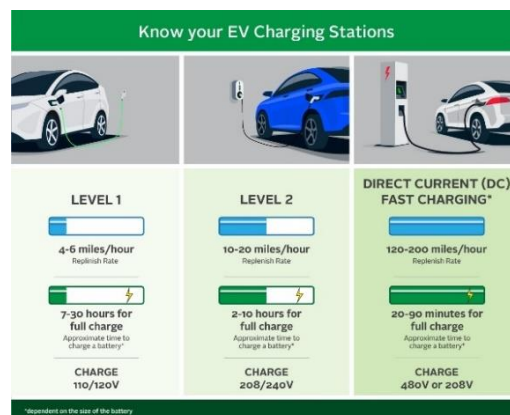
The preliminary assessment of EV charging at the facility shows that there is high potential for adding EV chargers to the facility's parking, based on potential costs of installation and other site factors.

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

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

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

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



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

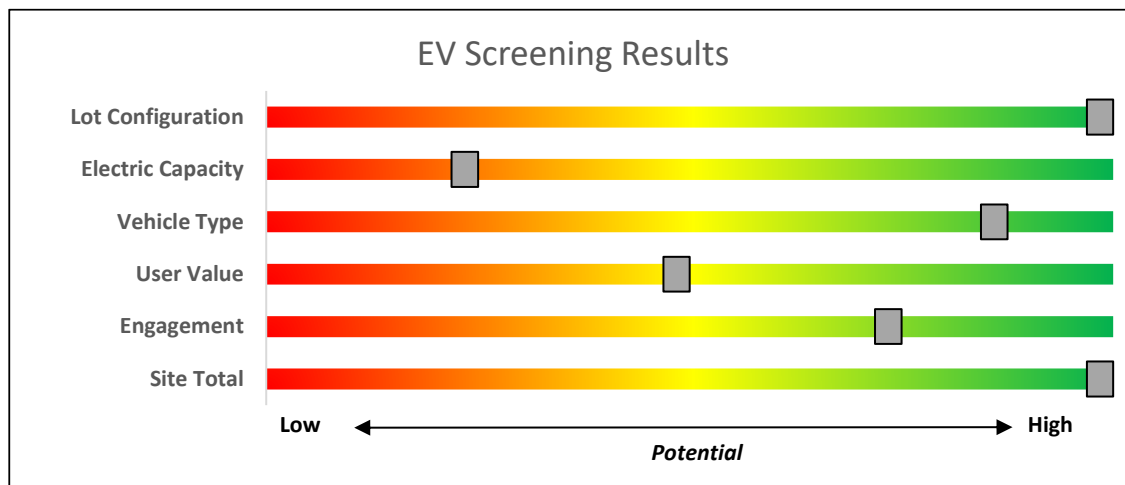


Figure 10 – EV Charger Screening

Electric Vehicle Programs Available

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

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

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

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

8 PROJECT FUNDING AND INCENTIVES

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










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 (FEED). Once the FEED is approved, the proposed work can begin.

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

Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

Successor Solar Incentive Program (SuSI)

