Local Government Energy Audit Report

Winding River Park - Ice Rink

November 19, 2020

Prepared for:

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Disclaimer

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information about financial incentives that may be available. 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 installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. Cost estimates include material and labor pricing associated with installation of primary recommended equipment only. Cost estimates do not include demolition or removal of hazardous waste. We encourage the owner of the facility to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual measures and conditions. TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. Please review all available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

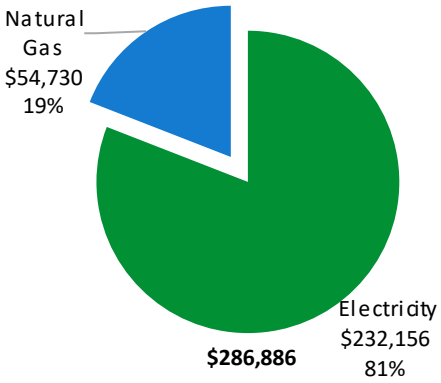
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

Table of Contents

1 EXECUTIVE SUMMARY

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

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $286,886 Electricity: 2,039,600 kWh Natural Gas: 50,379 Therms	
ENERGY STAR® Benchmarking Score	N/A *(1-100 scale)*	A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.

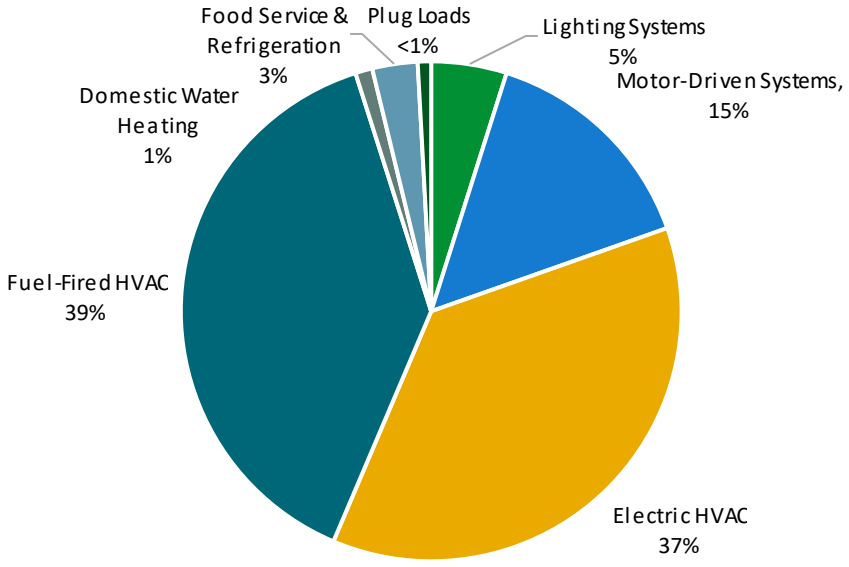


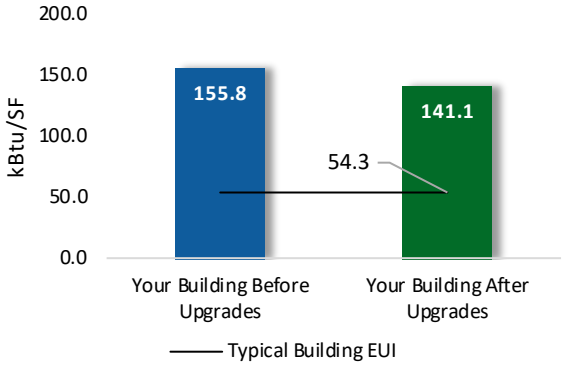
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

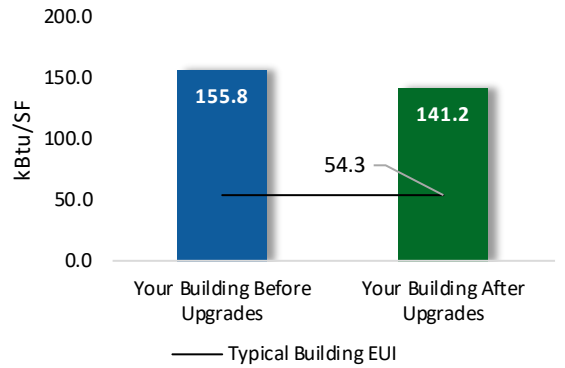
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$228,583
Potential Rebates & Incentives[1]	$50,841
Annual Cost Savings	$37,004
Annual Energy Savings	Electricity: 322,273 kWh Natural Gas: 296 Therms
Greenhouse Gas Emission Savings	164 Tons
Simple Payback	4.8 Years
Site Energy Savings (all utilities)	9%



Scenario 2: Cost Effective Package[2]

Installation Cost	$220,815
Potential Rebates & Incentives	$50,041
Annual Cost Savings	$36,806
Annual Energy Savings	Electricity: 320,533 kWh Natural Gas: 296 Therms
Greenhouse Gas Emission Savings	163 Tons
Simple Payback	4.6 Years
Site Energy Savings (all utilities)	9%



On-site Generation Potential

Photovoltaic	High
Combined Heat and Power	None

[1] Incentives are based on current SmartStart Prescriptive incentives. Other program incentives 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 ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**40,529**	**6.0**	**-8**	**$4,526**	**$8,886**	**$3,446**	**$5,440**	**1.2**	**39,877**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	8,619	1.4	-2	$961	$2,319	$620	$1,699	1.8	8,464
ECM 2	Retrofit Fixtures with LED Lamps	Yes	31,910	4.5	-6	$3,565	$6,567	$2,826	$3,741	1.0	31,413
Lighting Control Measures			**33,441**	**4.5**	**-7**	**$3,734**	**$18,412**	**$3,905**	**$14,507**	**3.9**	**32,894**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	32,724	4.3	-7	$3,654	$17,512	$3,470	$14,042	3.8	32,190
ECM 4	Install High/Low Lighting Controls	Yes	716	0.1	0	$80	$900	$435	$465	5.8	703
Variable Frequency Drive (VFD) Measures			**184,466**	**25.0**	**30**	**$21,321**	**$80,413**	**$20,800**	**$59,613**	**2.8**	**189,256**
ECM 5	Install VFDs on Constant Volume (CV) Fans	Yes	83,884	13.2	0	$9,548	$26,030	$7,600	$18,430	1.9	84,471
ECM 6	Install VFDs on Chilled Water Pumps	Yes	60,777	9.3	0	$6,918	$21,690	$5,600	$16,090	2.3	61,202
ECM 7	Install VFDs on Heating Water Pumps	Yes	27,791	2.7	0	$3,163	$20,848	$5,000	$15,848	5.0	27,986
ECM 8	Install VFDs on Cooling Tower Fans	No	1,740	-0.2	0	$198	$7,768	$800	$6,968	35.2	1,752
ECM 9	Install VFDs on Kitchen Hood Fan Motors	Yes	10,273	0.0	30	$1,494	$4,076	$1,800	$2,276	1.5	13,846
Electric Chiller Replacement			**58,273**	**20.5**	**0**	**$6,633**	**$118,167**	**$21,600**	**$96,567**	**14.6**	**58,680**
ECM 10	Install High Efficiency Chillers	Yes	58,273	20.5	0	$6,633	$118,167	$21,600	$96,567	14.6	58,680
Domestic Water Heating Upgrade			**1,425**	**0.0**	**14**	**$318**	**$1,533**	**$640**	**$893**	**2.8**	**3,114**
ECM 11	Install Low-Flow DHW Devices	Yes	1,425	0.0	14	$318	$1,533	$640	$893	2.8	3,114
Food Service & Refrigeration Measures			**4,141**	**0.5**	**0**	**$471**	**$1,172**	**$450**	**$722**	**1.5**	**4,170**
ECM 12	Refrigeration Controls	Yes	172	0.0	0	$20	$252	$150	$102	5.2	173
ECM 13	Vending Machine Control	Yes	3,969	0.5	0	$452	$920	$300	$620	1.4	3,997
TOTALS (COST EFFECTIVE MEASURES)			**320,533**	**56.6**	**30**	**$36,806**	**$220,815**	**$50,041**	**$170,774**	**4.6**	**326,239**
TOTALS (ALL MEASURES)			**322,273**	**56.4**	**30**	**$37,004**	**$228,583**	**$50,841**	**$177,742**	**4.8**	**327,991**

* - All incentives presented in this table are based on NJ SmartStart equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - 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

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.

The potential ECMs identified for this building likely qualify for multiple incentive and funding programs. Based on current program rules and requirements, your measures are likely to qualify for the following programs:

Energy Conservation Measure		SmartStart	Direct Install	Pay For Performance
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and	X		
ECM 2	Retrofit Fixtures with LED Lamps	X		
ECM 3	Install Occupancy Sensor Lighting Controls	X		
ECM 4	Install High/Low Lighting Controls	X		
ECM 5	Install VFDs on Constant Volume (CV) Fans	X		
ECM 6	Install VFDs on Chilled Water Pumps	X		
ECM 7	Install VFDs on Heating Water Pumps	X		
ECM 8	Install VFDs on Cooling Tower Fans	X		
ECM 9	Install VFDs on Kitchen Hood Fan Motors	X		
ECM 10	Install High Efficiency Chillers	X		
ECM 11	Install Low-Flow DHW Devices	X		
ECM 12	Refrigeration Controls	X		
ECM 13	Vending Machine Control	X		

Figure 3 – Funding Options

New Jersey's Clean Energy Programs At-A-Glance

	SmartStart Flexibility to install at your own pace	**Direct Install** Turnkey installation	**Pay for Performance** Whole building upgrades
Who should use it?	Buildings installing individual measures or small group of measures.	Small to mid-size facilities that can bundle multiple measures together. Average peak demand should be below 200 kW. Not suitable for significant building shell issues.	Mid to large size facilities looking to implement as many measures as possible at one time. Peak demand should be over 200 kW.
How does it work?	Use in-house staff or your preferred contractor.	Pre-approved contractors pass savings along to you via reduced material and labor costs.	Whole-building approach to energy upgrades designed to reduce energy use by at least 15%. The more you save, the higher the incentives.
What are the Incentives?	Fixed incentives for specific energy efficiency measures.	Incentives pay up to 70% of eligible costs, up to $125,000 per project. You pay the remaining 30% directly to the contractor.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
How do I participate?	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified Partner to develop your Energy Reduction Plan and set your energy savings targets.

Take the next step by visiting **www.njcleanenergy.com** for program details, applications, and to contact a qualified contractor.

Individual Measures with SmartStart

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 SmartStart 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 is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation.

Turnkey Installation with Direct Install

The Direct Install program provides turnkey installation of multiple measures through an authorized network of participating contractors. This program can provide substantially higher incentives than SmartStart, up to 70% of the cost of selected measures. Direct Install contractors will assess and verify individual measure eligibility, and, in most cases, they perform the installation work. The Direct Install program is available to sites with an average peak demand of less than 200 kW.

Whole Building Approach with Pay for Performance

Pay for Performance can be a good option for medium to large sized facilities to achieve deep energy savings. Pay for Performance 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. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also use this program. Pay for Performance works for larger customers with a peak demand over 200 kW. The minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings.

More Options from Around the State

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 & Power (CHP)

The CHP program provides incentives for combined heat and power (aka 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.

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.

2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Winding River Park - Ice Rink. 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. This report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

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

2.1 Site Overview

On July 1, 2020, TRC performed an energy audit at Winding River Park - Ice Rink located in Toms River, New Jersey. TRC met with Dean Marusic to review the facility operations and help focus our investigation on specific energy-using systems.

Winding River Park - Ice Rink is a multi-story facility built in 1992, with a 39,000 square foot indoor rink building and a 38,000 square foot outdoor rink. Spaces include ice rinks, skate rental room, offices, kitchen, dining room, main lobby, ticket booth area, lobby, corridor, team room, ice resurface room, chiller room, and mechanical room. There is an outdoor rink right next to the indoor rink which is used during the winter season and as needed for events or tournaments.

Recent improvements include: Over the last several years the facility has replaced all its existing T12 fluorescent fixtures with T8 fluorescent fixtures. The facility is in the process of replacing the commercial dehumidifier for the indoor rink, installing new garage doors and upgrading to a brand-new chiller for the outdoor rink.

Facility concerns include: improving energy efficiency by lowering overall ice rink energy consumption and operating cost

2.2 Building Occupancy

The indoor facility is occupied year-round according to the following schedule. Typical weekday occupancy is five to six staff during the day and eight to ten staff during the weekends. The outdoor rink facility is typically open from the first week of November to late April.

Building Name	Weekday/Weekend	Operating Schedule
Winding River Park - Ice Rink	Weekday	8:00 AM - midnight
	Weekend	6:00 AM - midnight
Winding River Park - Ice Rink (Staff)	Weekday	8:00 AM - 4:30 PM & 4:30 PM - midnight
	Weekend	8:00 AM - 4:30 PM & 4:30 PM - midnight

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Indoor rink walls are made of concrete masonry units (CMUs) with poured concrete and gypsum drywall interior finish. Steel trusses support a pitched roof with a metal deck covered with a standing seam metal roofing system. The area between the roof and rink ceiling is unintentionally heated by waste heat from HVAC equipment. There is a thermal barrier between this access space and the conditioned space of the rink below. Most of the windows are clear double glazed with low-e glass and have aluminum frames with a thermal break. The glass-to-frame seals are in good condition. The operable window weather seals are in good condition, showing very little evidence of excessive wear. Exterior doors are glass with metal frames and are in good condition with undamaged door seals.

The outdoor rink structure is made of wood and vinyl siding with a canopy roof. The canopy roof was installed approximately four years ago. There are enclosed spaces which include locker rooms, waiting area, and skate repair/rental rooms.

Indoor Rink

Outdoor Rink

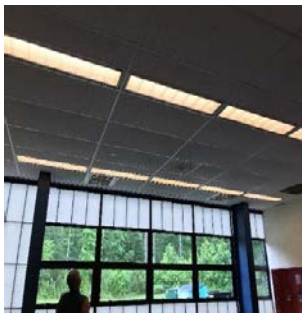
Indoor Rink Doors

Windows

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also several 40-Watt T12 fixtures. Additionally, there are some compact fluorescent lamps (CFL), incandescent, and LED general purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts. Fixture configurations mainly include 1-lamp, 2-lamp, or 4-lamp, 4-foot fixtures, and 4-lamp or 8-lamp, 8-foot fixtures. Fixture types include recessed troffers and surface mounted fixtures. The 2-foot fixtures have U-bend tube T8 lamps.

Indoor and outdoor rinks are illuminated with recessed LED fixtures in various configurations. Most fixtures are in good condition. All exit signs are LED units. Interior lighting levels were generally sufficient.



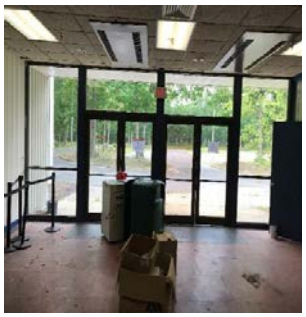
Indoor Rink Lobby Lighting

Cafeteria Lighting

Restroom Lighting

Indoor Rink Lighting

Lighting fixtures in locker rooms and referee room are controlled by occupancy sensors and the remainder of the fixtures in the facility by wall switches.



Outdoor Rink Lobby Lighting

Outdoor Rink Lighting

Locker Room Lighting

Indoor Rink Deck Lighting

Exterior fixtures include wall packs, flood lights, and canopy lights with CFL lamps. The pole mounted parking lot fixtures have with 300-Watt LED fixtures. Exterior light fixtures are controlled by a time clock, or wall switch, depending on the fixture.

Parking Lot Lighting

Outdoor Lighting

CFL Canopy Lighting

Wall Packs

2.5 Air Handling Systems

Unit Ventilators

The entrance lobby in the outdoor rink has seven-unit ventilators with 1/4 hp supply fan motors and pneumatically controlled outside air dampers with hot water heating coils that operate with a pneumatic control system. This system is original to the building and appears to be in fair operating condition.

Electric Heating

Indoor rink has dressing rooms, offices, main lobby, restrooms, and locker rooms which are served by electric baseboards and wall mounted electric heaters. These units are ranging in size from 1.5 kW to 4 kW. They are in good operating conditions.

Packaged Units

The indoor rink has a lobby, main offices, rink side offices, and locker rooms which are served by two Aaon packaged units (RTU-1 and 2) with 40-tons and 25-tons cooling capacity, respectively; each with 9.3 EER efficiency. These units have gas-fired furnaces with an output capacity of 632 MBh and 389 MBh, respectively. RTU-1 is equipped with a 10 hp supply fan motor and a 2 hp exhaust fan motor. RTU-2 is equipped with a 3 hp supply fan motor and has no exhaust fan. These units are equipped with economizers that are in good condition.

There is a commercial dehumidifier (DU-1) serving the indoor rink. This 10.70 EER unit has 120-ton cooling capacity. Dehumidifier has one 20 hp supply fan motor, one 10 hp exhaust fan motor, four 2 hp condenser fan motors, and a 5 hp refrigeration fan.

There are two make up air units serving the indoor rink. These units each provide 240 MBh of heating with 80% efficiency and are each equipped with a 2 hp makeup air fan motor.

The indoor rink has three exhaust fans (EF-1, 6, and 7) which serve various areas of the rink. Exhaust fan motors are either 1/2 hp or 1 hp. The outdoor rink has nine exhaust fans which serve various areas of the rink and each equipped with a 1/3 hp exhaust fan motor.

The outdoor rink has two air handling units used to provide heating in locker room showers and main office located in boiler room each with a 1.5 hp supply fan motor.

Refer to Appendix A for detailed information about each unit.

Packaged Unit

Wall Mount Heater

Make Up Air Unit

Commercial Humidifier

2.6 Heating Hot Water Systems

One Patterson-Kelly 1,700 MBh non-condensing hot water boiler serves the outdoor rink heating load needs. The burners are fully modulating with a nominal efficiency of 85%. Installed in 2007, boiler is in good condition. There is a service contract in place. The boiler serves a primary/secondary distribution system with two constant speed 7.5 hp heating hot water pumps (P1 and P2) circulating the primary loop and two constant speed 3 hp heating hot water pumps (HHW 1 and 2) operating in lead/lag fashion on the secondary loop.

The indoor rink receives hot water which serves unit ventilators and two air handling units through a 2 hp constant flow underground heating hot water pump located in the mechanical room.

Boilers

Heating Hot Water Pumps

2.7 Chilled Water Systems

The indoor rink chiller plant consists of a 265-ton, Trane, R-22, variable speed water-cooled screw centrifugal chiller. The chiller is configured in a primary distribution loop with two 25 hp constant flow primary pumps (CHWP1 and 2). Installed in 2015, the chiller is in good operating condition.

The outdoor rink chiller plant consists of a 120-ton, York, R-22, constant speed water-cooled screw centrifugal chiller. Installed in 1975, the chiller is in good operating condition.

Condenser water is supplied to the chillers by two 7.5 hp, 300 gpm constant flow pumps (P3 and P4). The condenser water system for the indoor rink consists of a one-cell cooling tower with two constant speed 3 hp fan motors which serves the indoor rink chiller and a one-cell cooling tower with a 3/4 hp fan motor. Fan motors for the tower serving the indoor rink are staged based on maintaining basin water temperature.

Indoor Rink Chiller

Outdoor Rink Chiller

Condensing Water Pumps

Cooling Tower

2.8 Building Energy Management Systems (EMS)

A Johnson Controls EMS controls the HVAC equipment, the boiler, chiller, and package units serving the indoor rink. The EMS provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, humidity, and chilled water loop temperatures.

The site staff expressed an interest in expanding the level of control provided by the existing EMS or replacing the EMS to include the outdoor rink after installing a new chiller as well as receiving additional training on operating the EMS.

2.9 Domestic Hot Water

Hot water for restrooms and dressing rooms in the indoor rink is produced with two 100-gallon A.O. Smith 150 MBh gas-fired storage water heaters each with an 80% thermal efficiency. One 1/12 hp circulation pump distributes water to end uses. Hot water for locker rooms in the indoor rink is produced with a 250-gallon PVI 565 MBh gas-fired storage water heater with an 80% thermal efficiency. This storage tank heater has two 1/3 hp combustion air fan and a 1/12 hp recirculation pump distribute water to end uses.

Hot water for locker rooms in the outdoor rink is produced with a 100-gallon State Industries 4.5-kW electric storage water heater. One 1/2 hp and one 1/12 hp circulation pump distribute water to end uses with. The circulation pumps operate continuously. The domestic hot water pipes are insulated, and the insulation is in good condition.

DHW Heater

DHW Heater 2

2.10 Food Service Equipment

The indoor rink kitchen has a mix of gas and electric equipment that is used to prepare meals for visitors and employees. Most cooking is done using a large vat fryer and a gas stove and griddle with combination oven. Bulk prepared foods are held in two electric holding cabinets. Equipment is high efficiency and is in good condition.

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

Gas Griddle

Large Vat Fryer

2.11 Refrigeration

The indoor rink kitchen has three stand-up refrigerators with either solid or glass doors ranging in size from about 20 cubic feet to 40 cubic feet. All equipment is high efficiency and in good condition. The kitchen also has a 145 lbs. ice making self-contained unit. Ice maker is high efficiency and is in good condition.

The kitchen has one 5 hp hood exhaust fan.

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

Ice Machine

Refrigerator

2.12 Plug Load & Vending Machines

The location is doing a great job managing their electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are 10 computer workstations throughout the facility. Plug loads throughout the building include general café and office equipment. There are ice rink typical loads such as skate repair machines, bench grinders and portable space heaters.