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

Administratively Determined Incentive (ADI) Program

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

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

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

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

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

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

Competitive Solar Incentive Program

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

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

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

Energy Savings Improvement Program

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

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

How to Participate

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

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

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

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

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

9 PROJECT DEVELOPMENT

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

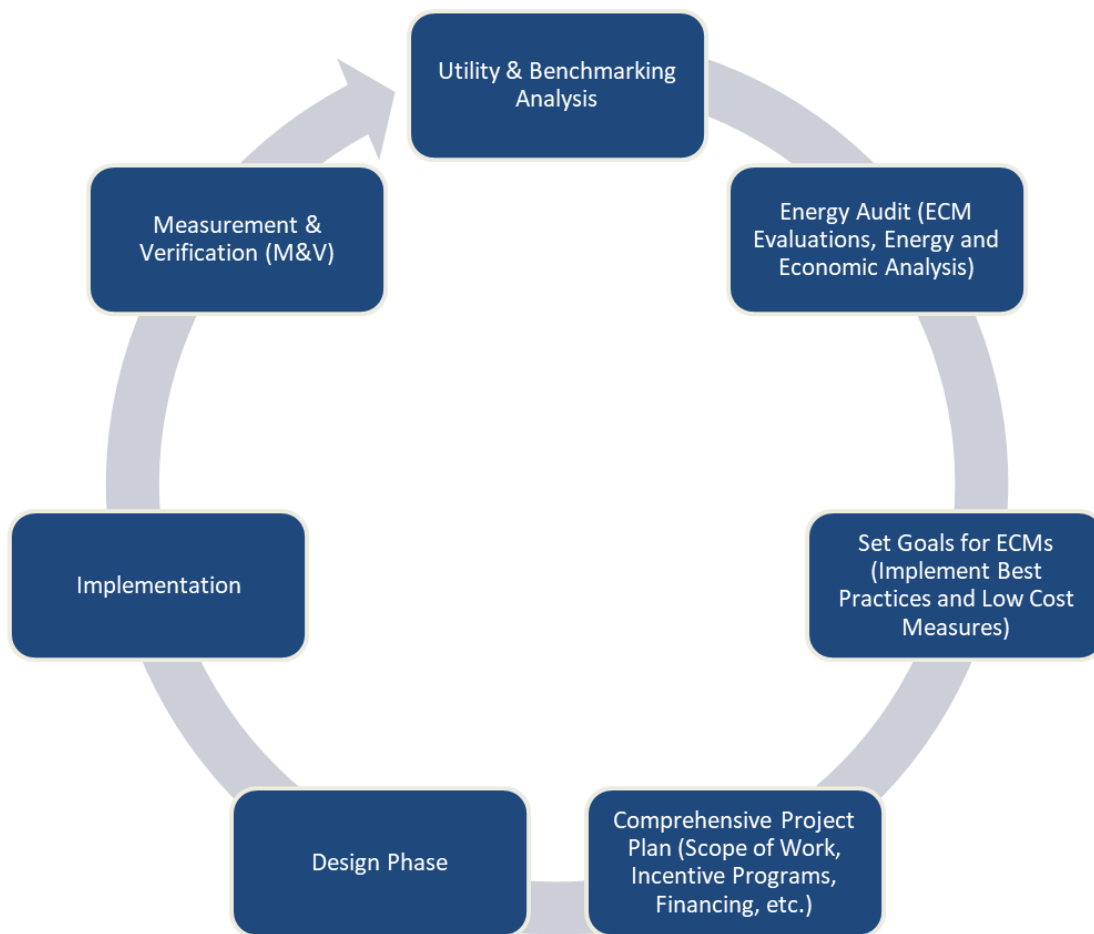


Figure 11 – Project Development Cycle

10 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

10.1 Retail Electric Supply Options

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

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

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

10.2 Retail Natural Gas Supply Options

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

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

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

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

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

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



APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Conference 107	12	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	25	4,395		None	No	12	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	25	4,395	0.0	0	0	\$0	\$0	\$0	0.0
Girls Locker Room 1	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,370	2, 3	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,395	0.1	1,872	0	\$256	\$526	\$105	1.6
Gymnasium 1 Squash	48	LED - Fixtures: Ambient - 4' - Direct Fixture	High/Low Control	S	50	4,395		None	No	48	LED - Fixtures: Ambient - 4' - Direct Fixture	High/Low Control	50	4,395	0.0	0	0	\$0	\$0	\$0	0.0
Gymnasium 1 Squash	8	LED - Fixtures: Downlight Recessed	High/Low Control	S	25	4,395		None	No	8	LED - Fixtures: Downlight Recessed	High/Low Control	25	4,395	0.0	0	0	\$0	\$0	\$0	0.0