There are several residential-style refrigerators throughout the building that are used to store staff lunches and cold beverages. These vary in condition and efficiency.

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

Vending Machine

Television

Ticket Booth

Skate Repair Machine

2.13 Water-Using Systems

There are nine restrooms with toilets, urinals, and sinks. Faucet flow rates are at 1.5 gallons per minute (gpm) or higher. Toilets are rated at 1.6 gallons per flush (gpf) and urinals are rated at 1 gpf. Team locker rooms are infrequently used. The showerheads are rated at 2.5 gpm.

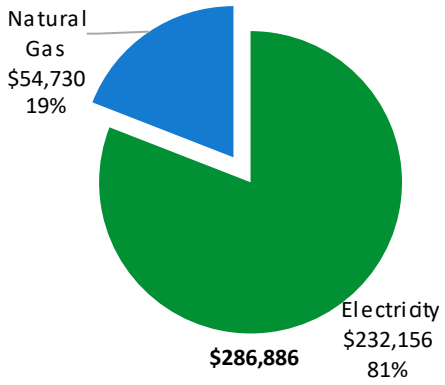
2.14 Process Equipment

Three 2 hp ice melting pumps located in mechanical room of indoor rink collects excessive ice from resurface machine and ejects into the ground.

3 Energy Use and Costs

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

Utility Summary		
Fuel	**Usage**	**Cost**
Electricity	2,039,600 kWh	$232,156
Natural Gas	50,379 Therms	$54,730
Total		**$286,886**



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.

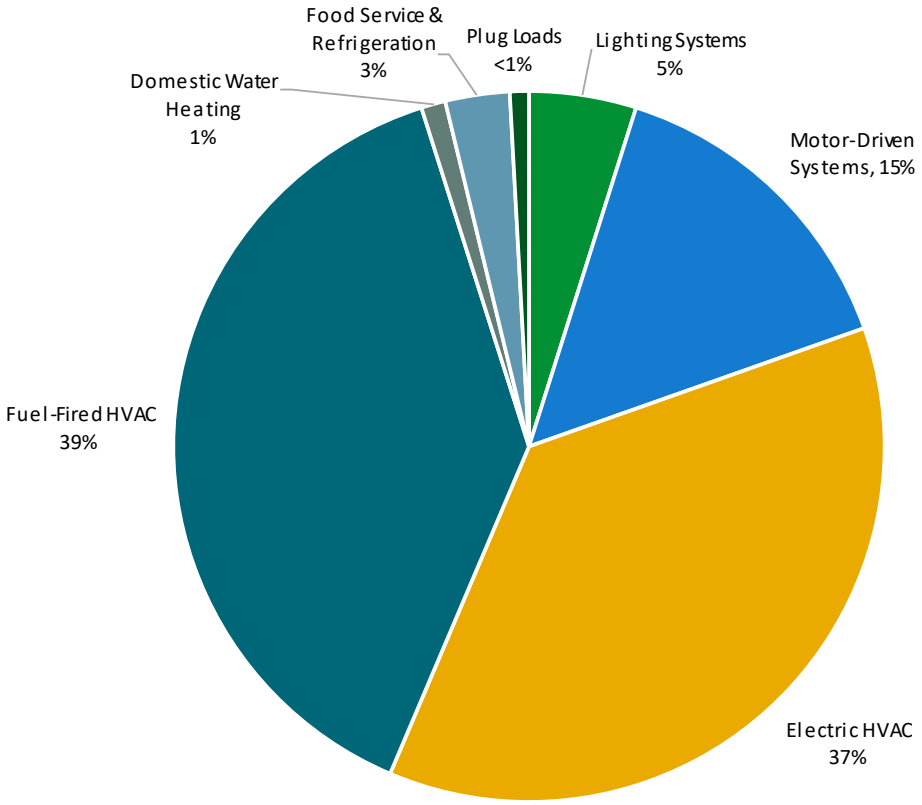
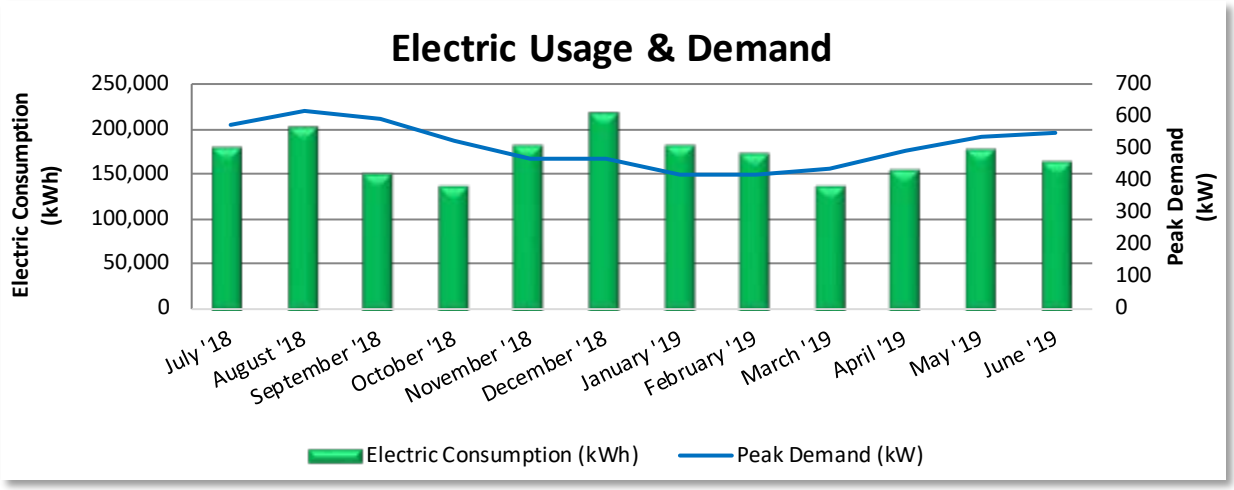


Figure 5 - Energy Balance

3.1 Electricity

JCP&L delivers electricity under rate class General Service Secondary JC_GS3_02D, with electric production provided by South Jersey Energy, a third-party supplier.



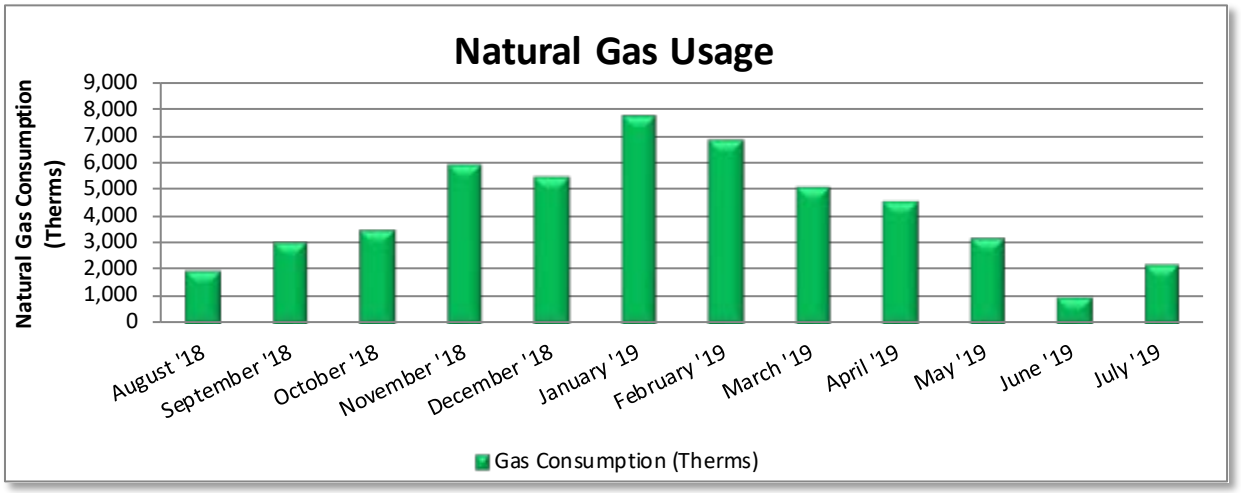
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
8/4/18	32	178,400	572	$0	$19,553
9/4/18	31	200,240	615	$0	$21,878
10/4/18	30	150,000	593	$0	$17,828
11/4/18	31	136,800	524	$0	$16,048
12/4/18	30	180,240	468	$0	$20,594
1/4/19	31	215,200	470	$0	$24,008
2/4/19	31	180,400	417	$1,166	$20,152
3/3/19	27	170,960	416	$0	$19,222
4/2/19	30	134,960	435	$1,669	$15,907
5/4/19	32	154,560	494	$0	$17,816
6/4/19	31	176,160	534	$0	$20,169
7/3/19	29	161,680	547	$0	$18,980
Totals	**365**	**2,039,600**	**615**	**$2,835**	**$232,156**
Annual	**365**	**2,039,600**	**615**	**$2,835**	**$232,156**

Notes:

- Peak demand of 615 kW occurred in August 2018.
- Average demand over the past 12 months was 507 kW.
- The average electric cost over the past 12 months was $0.114/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

NJ Natural Gas delivers natural gas under rate class 007CNN4G, with natural gas supply provided by UGI Energy, a third-party supplier.



Gas Billing Data				
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**	**TRC Estimated Usage?**
8/23/18	29	1,964	$2,540	No
9/26/18	34	3,005	$3,528	No
10/24/18	28	3,465	$3,900	No
11/26/18	33	5,857	$6,151	No
12/21/18	25	5,466	$5,657	No
1/23/19	33	7,674	$7,783	No
2/22/19	30	6,825	$6,974	No
3/26/19	32	5,089	$5,359	No
4/25/19	30	4,569	$4,902	No
5/29/19	34	3,203	$3,627	No
6/25/19	27	1,030	$1,591	No
7/25/19	30	2,232	$2,718	No
Totals	**365**	**50,379**	**$54,730**	
Annual	**365**	**50,379**	**$54,730**	

Notes:

- The average gas cost for the past 12 months is $1.086/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

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

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

Benchmarking Score	**N/A**

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

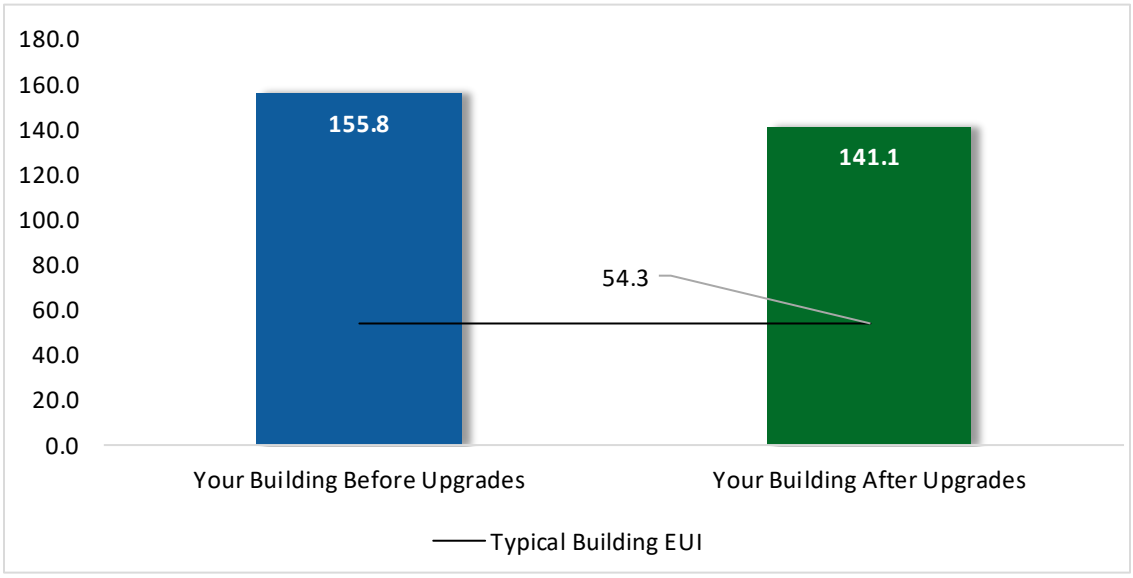


Figure 6 - Energy Use Intensity Comparison[3]

Energy use intensity (EUI) measures energy consumption per square foot and is the standard metric for comparing buildings' energy performance. A lower EUI means better performance and less energy consumed. A number of factors can cause a building to vary from the "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 we 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].

[4] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

4 ENERGY CONSERVATION MEASURES

The goal of this audit report is to identify and evaluate potential energy efficiency improvements, provide information about the cost effectiveness of those improvements, and recognize potential financial incentives from NJBPU. Most energy conservation measures have received preliminary analysis of feasibility which identifies expected ranges of savings and costs. 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 are based on the current NJCEP prescriptive SmartStart program. A higher level of investigation may be necessary to support any SmartStart Custom, Pay for Performance, or Direct Install incentive applications. Some measures and proposed upgrades may be eligible for higher incentives than those shown below through other NJCEP programs described in a following section of this report.

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 ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**40,529**	**6.0**	**-8**	**$4,526**	**$8,886**	**$3,446**	**$5,440**	**1.2**	**39,877**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	8,619	1.4	-2	$961	$2,319	$620	$1,699	1.8	8,464
ECM 2	Retrofit Fixtures with LED Lamps	Yes	31,910	4.5	-6	$3,565	$6,567	$2,826	$3,741	1.0	31,413
Lighting Control Measures			**33,441**	**4.5**	**-7**	**$3,734**	**$18,412**	**$3,905**	**$14,507**	**3.9**	**32,894**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	32,724	4.3	-7	$3,654	$17,512	$3,470	$14,042	3.8	32,190
ECM 4	Install High/Low Lighting Controls	Yes	716	0.1	0	$80	$900	$435	$465	5.8	703
Variable Frequency Drive (VFD) Measures			**184,466**	**25.0**	**30**	**$21,321**	**$80,413**	**$20,800**	**$59,613**	**2.8**	**189,256**
ECM 5	Install VFDs on Constant Volume (CV) Fans	Yes	83,884	13.2	0	$9,548	$26,030	$7,600	$18,430	1.9	84,471
ECM 6	Install VFDs on Chilled Water Pumps	Yes	60,777	9.3	0	$6,918	$21,690	$5,600	$16,090	2.3	61,202
ECM 7	Install VFDs on Heating Water Pumps	Yes	27,791	2.7	0	$3,163	$20,848	$5,000	$15,848	5.0	27,986
ECM 8	Install VFDs on Cooling Tower Fans	No	1,740	-0.2	0	$198	$7,768	$800	$6,968	35.2	1,752
ECM 9	Install VFDs on Kitchen Hood Fan Motors	Yes	10,273	0.0	30	$1,494	$4,076	$1,800	$2,276	1.5	13,846
Electric Chiller Replacement			**58,273**	**20.5**	**0**	**$6,633**	**$118,167**	**$21,600**	**$96,567**	**14.6**	**58,680**
ECM 10	Install High Efficiency Chillers	Yes	58,273	20.5	0	$6,633	$118,167	$21,600	$96,567	14.6	58,680
Domestic Water Heating Upgrade			**1,425**	**0.0**	**14**	**$318**	**$1,533**	**$640**	**$893**	**2.8**	**3,114**
ECM 11	Install Low-Flow DHW Devices	Yes	1,425	0.0	14	$318	$1,533	$640	$893	2.8	3,114
Food Service & Refrigeration Measures			**4,141**	**0.5**	**0**	**$471**	**$1,172**	**$450**	**$722**	**1.5**	**4,170**
ECM 12	Refrigeration Controls	Yes	172	0.0	0	$20	$252	$150	$102	5.2	173
ECM 13	Vending Machine Control	Yes	3,969	0.5	0	$452	$920	$300	$620	1.4	3,997
TOTALS			**322,273**	**56.4**	**30**	**$37,004**	**$228,583**	**$50,841**	**$177,742**	**4.8**	**327,991**

* - All incentives presented in this table are based on NJ SmartStart equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

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

Figure 7 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**40,529**	**6.0**	**-8**	**$4,526**	**$8,886**	**$3,446**	**$5,440**	**1.2**	**39,877**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	8,619	1.4	-2	$961	$2,319	$620	$1,699	1.8	8,464
ECM 2	Retrofit Fixtures with LED Lamps	31,910	4.5	-6	$3,565	$6,567	$2,826	$3,741	1.0	31,413
Lighting Control Measures		**33,441**	**4.5**	**-7**	**$3,734**	**$18,412**	**$3,905**	**$14,507**	**3.9**	**32,894**
ECM 3	Install Occupancy Sensor Lighting Controls	32,724	4.3	-7	$3,654	$17,512	$3,470	$14,042	3.8	32,190
ECM 4	Install High/Low Lighting Controls	716	0.1	0	$80	$900	$435	$465	5.8	703
Variable Frequency Drive (VFD) Measures		**182,726**	**25.2**	**30**	**$21,123**	**$72,645**	**$20,000**	**$52,645**	**2.5**	**187,504**
ECM 5	Install VFDs on Constant Volume (CV) Fans	83,884	13.2	0	$9,548	$26,030	$7,600	$18,430	1.9	84,471
ECM 6	Install VFDs on Chilled Water Pumps	60,777	9.3	0	$6,918	$21,690	$5,600	$16,090	2.3	61,202
ECM 7	Install VFDs on Heating Water Pumps	27,791	2.7	0	$3,163	$20,848	$5,000	$15,848	5.0	27,986
ECM 9	Install VFDs on Kitchen Hood Fan Motors	10,273	0.0	30	$1,494	$4,076	$1,800	$2,276	1.5	13,846
Electric Chiller Replacement		**58,273**	**20.5**	**0**	**$6,633**	**$118,167**	**$21,600**	**$96,567**	**14.6**	**58,680**
ECM 10	Install High Efficiency Chillers	58,273	20.5	0	$6,633	$118,167	$21,600	$96,567	14.6	58,680
Domestic Water Heating Upgrade		**1,425**	**0.0**	**14**	**$318**	**$1,533**	**$640**	**$893**	**2.8**	**3,114**
ECM 11	Install Low-Flow DHW Devices	1,425	0.0	14	$318	$1,533	$640	$893	2.8	3,114
Food Service & Refrigeration Measures		**4,141**	**0.5**	**0**	**$471**	**$1,172**	**$450**	**$722**	**1.5**	**4,170**
ECM 12	Refrigeration Controls	172	0.0	0	$20	$252	$150	$102	5.2	173
ECM 13	Vending Machine Control	3,969	0.5	0	$452	$920	$300	$620	1.4	3,997
TOTALS		**320,533**	**56.6**	**30**	**$36,806**	**$220,815**	**$50,041**	**$170,774**	**4.6**	**326,239**

* - All incentives presented in this table are based on NJ SmartStart equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

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

Figure 8 – 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 ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**40,529**	**6.0**	**-8**	**$4,526**	**$8,886**	**$3,446**	**$5,440**	**1.2**	**39,877**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	8,619	1.4	-2	$961	$2,319	$620	$1,699	1.8	8,464
ECM 2	Retrofit Fixtures with LED Lamps	31,910	4.5	-6	$3,565	$6,567	$2,826	$3,741	1.0	31,413

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 are proposed, we suggest converting all of a specific lighting type (e.g., linear fluorescent) to LED lamps to minimize the number of lamp types in use at the facility, which should help reduce future maintenance costs.

ECM 1: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

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

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

Affected building areas: fixtures with T12 fluorescent lamps in team dressing rooms, the mechanical room, and entrance lobby in the indoor rink and salt storage in the outdoor rink

ECM 2: Retrofit Fixtures with LED Lamps

Replace linear fluorescent, CFL, or incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies.

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

Affected building areas: all areas with fluorescent fixtures with T8 tubes, CFL, and incandescent lamps.

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**33,441**	**4.5**	**-7**	**$3,734**	**$18,412**	**$3,905**	**$14,507**	**3.9**	**32,894**
ECM 3	Install Occupancy Sensor Lighting Controls	32,724	4.3	-7	$3,654	$17,512	$3,470	$14,042	3.8	32,190
ECM 4	Install High/Low Lighting Controls	716	0.1	0	$80	$900	$435	$465	5.8	703

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: restrooms, skate rental room, locker areas, electric room, lobby, corridors, offices, storages, team rooms, and upstairs seating.

ECM 4: 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.

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

Affected building areas: stairs, restroom hallway

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 an occupant approaches.

4.3 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**184,466**	**25.0**	**30**	**$21,321**	**$80,413**	**$20,800**	**$59,613**	**2.8**	**189,256**
ECM 5	Install VFDs on Constant Volume (CV) Fans	83,884	13.2	0	$9,548	$26,030	$7,600	$18,430	1.9	84,471
ECM 6	Install VFDs on Chilled Water Pumps	60,777	9.3	0	$6,918	$21,690	$5,600	$16,090	2.3	61,202
ECM 7	Install VFDs on Heating Water Pumps	27,791	2.7	0	$3,163	$20,848	$5,000	$15,848	5.0	27,986
ECM 8	Install VFDs on Cooling Tower Fans	1,740	-0.2	0	$198	$7,768	$800	$6,968	35.2	1,752
ECM 9	Install VFDs on Kitchen Hood Fan Motors	10,273	0.0	30	$1,494	$4,076	$1,800	$2,276	1.5	13,846

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

ECM 5: Install VFDs on Constant Volume (CV) Fans

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

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

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

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

Affected air handlers: dehumidifier DU-1, Lobby/Main Offices RTU-1, Rink Offices, and Locker RTU-2.