Locker Room 112	1	LED - Fixtures: Ambient 1x4 Fixture	Wall Switch	S	30	6,370		None	No	1	LED - Fixtures: Ambient 1x4 Fixture	Wall Switch	30	6,370	0.0	0	0	\$0	\$0	\$0	0.0
Locker Room 113	2	LED - Fixtures: Downlight Recessed	Occupancy Sensor	S	20	4,395		None	No	2	LED - Fixtures: Downlight Recessed	Occupancy Sensor	20	4,395	0.0	0	0	\$0	\$0	\$0	0.0
Locker Room 113	2	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	30	4,395		None	No	2	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	30	4,395	0.0	0	0	\$0	\$0	\$0	0.0
Locker Room 2	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 2	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	4,395	2	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,395	0.1	1,015	0	\$139	\$256	\$70	1.3
Locker Room 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
Locker Room 1	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	4,395	2	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,395	0.1	1,160	0	\$159	\$292	\$80	1.3
Locker Room 3	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 3	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	4,395	2	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,395	0.1	1,160	0	\$159	\$292	\$80	1.3
Locker Room 4	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	4,395	2	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,395	0.1	1,160	0	\$159	\$292	\$80	1.3
Locker Room 4	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	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	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,000	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.1	264	0	\$36	\$146	\$40	2.9
Mechanical 2 Sprinkler Rm	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	345	0.1	84	0	\$11	\$416	\$75	29.7
Mens Locker Room 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	6,370	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	None	29	6,370	0.0	210	0	\$29	\$37	\$10	0.9
Multipurpose Field House	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Multipurpose Field House	48	LED - Fixtures: High-Bay	Wall Switch	S	75	6,370	3	None	Yes	48	LED - Fixtures: High-Bay	Occupancy Sensor	75	4,395	0.6	7,109	-2	\$972	\$1,080	\$140	1.0
Office - Enclosed 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	4,395	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,395	0.0	145	0	\$20	\$37	\$10	1.3
Office - Enclosed 2	1	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	30	4,395		None	No	1	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	30	4,395	0.0	0	0	\$0	\$0	\$0	0.0
Office - Enclosed Trainers Rm	2	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	30	4,395		None	No	2	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	30	4,395	0.0	0	0	\$0	\$0	\$0	0.0
Recreation Ice Hockey Rink	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0