ECM 6: Install VFDs on Chilled Water Pumps

Install VFDs to control chilled water pumps. Two-way valves must serve the chilled water coils being served and the chilled water loop must have a differential pressure sensor installed. If three-way valves or a bypass leg are used in the chilled water distribution they will need to be modified when this measure is implemented. As the chilled water valves close, the differential pressure increases, and the VFD modulates the pump speed to maintain a differential pressure setpoint.

For systems with variable chilled water flow through the chiller, the minimum flow to prevent the chiller from tripping off will need to be determined during the final project design. The control system should be programmed to maintain the minimum flow through the chiller and to prevent pump cavitation.

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

Affected pumps: chilled water pump 1 and 2.

ECM 7: Install VFDs on Heating Water Pumps

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

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

Affected pumps: underfloor heat pump P5, P1, P2, and secondary HHW 1 & 2.

ECM 8: Install VFDs on Cooling Tower Fans

We evaluated a VFD to control the cooling tower fan motor. The VFD will allow the cooling tower fan to operate at the minimum speed necessary to maintain the temperature of the condenser water returning to the chiller.

Energy savings result from reducing fan speed (and power) when there is a reduced load on the chiller and outside air wet bulb temperatures are depressed. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

Affected pumps: indoor rink - cooling tower fan.

ECM 9: Install VFDs on Kitchen Hood Fan Motors

Install VFDs and sensors to control the kitchen hood fan motors. The air flow of the hood is varied based on two key inputs: temperature and smoke/cooking fumes. The VFD controls the amount of exhaust (and kitchen make-up air) based on temperature—the lower the temperature the lower the flow. If the optic sensor is triggered by smoke or cooking fumes, the speed of the fan ramps up to 100%.

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

Affected pumps: KEF-1.

4.4 Electric Chillers

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Chiller Replacement		**58,273**	**20.5**	**0**	**$6,633**	**$118,167**	**$21,600**	**$96,567**	**14.6**	**58,680**
ECM 10	Install High Efficiency Chillers	58,273	20.5	0	$6,633	$118,167	$21,600	$96,567	14.6	58,680

ECM 10: Install High Efficiency Chillers

We evaluated the replacement of the older inefficient electric chiller with a new high efficiency chiller. 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 at this facility. In some cases, the plant energy use can be reduced by selecting multiple chillers that match the facility load profile rather than one or two large chillers. This can also improve the chiller plant reliability through increased redundancy. Energy savings are maximized by proper selection of new equipment based on the cooling load profile.

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

4.5 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**1,425**	**0.0**	**14**	**$318**	**$1,533**	**$640**	**$893**	**2.8**	**3,114**
ECM 11	Install Low-Flow DHW Devices	1,425	0.0	14	$318	$1,533	$640	$893	2.8	3,114

ECM 11: Install Low-Flow DHW Devices

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

Device	Flow Rate
Faucet aerators (lavatory)	0.5 gpm
Faucet aerator (kitchen)	1.5 gpm
Showerhead	2.0 gpm

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing.

Additional cost savings may result from reduced water usage.

4.6 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**4,141**	**0.5**	**0**	**$471**	**$1,172**	**$450**	**$722**	**1.5**	**4,170**
ECM 12	Refrigeration Controls	172	0.0	0	$20	$252	$150	$102	5.2	173
ECM 13	Vending Machine Control	3,969	0.5	0	$452	$920	$300	$620	1.4	3,997

ECM 12: Refrigeration Controls

Novelty coolers often run continuously. This measure adds a control system feature to automatically shut off novelty coolers based on pre-set store operating hours. Based on programmed hours, the control mechanism shuts off the cooler at the end of business and then begins operation on reduced cycles. Regular compressor operation begins the following day an hour before the start of business.

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

ECM 13: Vending Machine Control

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

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 between 5 to 20 percent 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, planned capital upgrades, and 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 will 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 can't manage what you don't measure. ENERGY STAR® Portfolio Manager® is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions[5]. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Doors and Windows

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

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.

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

Lighting Controls

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

Motor Controls

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

Motor Maintenance

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

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.

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 check for fire dampers or balancing dampers that have failed closed.

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

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

Boiler Maintenance

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

Furnace Maintenance

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

Water Heater Maintenance

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

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

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

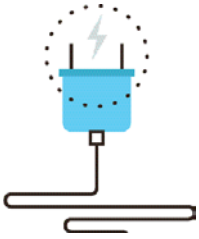
Refrigeration Equipment Maintenance

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

Maintaining your commercial refrigeration equipment can save between 5 and 10 percent on energy costs. When condenser coils are dirty, your commercial refrigerators and freezers work harder to maintain the temperature inside. Worn gaskets, hinges, door handles or faulty seals cause cold air to leak from the unit, forcing the unit to run longer and use more electricity.

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

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips[6]. Your local utility may offer incentives or rebates for this equipment.

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

Computer Monitor Replacement

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

Computer Power Management Software

Many computers consume power during nights, weekends, and holidays. Screen savers are commonly confused as a power management strategy. This contributes to avoidable, excessive electrical energy consumption. There are innovative power management software packages available that are designed to deliver significant energy saving and provide ongoing tracking measurements. A central power management platform helps enforce energy savings policies as well as identify and eliminate underutilized devices.

Water Conservation

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

For more information regarding water conservation go to the EPA's WaterSense® website[7] or download a copy of EPA's "WaterSense® at Work: Best Management Practices for Commercial and Institutional Facilities"[8] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

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

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

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

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.

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

[8] 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.

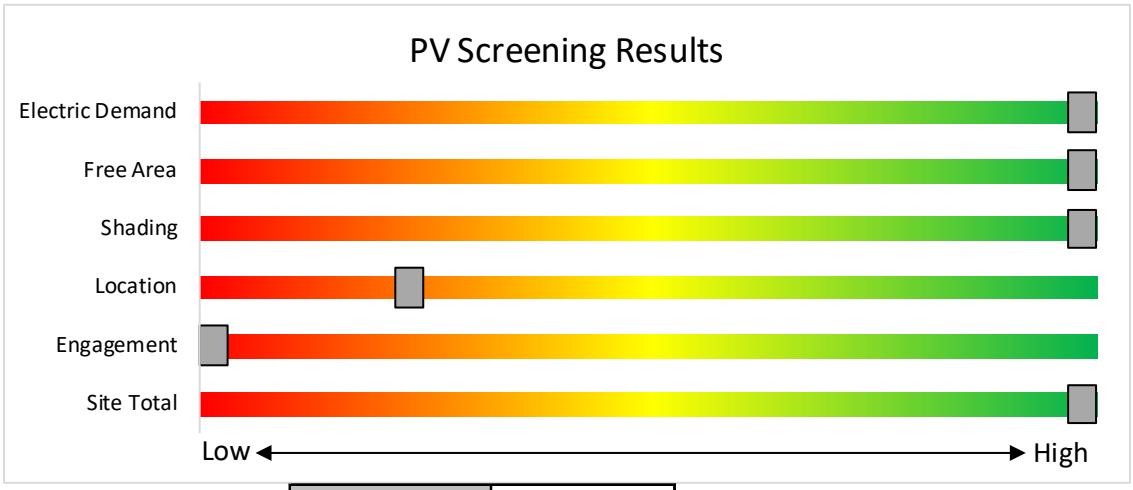
6.1 Solar Photovoltaic

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 (parking lot), and the lack of shading elements contribute to the high potential. A PV array located in the parking lot 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.



Potential	High	
System Potential	500	kW DC STC
Electric Generation	595,685	kWh/yr
Displaced Cost	$67,800	/yr
Installed Cost	$1,690,000	

Figure 9 - Photovoltaic Screening

Transition Incentive (TI) Program

The TI program is a bridge between the Legacy SREC Program and a to-be determined Successor Incentive Program. The program is used to register the intent to install 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 TRECs (Transition Incentive Renewable Energy Certificates). The Transition Incentive is structured as a factorized renewable energy certificate. The factors allow the TI Program to provide differentiated financial incentives for different types of solar installation.

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:

Transition Incentive (TI) Program: https://www.njcleanenergy.com/renewable-energy/programs/transition-incentive-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. Low and infrequent thermal load and lack of space for siting the equipment are the most significant factors contributing to the lack of CHP potential.

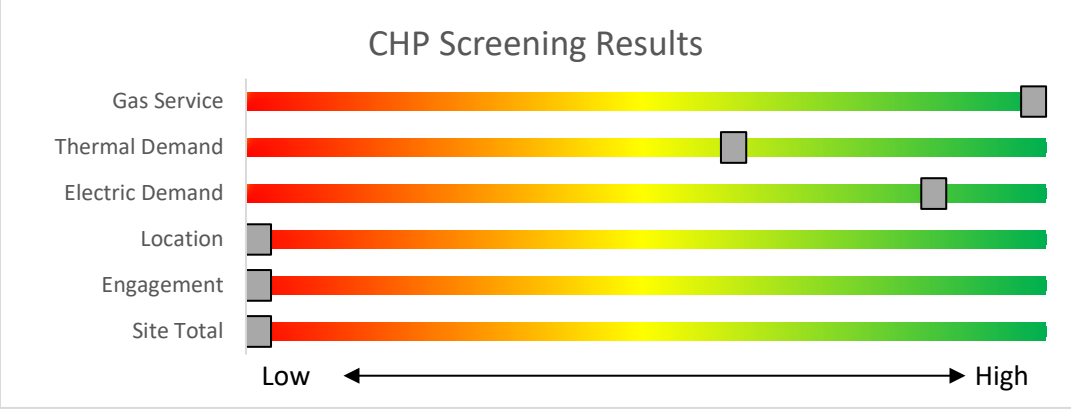


Figure 10 - CHP Screening

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 PROJECT FUNDING AND INCENTIVES

Ready to improve your building's performance? New Jersey's Clean Energy Programs can help. Pick the program that works best for you. Incentive programs that may apply to this facility are identified in the Executive Summary. This section provides an overview of currently available New Jersey Clean Energy Programs.

	SmartStart *Flexibility to install at your own pace*	**Direct Install** *Turnkey installation*	**Pay for Performance** *Whole building upgrades*
Who should use it?	Buildings installing individual measures or small group of measures.	Small to mid-size facilities that can bundle multiple measures together. Average peak demand should be below 200 kW. Not suitable for significant building shell issues.	Mid to large size facilities looking to implement as many measures as possible at one time. Peak demand should be over 200 kW.
How does it work?	Use in-house staff or your preferred contractor.	Pre-approved contractors pass savings along to you via reduced material and labor costs.	Whole-building approach to energy upgrades designed to reduce energy use by at least 15%. The more you save, the higher the incentives.
What are the Incentives?	Fixed incentives for specific energy efficiency measures.	Incentives pay up to 70% of eligible costs, up to $125,000 per project. You pay the remaining 30% directly to the contractor.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
How do I participate?	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified Partner to develop your Energy Reduction Plan and set your energy savings targets.
Take the next step by visiting **www.njcleanenergy.com** for program details, applications, and to contact a qualified contractor.			

7.1 SmartStart

SmartStart 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.

SmartStart routinely adds, removes, or modifies incentives from year-to-year for various energy-efficient equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Incentives

The SmartStart Prescriptive program provides fixed incentives for specific energy efficiency measures. Prescriptive incentives vary by equipment type.

SmartStart Custom provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentives. Custom incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings. Incentives are capped at 50% of the total installed incremental project cost, or a project cost buy down to a one-year payback (whichever is less). Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

Submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. You can work with your preferred contractor or use internal staff to install measures.

Visit www.njcleanenergy.com/SSB for a detailed program description, instructions for applying, and applications.

7.2 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 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.

Based on the site building and utility data provided, the facility does not meet the requirements of the current DI program.

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to $125,000 per project. Each entity is limited to incentives up to $250,000 per fiscal year.

How to Participate

To participate in Direct Install, you will need to contact the participating contractor assigned to the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct Install website linked below. 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 program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI.

7.3 Pay for Performance - Existing Buildings

Pay for Performance works for larger customers with a peak demand over 200 kW. The minimum installed scope of work must include at least two unique measures that results in at least 15% source energy savings, and lighting cannot make up the majority of the savings.

P4P is a generally a good option for medium-to-large sized facilities looking to implement as many measures as possible under a single project to achieve deep energy savings. This program 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.

The scope of work presented in this audit report does not quite meet the requirements of the current P4P program. However, due to the size of the facility and existing conditions, should additional measures be identified at a later point in time, this facility could potentially meet the requirements necessary to participate in the P4P program.

Incentives

Incentives are based on estimated and achieved energy savings ranging from $0.18-$0.22/kWh and $1.80-$2.50/therm, capped at the lesser of 50% total project cost, or $1 million per electric account and $1 million per natural gas account, per fiscal year, not to exceed $2 million per project. An incentive of $0.15/square foot is also available to offset the cost of developing the Energy Reduction Plan (see below) contingent on the project moving forward with measure installation.

How to Participate

Contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, they will help further evaluate the measures identified in this report through development of the energy reduction plan), assist you in implementing selected measures, and verify actual savings one year after the installation. Your Partner will also help you apply for incentives.

Approval of the final scope of work is required by the program prior to installation. Installation can be done by the contractor of your choice (some P4P Partners are also contractors) or by internal staff, but the Partner remains involved throughout construction to ensure compliance with the program requirements.

Detailed program descriptions, instructions for applying, applications and list of Partners can be found at: www.njcleanenergy.com/P4P.

7.4 Combined Heat and Power

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

Incentives

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

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

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

How to Participate

You 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.

7.5 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 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 (ESP) 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 description 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.

7.6 Transition Incentive (TI) Program

The TI program is a bridge between the Legacy SREC Program and a to-be determined Successor Incentive Program. The program is used to register the intent to install 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 TRECs (Transition Incentive Renewable Energy Certificates). The Transition Incentive is structured as a factorized renewable energy certificate. The factors allow the TI Program to provide differentiated financial incentives for different types of solar installations. NJBPU calculates the value of a Transition Renewable Energy Certificate (TREC) by multiplying the base compensation rate ($152/MWh) by the project's assigned factor (i.e. $152 x 0.85 = $129.20/MWh). The TREC factors are defined based on the chart below:

Project Type	Factor
Subsection (t): landfill, brownfield, areas of historic fill	1.00
Grid supply (Subsection (r)) rooftop	1.00
Net metered non-residential rooftop and carport	1.00
Community solar	0.85
Grid supply (Subsection (r)) ground mount	0.60
Net metered residential ground mount	0.60
Net metered residential rooftop and carport	0.60
Net metered non-residential ground mount	0.60

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number, which enables it to generate New Jersey TRECs.

Eligible projects may generate TRECs for 15 years following the commencement of commercial operations (also referred to as the "Transition Incentive Qualification Life"). After 15 years, projects may be eligible for a NJ Class I REC.

TRECs will be used by the identified compliance entities to satisfy a compliance obligation tied to a new Transition Incentive Renewable Portfolio Standard ("TI-RPS"), which will exist in parallel with, and completely separate from, the existing Solar RPS for Legacy SRECs. The TI-RPS is a carve-out of the current Class I RPS requirement. The creation of TRECs is based upon metered generation supplied to PJM-EIS General Attribute Tracking System ("GATS") by the owners of eligible facilities or their agents. GATS would create one TREC for each MWh of energy produced from a qualified facility.

TRECs will be purchased monthly by a TREC Administrator who will allocate the TRECs 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.

Solar projects help the State of New Jersey reach renewable energy goals outlined in the state's Energy Master Plan. The Transition Incentive Program online portal is now open to new applications effective May 1, 2020. There are instructions on "How and When to Transfer my SRP Registration to the Transition Incentive Program". If you are considering installing solar photovoltaics on your building, visit the following link for more information:

https://www.njcleanenergy.com/renewable-energy/programs/transition-incentive-program

8 Energy Purchasing and Procurement Strategies

8.1 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. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

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

A list of licensed third-party electric suppliers is available at the NJBPU website[9].

8.2 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 that fluctuate monthly. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third-party supplier for natural gas commodity.

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

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

A list of licensed third-party natural gas suppliers is available at the NJBPU website[10].

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main Lobby	3	Compact Fluorescent: 4 Pin - 2L	Wall Switch	S	64	6,334	2, 3	Relamp	Yes	3	LED Lamps: 4 Pin - 2L	Occupancy Sensor	45	4,370	0.1	679	0	$76	$351	$12	4.5
Skate Rental Room	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	6,334	3	None	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,370	0.0	184	0	$21	$270	$70	9.7
Skate Booth	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	6,334		None	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	6,334	0.0	0	0	$0	$0	$0	0.0
Locker Area	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,334	3	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.1	922	0	$103	$270	$70	1.9
Dining Area	24	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	6,334	3	None	Yes	24	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,370	0.1	865	0	$96	$540	$140	4.1
Men Restroom	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,334	3	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.0	369	0	$41	$270	$70	4.9
Women Restroom	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,334	3	None	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.1	553	0	$62	$270	$70	3.2
Restroom Lobby	2	Compact Fluorescent: 4 Pin - 2L	Wall Switch	S	64	6,334	2, 3	Relamp	Yes	2	LED Lamps: 4 Pin - 2L	Occupancy Sensor	45	4,370	0.1	453	0	$50	$324	$8	6.3
Electric Room	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,167		None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,167	0.0	0	0	$0	$0	$0	0.0
Side Entrance	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,334	3	None	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.0	307	0	$34	$270	$70	5.8
Side Entrance	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
Concession Area	7	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	6,334	3	None	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,370	0.1	646	0	$72	$270	$70	2.8
Kitchen Hood	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,334	3	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.0	184	0	$21	$270	$70	9.7
Kitchen	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
Dining Room	9	Compact Fluorescent: 4 Pin - 2L	Wall Switch	S	64	6,334	2, 3	Relamp	Yes	9	LED Lamps: 4 Pin - 2L	Occupancy Sensor	45	4,370	0.3	2,037	0	$227	$513	$106	1.8
Main Lobby	30	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,334	3	None	Yes	30	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.2	1,845	0	$206	$540	$0	2.6
Main Lobby	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Main Office	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,334	3	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.0	184	0	$21	$270	$70	9.7
GM Office	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	6,334	3	None	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,370	0.0	184	0	$21	$270	$70	9.7
Spare Room	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	6,334	3	None	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,370	0.0	184	0	$21	$270	$70	9.7
Restroom	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,334		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,334	0.0	0	0	$0	$0	$0	0.0
Ticket Booth	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	6,334		None	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	6,334	0.0	0	0	$0	$0	$0	0.0
Skate Rental Room	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,334	3	None	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.1	492	0	$55	$270	$70	3.6
Rink Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.1	1,149	0	$128	$416	$150	2.1
EMR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,334	0.0	226	0	$25	$37	$20	0.7

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.1	862	0	$96	$380	$130	2.6
Server Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,167	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,167	0.0	113	0	$13	$37	$20	1.3
Hockey Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,267	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	874	0.1	172	0	$19	$380	$60	16.6
Cleaning Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	633	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	633	0.0	23	0	$3	$37	$20	6.6
22 First Aid	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.2	1,436	0	$160	$453	$170	1.8
Janitor Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	633	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	633	0.0	23	0	$3	$37	$20	6.6
Referee Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.2	1,436	0	$160	$453	$170	1.8
030 Women Dress	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.1	862	0	$96	$380	$130	2.6
030 Women Restroom	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,334		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,334	0.0	0	0	$0	$0	$0	0.0
030 Women Restroom	1	LED Lamps: (1) 10.5W Plug-In Lamp	Wall Switch	S	11	6,334		None	No	1	LED Lamps: (1) 10.5W Plug-In Lamp	Wall Switch	11	6,334	0.0	0	0	$0	$0	$0	0.0
32 Team Dressing 1	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.3	2,585	-1	$288	$599	$250	1.2
32 Team Dressing Shower	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.2	1,723	0	$192	$489	$190	1.6
32 Team Dressing Shower	6	LED Lamps: (1) 10.5W Plug-In Lamp	Wall Switch	S	11	6,334	3	None	Yes	6	LED Lamps: (1) 10.5W Plug-In Lamp	Occupancy Sensor	11	4,370	0.0	134	0	$15	$270	$70	13.4
35 Team Dressing 2	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.3	2,585	-1	$288	$599	$250	1.2
35 Team Dressing 3	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.2	1,436	0	$160	$453	$170	1.8
35 Team Dressing 3	3	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	6,334	1, 3	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.2	1,395	0	$156	$476	$130	2.2
35 Team Dressing 3	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,334		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,334	0.0	0	0	$0	$0	$0	0.0
35 Team Dressing Shower	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.2	1,723	0	$192	$489	$190	1.6
35 Team Dressing Shower	6	LED Lamps: (1) 10.5W Plug-In Lamp	Wall Switch	S	11	6,334	3	None	Yes	6	LED Lamps: (1) 10.5W Plug-In Lamp	Occupancy Sensor	11	4,370	0.0	134	0	$15	$270	$70	13.4
37 Team Dressing 4	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.3	2,585	-1	$288	$599	$250	1.2
Electric Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,167	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,167	0.1	451	0	$50	$146	$80	1.3
Mechanical Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,334	0.1	903	0	$101	$146	$80	0.7
Mechanical ROom	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Outside Exit	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.1	574	0	$64	$343	$40	4.7
Outside Exit	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