Existing Conditions							Proposed Conditions							Energy Impact & Financial Analysis							
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Recreation Ice Hockey Rink	7	Linear Fluorescent - T8: 4' T8 (32W) - 6L	Wall Switch	S	176	8,760	2	Relamp	No	7	LED - Linear Tubes: (6) 4' Lamps	Wall Switch	87	8,760	0.3	5,457	-1	\$746	\$767	\$210	0.7
Recreation Ice Hockey Rink	71	Linear Fluorescent - T8: 4' T8 (32W) - 6L	Wall Switch	S	176	4,380	2	Relamp	No	71	LED - Linear Tubes: (6) 4' Lamps	Wall Switch	87	4,380	3.2	27,677	-6	\$3,785	\$7,778	\$2,130	1.5
Restroom - Female 2	4	LED - Fixtures: Downlight Recessed	Occupancy Sensor	S	20	4,395		None	No	4	LED - Fixtures: Downlight Recessed	Occupancy Sensor	20	4,395	0.0	0	0	\$0	\$0	\$0	0.0
Restroom - Female 2	5	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	30	4,395		None	No	5	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	30	4,395	0.0	0	0	\$0	\$0	\$0	0.0
Restroom - Female Locker Rm	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,370	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,395	0.1	1,070	0	\$146	\$416	\$75	2.3
Restroom - Locker Rm 3/4	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,370	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,395	0.1	802	0	\$110	\$380	\$65	2.9
Restroom - Male 2	3	LED - Fixtures: Downlight Recessed	Occupancy Sensor	S	20	4,395		None	No	3	LED - Fixtures: Downlight Recessed	Occupancy Sensor	20	4,395	0.0	0	0	\$0	\$0	\$0	0.0
Restroom - Male 2	4	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	30	4,395		None	No	4	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	30	4,395	0.0	0	0	\$0	\$0	\$0	0.0
Restroom - Male Locker Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	4,395	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,395	0.0	145	0	\$20	\$37	\$10	1.3
Restroom - Unisex 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	4,395	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,395	0.0	145	0	\$20	\$37	\$10	1.3
Restroom - Unisex 2	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,370	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,395	0.1	802	0	\$110	\$380	\$65	2.9
Restroom - Unisex 4	1	LED - Fixtures: Ambient - 8' - Direct Fixture	Occupancy Sensor	S	40	4,395		None	No	1	LED - Fixtures: Ambient - 8' - Direct Fixture	Occupancy Sensor	40	4,395	0.0	0	0	\$0	\$0	\$0	0.0
Server Room 121	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	500	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	500	0.0	17	0	\$2	\$37	\$10	11.8
Storage 1 Zamboni Rm	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	1,000	3	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	690	0.0	54	0	\$7	\$270	\$35	31.9
Storage 101A	2	LED - Fixtures: Ambient - 2' - Direct/Indirect Fixture	Wall Switch	S	15	500	3	None	Yes	2	LED - Fixtures: Ambient - 2' - Direct/Indirect Fixture	Occupancy Sensor	15	345	0.0	5	0	\$1	\$116	\$20	151.0
Storage 103	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	20	500	3	None	Yes	4	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	20	345	0.0	12	0	\$2	\$270	\$35	138.6
Storage 120A	1	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	28	500		None	No	1	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	28	500	0.0	0	0	\$0	\$0	\$0	0.0
Storage 120B	1	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	28	500		None	No	1	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	28	500	0.0	0	0	\$0	\$0	\$0	0.0
Storage 146	1	LED - Fixtures: Ambient 1x4 Fixture	Wall Switch	S	30	500		None	No	1	LED - Fixtures: Ambient 1x4 Fixture	Wall Switch	30	500	0.0	0	0	\$0	\$0	\$0	0.0