	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Ice Resurface Room	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	6,334	3	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.0	369	0	$41	$270	$70	4.9
Ice Resurface Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,370	0.1	574	0	$64	$73	$40	0.5
Chiller Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,334	0.2	1,806	0	$201	$292	$160	0.7
Chiller Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Ice Rink	55	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	6,334	3	None	Yes	55	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,370	0.9	6,764	-1	$754	$1,080	$280	1.1
Ice Rink	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
Elevator	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Breaker Panel	S	62	6,334	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Breaker Panel	29	6,334	0.0	226	0	$25	$37	$20	0.7
Upstairs Seating	29	Compact Fluorescent: 4 Pin - 2L	Wall Switch	S	64	6,334	2, 3	Relamp	Yes	29	LED Lamps: 4 Pin - 2L	Occupancy Sensor	45	4,370	0.8	6,564	-1	$732	$1,593	$326	1.7
Stairs 2	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 4	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	4,370	0.0	287	0	$32	$262	$20	7.5
Stairs 2	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs 1	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	6,334	2, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	4,370	0.1	862	0	$96	$335	$270	0.7
Stairs 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
Exterior	12	Compact Fluorescent: 4 Pin - 2L	Wall Switch		84	6,334	2, 3	Relamp	Yes	12	LED Lamps: 4 Pin - 2L	Occupancy Sensor	59	4,370	0.0	3,301	0	$376	$1,134	$258	2.3
Canopy	3	Compact Fluorescent: (1) 18W Plug-In Lamp	Timeclock		18	4,380	2	Relamp	No	3	LED Lamps: Bulb - 1L	Timeclock	13	4,380	0.0	71	0	$8	$52	$6	5.7
Parking Lot	13	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Timeclock		300	4,380		None	No	13	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	300	4,380	0.0	0	0	$0	$0	$0	0.0
Outdoor Rink																					
Mechanical Room	5	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	5,127	1	Relamp & Reballast	No	5	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	5,127	0.4	2,381	-1	$266	$643	$200	1.7
Janitor Closet	1	Incandescent: Bulb - 1L	Wall Switch	S	60	513	2	Relamp	No	1	LED Lamps: Bulb - 1L	Wall Switch	9	513	0.0	28	0	$3	$17	$2	4.8
Men Restroom	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	5,127	3	None	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,538	0.0	224	0	$25	$270	$70	8.0
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	513	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	354	0.1	82	0	$9	$416	$80	36.8
Trophy Store	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,127	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,538	0.1	465	0	$52	$189	$80	2.1
Restroom Hall	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	5,127	2, 4	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	3,538	0.3	1,639	0	$183	$517	$385	0.7
Women Restroom	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	5,127	3	None	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,538	0.0	224	0	$25	$270	$70	8.0
Entrance Lobby	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	5,127	3	None	Yes	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,538	0.0	117	0	$13	$270	$0	20.7
Entrance Lobby	16	Linear Fluorescent - T12: 8' T12 (75W) - 1L	Wall Switch	S	92	5,127	1, 3	Relamp & Reballast	Yes	16	LED - Linear Tubes: (1) 8' Lamp	Occupancy Sensor	36	3,538	1.0	5,950	-1	$664	$1,891	$320	2.4

	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Entrance Lobby	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	5,127	3	None	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,538	0.1	398	0	$44	$270	$0	6.1
Back Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	513	2, 3	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	354	0.2	123	0	$14	$489	$120	26.9
Ticket Booth	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	5,127	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	5,127	0.0	161	0	$18	$72	$20	2.9
Entrance Lobby	9	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	5,127	3	None	Yes	9	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,538	0.0	263	0	$29	$270	$0	9.2
Entrance Lobby	7	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Seating Area	11	LED Lamps: (1) 10.5W Plug-In Lamp	Wall Switch	S	11	5,127	3	None	Yes	11	LED Lamps: (1) 10.5W Plug-In Lamp	Occupancy Sensor	11	3,538	0.0	198	0	$22	$270	$70	9.0
Ticket Booth 2	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	5,127	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	5,127	0.0	161	0	$18	$72	$20	2.9
Skate Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,025	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	708	0.1	186	0	$21	$416	$80	16.2
Skate Cleaning	1	Incandescent: Bulb - 2L	Wall Switch	S	130	5,127	2	Relamp	No	1	LED Lamps: Bulb - 2L	Wall Switch	20	5,127	0.1	612	0	$68	$34	$4	0.4
Salt Storage	1	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	513	1	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	513	0.1	65	0	$7	$118	$40	10.8
Cloth Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,025	2, 3	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	708	0.2	246	0	$27	$489	$120	13.5
Kitchen Area	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	5,127	3	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,538	0.0	299	0	$33	$270	$70	6.0
Ice Rink	32	LED - Linear Tubes: (6) 4' Lamps	Wall Switch	S	87	5,127	3	None	Yes	32	LED - Linear Tubes: (6) 4' Lamps	Occupancy Sensor	87	3,538	0.8	4,779	-1	$533	$1,080	$280	1.5
Ice Rink	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
Locker Rooms	11	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor		40	3,538		None	No	11	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	40	3,538	0.0	0	0	$0	$0	$0	0.0
Restroom	2	LED - Fixtures: Ceiling Mount	Wall Switch	S	12	5,127	3	None	Yes	2	LED - Fixtures: Ceiling Mount	Occupancy Sensor	12	3,538	0.0	41	0	$5	$116	$0	25.3
Referee Room	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor		40	3,538		None	No	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	40	3,538	0.0	0	0	$0	$0	$0	0.0
Referee Room	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 2	11	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor		40	3,538		None	No	11	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	40	3,538	0.0	0	0	$0	$0	$0	0.0
Janitor Closet	1	Incandescent: Bulb - 1L	Wall Switch	S	65	513	2	Relamp	No	1	LED Lamps: Bulb - 1L	Wall Switch	10	513	0.0	31	0	$3	$17	$2	4.5
Hallway	2	LED Lamps: (2) 10.5W Plug-In Lamps	Wall Switch	S	21	5,127	4	None	Yes	2	LED Lamps: (2) 10.5W Plug-In Lamps	High/Low Control	21	3,538	0.0	72	0	$8	$225	$0	28.0
Walkway	8	Compact Fluorescent: 4 Pin - 2L	Wall Switch		84	5,127	2, 3	Relamp	Yes	8	LED Lamps: 4 Pin - 2L	Occupancy Sensor	59	3,538	0.0	1,781	0	$203	$756	$172	2.9

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?	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Indoor Rink - Electric Room	KEF-1	1	Kitchen Hood Exhaust Fan	5.0	89.5%	No	W	5,250	9	No	89.5%	Yes	1	0.0	10,273	30	$1,494	$4,076	$1,800	1.5
Indoor Rink - Electric Room	EF-1	1	Exhaust Fan	0.5	75.0%	No	W	8,760		No	75.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Electric Room	DHW Recirculation	1	Water Supply Pump	0.1	60.0%	No	W	8,760		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor Rink - EMR	Elevator Hydraulic Pump	1	Other	20.0	78.0%	No	W	1,095		No	78.0%	No		0.0	0	0	$0	$0	$0	0.0
Outdoor Rink - Lobby Entrance	Unit Ventilators	7	Supply Fan	0.3	73.4%	No	W	3,016		No	73.4%	No		0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Electric Room	EF-6	1	Exhaust Fan	1.0	82.5%	No	W	8,760		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Mechanical Room	DHW Heater - Locker Rooms	1	Combustion Air Fan	0.3	55.0%	No	W	2,745		No	55.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Mechanical Room	DHW Heater - Locker Rooms	1	Combustion Air Fan	0.3	55.0%	No	W	2,745		No	55.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Mechanical Room	DHW Recirculation	1	Water Supply Pump	0.1	60.0%	No	W	8,760		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Mechanical Room	Ice Melting Pumps	3	Process Pump	2.0	75.0%	No	W	2,745		No	75.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Mechanical Room	Chilled Water Pump 1&2	2	Chilled Water Pump	25.0	93.6%	No	W	4,067	6	No	93.6%	Yes	2	9.3	60,777	0	$6,918	$21,690	$5,600	2.3
Indoor Rink - Mechanical Room	Condenser Pump P3 & P4	2	Condenser Water Pump	7.5	91.7%	No	W	3,391		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Outdoor	Cooling Tower	2	Cooling Tower Fan	3.0	89.5%	No	W	2,745	8	No	89.5%	Yes	2	-0.2	1,740	0	$198	$7,768	$800	35.2
Indoor Rink - Mechanical Room	Underfloor Heat Pump P5	1	Heating Hot Water Pump	2.0	86.5%	No	W	2,745	7	No	86.5%	Yes	1	0.2	1,776	0	$202	$3,261	$200	15.1
Indoor Rink - Roof	EF-7	1	Exhaust Fan	1.0	85.5%	No		8,760		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Outdoor	MUA-1 & 2	2	Makeup Air Fan	2.0	86.5%	No	W	6,032		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Outdoor	DU-1	1	Supply Fan	20.0	93.0%	No	W	6,032	5	No	93.0%	Yes	1	5.7	36,289	0	$4,131	$8,582	$2,600	1.4
Indoor Rink - Outdoor	DU-1	1	Exhaust Fan	10.0	89.5%	No	W	6,032	5	No	91.7%	Yes	1	3.1	18,694	0	$2,128	$5,152	$2,200	1.4
Indoor Rink - Outdoor	DU-1	4	Process Fan	2.0	86.5%	No	W	2,745		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Outdoor	DU-1	1	Process Fan	5.0	89.5%	No	W	2,745		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Indoor Rink - Outdoor	Lobby/Main Offices RTU-1	1	Supply Fan	10.0	89.5%	No	W	6,032	5	No	91.7%	Yes	1	3.0	19,668	0	$2,239	$5,152	$2,200	1.3
Indoor Rink - Outdoor	Lobby/Main Offices RTU-1	1	Exhaust Fan	2.0	86.5%	No	W	6,032	5	No	86.5%	Yes	1	0.6	3,576	0	$407	$3,261	$200	7.5
Indoor Rink - Outdoor	Rink Offices and Locker RTU-2	1	Supply Fan	3.0	89.5%	No	W	6,032	5	No	89.5%	Yes	1	0.9	5,656	0	$644	$3,884	$400	5.4
Outdoor Rink - Outside	Cooling Tower	1	Cooling Tower Fan	0.8	78.0%	No	W	2,745		No	78.0%	No		0.0	0	0	$0	$0	$0	0.0
Outdoor Rink - Boiler Room	Air Handler - Office	1	Supply Fan	1.5	84.0%	No	W	3,016		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Outdoor Rink - Boiler Room	DHW Recirculation	1	Water Supply Pump	0.5	75.0%	No	B	8,760		No	75.0%	No		0.0	0	0	$0	$0	$0	0.0
Outdoor Rink - Boiler Room	P1 & P2	2	Heating Hot Water Pump	7.5	84.0%	No	B	3,391	7	No	88.5%	Yes	2	1.8	18,490	0	$2,105	$9,819	$4,000	2.8
Outdoor Rink - Boiler Room	DHW Recirculation P3	1	Water Supply Pump	0.1	60.0%	No	W	8,760		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Outdoor Rink - Boiler Room	Secondary HHW 1 & 2	2	Heating Hot Water Pump	3.0	84.0%	No	W	3,391	7	No	89.5%	Yes	2	0.7	7,525	0	$857	$7,768	$800	8.1
Outdoor Rink - Boiler Room	Air Handler - Shower	1	Supply Fan	1.5	84.0%	No	W	3,016		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Outdoor Rink - Roof	Exhaust Fans	6	Exhaust Fan	0.3	60.0%	No	W	3,016		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Outdoor Rink - Showers	Exhaust Fans	3	Exhaust Fan	0.3	60.0%	No	W	3,016		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0