Storage 5	3	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	S	25	500		None	No	3	LED - Fixtures: Ambient 1x4 Fixture	Occupancy Sensor	25	500	0.0	0	0	\$0	\$0	\$0	0.0
Electrical Room 1	6	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	30	500	3	None	Yes	6	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	30	345	0.0	28	0	\$4	\$270	\$35	61.6
Corridor 1	8	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	8	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Corridor 1	3	LED - Fixtures: Ambient - 8' - Direct Fixture	Wall Switch	S	80	6,000	5	None	Yes	3	LED - Fixtures: Ambient - 8' - Direct Fixture	High/Low Control	80	4,140	0.0	446	0	\$61	\$225	\$105	2.0
Corridor 1	11	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	60	6,000	5	None	Yes	11	LED - Fixtures: Ambient - 4' - Direct Fixture	High/Low Control	60	4,140	0.1	1,228	0	\$168	\$450	\$385	0.4
Corridor 1	26	LED - Fixtures: Downlight Recessed	Wall Switch	S	15	6,000	5	None	Yes	26	LED - Fixtures: Downlight Recessed	High/Low Control	15	4,140	0.1	725	0	\$99	\$1,125	\$910	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
Corridor 1	35	LED Lamps: (1) 7W MR16 Plug-In Lamp	Wall Switch	S	7	6,000	5	None	Yes	35	LED Lamps: (1) 7W MR16 Plug-In Lamp	High/Low Control	7	4,140	0.0	456	0	\$62	\$1,350	\$1,225	2.0
Exterior 1	15	LED - Fixtures: Ambient - 4' - Direct Fixture	Photocell		15	4,380		None	No	15	LED - Fixtures: Ambient - 4' - Direct Fixture	Photocell	15	4,380	0.0	0	0	\$0	\$0	\$0	0.0
Exterior 1	6	LED - Fixtures: Downlight Recessed	Photocell		15	4,380		None	No	6	LED - Fixtures: Downlight Recessed	Photocell	15	4,380	0.0	0	0	\$0	\$0	\$0	0.0
Exterior 1	16	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Photocell		100	4,380		None	No	16	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Photocell	100	4,380	0.0	0	0	\$0	\$0	\$0	0.0
Exterior 1	3	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Photocell		50	4,380		None	No	3	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Photocell	50	4,380	0.0	0	0	\$0	\$0	\$0	0.0
Exterior 1	5	LED - Fixtures: Wall Pack	Photocell		39	4,380		None	No	5	LED - Fixtures: Wall Pack	Photocell	39	4,380	0.0	0	0	\$0	\$0	\$0	0.0
Exterior 1	2	LED - Fixtures: Wall Pack	Photocell		50	4,380		None	No	2	LED - Fixtures: Wall Pack	Photocell	50	4,380	0.0	0	0	\$0	\$0	\$0	0.0
Exterior 1	2	Metal Halide: (1) 50W Lamp	Photocell		72	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	20	4,380	0.0	456	0	\$63	\$399	\$100	4.7
Exterior 3 Garage	2	Compact Fluorescent: (1) 23W Screw-In Lamp	Wall Switch		23	6,370	2, 4	Relamp	Yes	2	LED Lamps: A Lamp	Photocell	16	4,380	0.0	153	0	\$21	\$234	\$2	11.0
Kitchen 104	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	S	25	4,395		None	No	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	25	4,395	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
Exterior 1	Ice Hockey Rink	1	Cooling Tower Fan	10.0	91.7%	No	Baldor	Unknown	W	6,000		No	91.7%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior 2	Rink/Athletic Center Building	7	Exhaust Fan	0.2	65.0%	No	Unknown	Unknown	W	4,380		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Janitorial 1	Athletic Center Building	1	DHW Circulation Pump	0.3	65.0%	No	Bell & Gossett	PL-36B	W	8,760		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical 1	Ice Hockey Rink	1	Process Pump	3.0	87.5%	No	Baldor	M3611T	W	3,500		No	87.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical 1	Ice Hockey Rink	1	Process Pump	1.5	86.5%	No	Century	PE5AA15A01C	W	3,500		No	86.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical 1	Ice Hockey Rink	1	Chilled Water Pump	25.0	93.6%	No	Century	E514M2	W	5,000		No	93.6%	No		0.0	0	0	\$0	\$0	\$0	0.0
Mechanical 1	Ice Hockey Rink	1	Chilled Water Pump	25.0	88.5%	No	US Motors	J374A	B	5,000	6	Yes	93.6%	No		0.6	4,306	0	\$597	\$3,141	\$0	5.3
Mechanical 2 Sprinkler Rm	Ice Hockey Rink	1	DHW Circulation Pump	0.3	65.0%	No	Unknown	Unknown	W	8,760		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Multipurpose Field House	Field House	12	Other	0.3	65.0%	No	Unknown	Unknown	W	50		No	65.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior 1	Ice Hockey Rink	1	Supply Fan	20.0	91.7%	No	Baldor	EM2514T	B	7,000	6	Yes	93.0%	No		0.1	1,194	0	\$165	\$2,733	\$0	16.5
Exterior 1	Ice Hockey Rink	2	Exhaust Fan	7.5	87.5%	No	AO Smith	6184T	B	7,000	6	Yes	89.5%	No		0.2	1,500	0	\$208	\$2,756	\$0	13.3
Exterior 1	Ice Hockey Rink	1	Other	5.0	88.5%	No	Baldor	VEM3613T	W	7,000		No	88.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior 1	Locker Rooms	1	Supply Fan	3.0	89.5%	No	Century	CATM557L	W	4,380		No	89.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior 1	Team Locker Rooms	1	Supply Fan	2.0	86.5%	No	AO Smith	327P274	W	4,380		No	86.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior 2	Athletic Center Building	2	Supply Fan	5.0	89.5%	No	Unknown	Unknown	W	4,380		No	89.5%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior 2	Athletic Center Building	1	Supply Fan	10.0	91.7%	No	Unknown	Unknown	W	4,380		No	91.7%	No		0.0	0	0	\$0	\$0	\$0	0.0
Exterior	Various	1	Supply Fan	2.0	86.5%	No	Unknown	Unknown	W	4,380		No	86.5%	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
Rink/Athletic Center Building	Rink/Athletic Center Building	9	Electric Resistance Heat		17.06		1 COP	Unknown	Unknown	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Mechanical 2 Sprinkler Rm	Mechanical 2 Sprinkler Rm	1	Forced Air Furnace		76.00		0.76 AFUE	Hastings	GF-100E	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Ice Hockey Rink	Ice Hockey Rink	5	Infrared Heater		15.35		1 COP	Marley	M4541B	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior 1	Ice Hockey Rink	1	Package Unit		600.00		0.8 AFUE	Munters	AM30G - Dehumidifier	B		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior 1	Ice Hockey Rink	1	Forced Air Furnace		316.00		0.79 AFUE	Trane	GRCA40GFJB0N2BP105D0DEFL	B	8	Yes	1	Forced Air Furnace		316.00		0.97 AFUE	0.0	0	52	\$415	\$6,823	\$500	15.2
Exterior 1	Ice Hockey Rink	1	Forced Air Furnace		237.00		0.79 AFUE	Trane	GFC30GDI	B	8	Yes	1	Forced Air Furnace		237.00		0.97 AFUE	0.0	0	39	\$311	\$5,846	\$500	17.2
Exterior 2	Athletic Center Building	1	Forced Air Furnace		320.00		0.8 AFUE	Trane	OADG000C3-00000AK00-J3AJJ3AJ1-21A31E13A-C01003000-AA 1	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior 2	Athletic Center Building	1	Package Unit	30.00	280.00	10.00	0.8 AFUE	Trane	YCD360B4LY2B2DEB0B0D000H0B00000T00000000	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior 2	Server Room	1	Ductless Mini-Split AC	1.50		11.46		Mitsubishi	PUY-A18NKA7	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Ice Hockey Rink	Ice Hockey Rink	1	Electric Resistance Heat		6.82		1 COP	Watlow	BES25G6S2	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior 2	Athletic Center Building	2	Infrared Heater		162.50		0.65 AFUE	Unknown	Unknown	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior 2	Athletic Center Building	1	Infrared Heater		390.00		0.65 AFUE	Unknown	Unknown	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Athletic Center Building	Squash Court	1	Electric Resistance Heat		163.78		1 COP	Vaporsream	VLC-48-3	W		No							0.0	0	0	\$0	\$0	\$0	0.0
Exterior	Various	1	Forced Air Furnace		237.00		0.79 AFUE	Trane	GRCA30GFJ80N2Bn	B	8	Yes	1	Forced Air Furnace		237.00		0.97 AFUE	0.0	0	39	\$311	\$5,846	\$500	17.2

Electric Chiller Inventory & Recommendations

		Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical 1	Ice Hockey Rink	1	Water-Cooled Reciprocating Chiller	105.00	Cimco Lewis	Unknown	B	7	Yes	1	Water-Cooled Centrifugal Chiller	Constant	105.00	0.90	0.83	26.5	177,780	0	\$24,640	\$161,500	\$2,520	6.5

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
Janitorial 1	Athletic Center Building	1	Storage Tank Water Heater (> 50 Gal)	AO Smith	BTH-120A 300	W		No						0.0	0	0	\$0	\$0	\$0	0.0
Mechanical 2 Sprinkler Rm	Ice Hockey Rink	1	Storage Tank Water Heater (> 50 Gal)	AO Smith	BTH 500A 104	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
Rink/Athletic Center Building	9	3	Faucet Aerator (Kitchen)	2.20	1.50	0.0	0	1	\$5	\$22	\$6	3.3
Rink/Athletic Center Building	9	4	Faucet Aerator (Lavatory)	2.50	0.50	0.0	0	2	\$18	\$29	\$14	0.8
Rink/Athletic Center Building	9	4	Showerhead	2.50	1.50	0.0	0	3	\$25	\$357	\$60	11.9

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
Kitchen 104	1	Stand-Up Freezer, Solid Door (≤15 cu. ft.)	Continental	DL2RF	No		No	0.0	0	0	\$0	\$0	\$0	0.0
Kitchen 104	1	Stand-Up Refrigerator, Solid Door (≤15 cu. ft.)	Continental	DL2RF	No		No	0.0	0	0	\$0	\$0	\$0	0.0

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost (\$)	Total Incentives	Simple Payback w/ Incentives in Years
Rink/Athletic Center Building	2	Ice Making Head (<450 lbs/day), Continuous	Scotsman	CU3030SA-1E	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
Janitorial 1	1	Clothes Washer	1,176	No	Alliance	LTGE5ASP115TW01
Kitchen 104	2	Coffee Machine	800	No	Unknown	Unknown
Office - Enclosed 2	1	Desktop	270	No	Unknown	Unknown
Recreation Ice Hockey Rink	1	Electric Space Heater	1,500	No	Unknown	Unknown
Storage 5	1	Fan (Portable)	200	No	Unknown	Unknown
Office - Enclosed 152	2	Laptop	100	No	Unknown	Unknown
Kitchen 104	1	Microwave	1,000	No	Unknown	Unknown
Mechanical 2 Sprinkler Rm	1	Computer Misc.	2,000	No	Varied	Varied
Storage 1 Zamboni Rm	1	Misc. Equipment	2,500	No	Varied	Varied
Field Rm	1	Large Fans	500	No	Unknown	Unknown
Storage 5	1	Misc. Equipment	1,500	No	Varied	Varied
Rink/Athletic Center Building	2	Printer	200	No	Varied	Varied
Rink/Athletic Center Building	2	Smart Board	200	No	Unknown	Unknown
Corridor	1	Television	100	No	Unknown	Unknown
Corridor	1	Water Fountain	100	No	Unknown	Unknown
Exterior 1	1	EV charging station	19,000	No	Charging Point	Unknown

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
Recreation Ice Hockey Rink	1	Glass Fronted Refrigerated	N/A	No	0.0	0	0	\$0	\$0	\$0	0.0
Recreation Ice Hockey Rink	1	Non-Refrigerated	N/A	No	0.0	0	0	\$0	\$0	\$0	0.0

Miscellaneous Fuel Inventory


Existing Conditions						
Location	Quantity	Equipment Description	Input Capacity per Unit (MBh)	ENERGY STAR Qualified ?	Manufacturer	Model
Janitorial 1	1	Clothes Dryer	22.5	No	Alliance	LTGE5ASP115TW01

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



**ENERGY STAR®
Score¹**

Princeton Day School - Ice Rink / Athletic Center

Primary Property Type: Ice/Curling Rink
Gross Floor Area (ft²): 65,066
Built: 1997

For Year Ending: February 28, 2022
Date Generated: December 28, 2022

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information			
Property Address Princeton Day School - Ice Rink / Athletic Center 650 Great Road Princeton, New Jersey 08540	Property Owner Princeton Day School 650 Great Road Princeton, NJ 08640 (609) 924-6700	Primary Contact Robert Clemens 650 Great Road Princeton, NJ 08640 (609) 924-6700 Ext. 1401 rclemens@pds.org	
Property ID: 22816953			

Energy Consumption and Energy Use Intensity (EUI)			
Site EUI 161.4 kBtu/ft²	Annual Energy by Fuel	National Median Comparison	
	Electric - Solar (kBtu) 450,048 (4%)	National Median Site EUI (kBtu/ft²)	59.3
	Natural Gas (kBtu) 4,996,944 (48%)	National Median Source EUI (kBtu/ft²)	112
	Electric - Grid (kBtu) 5,051,444 (48%)	% Diff from National Median Source EUI	172%
Source EUI 304.9 kBtu/ft²		Annual Emissions	
		Greenhouse Gas Emissions (Metric Tons CO2e/year)	745

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.