Electric 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)	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/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Indoor Rink - Outdoor	Lobby/Main Offices RTU-1	1	Packaged AC	40.00		W		No							0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Outdoor	Rink Offices and Locker RTU-2	1	Packaged AC	25.00		W		No							0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Restrooms	Electric Wall mount heater	2	Electric Resistance Heat		5.12	W		No							0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Office	Electric Baseboards	1	Electric Resistance Heat		6.82	W		No							0.0	0	0	$0	$0	$0	0.0
Indoor Rink - 030 Women Dressing	Electric Baseboards	1	Electric Resistance Heat		6.82	W		No							0.0	0	0	$0	$0	$0	0.0
Indoor Rink - 32 team Dressing 1	Electric Heater	1	Electric Resistance Heat		13.65	W		No							0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Main Lobby	Electric Heaters	2	Electric Resistance Heat		13.65	W		No							0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Lockers	Electric Heaters	2	Electric Resistance Heat		8.53	W		No							0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Dining Room	Electric Wall mount heater	1	Electric Resistance Heat		5.12	W		No							0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Outdoor	Commercial Dehumidifier	1	Packaged AC	120.00		W		No							0.0	0	0	$0	$0	$0	0.0

Electric Chiller Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Indoor Rink - Mechanical Room	Chiller	1	Water-Cooled Screw Chiller	265.00	W		No							0.0	0	0	$0	$0	$0	0.0
Outdoor Rink - Mechanical Room	Chiller	1	Water-Cooled Reciprocating Chiller	120.00	B	10	Yes	1	Air-Cooled Screw Chiller	Variable	120.00	1.24	0.74	20.5	58,273	0	$6,633	$118,167	$21,600	14.6

Fuel Heating Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Indoor Rink - Outdoor	MUA-1 & 2	2	Furnace	240	W		No						0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Outdoor	Lobby/Main Offices RTU-1	1	Furnace	632	W		No						0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Outdoor	Rink Offices and Locker RTU-2	1	Furnace	389	W		No						0.0	0	0	$0	$0	$0	0.0
Outdoor Rink - Boiler Room	Boiler	1	Non-Condensing Hot Water Boiler	1,700	W		No						0.0	0	0	$0	$0	$0	0.0

DHW Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Indoor Rink - Electric Room	Restrooms	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Mechanical Room	Locker Rooms	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Mechanical Room	Dressing Rooms	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0
Outdoor Rink - Mechanical Room	Locker Rooms	2	Storage Tank Water Heater (> 50 Gal)	B		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Indoor Rink - Restrooms	11	17	Faucet Aerator (Lavatory)	1.50	0.50	0.0	0	5	$52	$122	$122	0.0
Indoor Rink - Lockers	11	12	Showerhead	2.50	1.50	0.0	0	9	$102	$1,072	$360	7.0
Outdoor Rink - Restrooms	11	9	Faucet Aerator (Lavatory)	1.50	0.50	0.0	736	0	$84	$65	$65	0.0
Outdoor Rink - Locker	11	3	Showerhead	2.50	1.50	0.0	689	0	$78	$268	$90	2.3
Indoor Rink - Kitchen	11	1	Faucet Aerator (Kitchen)	2.20	1.50	0.0	0	0	$2	$7	$4	1.5

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Indoor Rink - Kitchen	1	Stand-Up Refrigerator, Glass Door (31 - 50 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Indoor Rink - Kitchen	1	Self-Contained Unit (<175 lbs/day), Continuous	Yes		No	0.0	0	0	$0	$0	$0	0.0

Novelty Cooler Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Cooler Description	ECM #	Install Automatic Shutoff Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Indoor Rink - Kitchen	1	2 Door Refrigerated Sandwich Prep Table	12	Yes	0.00	172	0	$20	$252	$150	5.2

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Indoor Rink - Kitchen	2	Insulated Food Holding Cabinet (1/2 Size)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Kitchen	1	Gas Large Vat Fryer	Yes		No	0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Kitchen	1	Gas Griddle (4 Feet Width)	No		No	0.0	0	0	$0	$0	$0	0.0
Indoor Rink - Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	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?
Indoor Rink - Offices	10	Computers	145	Yes
Indoor Rink - Offices	1	Servers	550	No
Indoor Rink - Offices	4	Small Printer	20	Yes
Indoor Rink - Offices	2	Copy Machine	200	Yes
Indoor Rink - Offices	1	Paper Shredder	200	Yes
Indoor Rink - Offices	3	Microwave	900	Yes
Indoor Rink - Offices	3	Small Refrigerator	40	Yes
Indoor Rink - Offices	2	Large Refrigerator	200	Yes
Indoor Rink - Offices	1	Toaster Oven	1,200	No
Indoor Rink - Offices	6	Portable Fan	288	No
Indoor Rink - Offices	4	Plasma Tv - 42"	220	No
Indoor Rink - Offices	2	Skate Repair Machine	858	No
Indoor Rink - Offices	1	Space Heater	1,500	No

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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Indoor Rink	1	Non-Refrigerated	13	Yes	0.0	343	0	$39	$230	$0	5.9
Indoor Rink	3	Glass Fronted Refrigerated	13	Yes	0.4	3,627	0	$413	$690	$300	0.9

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

EUI is presented in terms of *site energy* and *source energy*. Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Winding River Park - Ice Rink

Primary Property Type: Ice/Curling Rink
Gross Floor Area (ft²): 77,000
Built: 1992

For Year Ending: June 30, 2019
Date Generated: July 09, 2020

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Winding River Park - Ice Rink 1211 Whiteville Road Toms River, New Jersey 08755	Township of Toms River 33 Washington Street Toms River, NJ 08753 (742) 341-1000	Donald Guardian 33 Washington Street Toms River, NJ 08753 (742) 341-1000 dguardian@tomsrivertownship.com

Property ID: 10865014

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
156.6 kBtu/ft²

Source EUI
322.9 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	6,973,490 (58%)
Natural Gas (kBtu)	5,084,594 (42%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	54.3
National Median Source EUI (kBtu/ft²)	112
% Diff from National Median Source EUI	188%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	977

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

LP Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer or Registered Architect Stamp (if applicable)

APPENDIX C: GLOSSARY

TERM	DEFINITION
Blended Rate	Used to calculate fiscal savings associated with measures. The blended rate is calculated by dividing the amount of your bill by the total energy use. For example, if your bill is $22,217.22, and you used 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
Btu	*British thermal unit*: a unit of energy equal to the amount of heat required to increase the temperature of one pound of water by one-degree Fahrenheit.
CHP	*Combined heat and power*. Also referred to as cogeneration.
COP	*Coefficient of performance*: a measure of efficiency in terms of useful energy delivered divided by total energy input.
Demand Response	Demand response reduces or shifts electricity usage at or among participating buildings/sites during peak energy use periods in response to time-based rates or other forms of financial incentives.
DCV	*Demand control ventilation*: a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
US DOE	*United States Department of Energy*
EC Motor	*Electronically commutated motor*
ECM	*Energy conservation measure*
EER	*Energy efficiency ratio*: a measure of efficiency in terms of cooling energy provided divided by electric input.
EUI	*Energy Use Intensity:* measures energy consumption per square foot and is a standard metric for comparing buildings' energy performance.
Energy Efficiency	Reducing the amount of energy necessary to provide comfort and service to a building/area. Achieved through the installation of new equipment and/or optimizing the operation of energy use systems. Unlike conservation, which involves some reduction of service, energy efficiency provides energy reductions without sacrifice of service.
ENERGY STAR®	ENERGY STAR® is the government-backed symbol for energy efficiency. The ENERGY STAR® program is managed by the EPA.
EPA	*United States Environmental Protection Agency*
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
GHG	*Greenhouse gas* gases that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.
gpf	*Gallons per flush*

gpm	*Gallon per minute*
HID	*High intensity discharge:* high-output lighting lamps such as high-pressure sodium, metal halide, and mercury vapor.
hp	*Horsepower*
HPS	*High-pressure sodium*: a type of HID lamp
HSPF	*Heating seasonal performance factor:* a measure of efficiency typically applied to heat pumps. Heating energy provided divided by seasonal energy input.
HVAC	*Heating, ventilating, and air conditioning*
IHP 2014	US DOE Integral Horsepower rule. The current ruling regarding required electric motor efficiency.
IPLV	*Integrated part load value:* a measure of the part load efficiency usually applied to chillers.
kBtu	One thousand British thermal units
kW	*Kilowatt*: equal to 1,000 Watts.
kWh	*Kilowatt-hour*: 1,000 Watts of power expended over one hour.
LED	*Light emitting diode*: a high-efficiency source of light with a long lamp life.
LGEA	*Local Government Energy Audit*
Load	The total power a building or system is using at any given time.
Measure	A single activity, or installation of a single type of equipment, that is implemented in a building system to reduce total energy consumption.
MH	*Metal halide*: a type of HID lamp
MBh	*Thousand Btu per hour*
MBtu	*One thousand British thermal units*
MMBtu	*One million British thermal units*
MV	*Mercury Vapor:* a type of HID lamp
NJBPU	*New Jersey Board of Public Utilities*
NJCEP	*New Jersey's Clean Energy Program:* NJCEP is a statewide program that offers financial incentives, programs and services for New Jersey residents, business owners and local governments to help them save energy, money and the environment.
psig	Pounds per square inch gauge
Plug Load	Refers to the amount of power used in a space by products that are powered by means of an ordinary AC plug.
PV	*Photovoltaic:* refers to an electronic device capable of converting incident light directly into electricity (direct current).

SEER	*Seasonal energy efficiency ratio:* a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	*Statement of energy performance:* a summary document from the ENERGY STAR® Portfolio Manager®.
Simple Payback	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
SREC	*Solar renewable energy credit*: a credit you can earn from the state for energy produced from a photovoltaic array.
TREC	*Transition Incentive Renewable Energy Certificate:* a factorized renewable energy certificate you can earn from the state for energy produced from a photovoltaic array.
T5, T8, T12	A reference to a linear lamp diameter. The number represents increments of 1/8th of an inch.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
therm	100,000 Btu. Typically used as a measure of natural gas consumption.
tons	A unit of cooling capacity equal to 12,000 Btu/hr.
Turnkey	Provision of a complete product or service that is ready for immediate use
VAV	*Variable air volume*
VFD	*Variable frequency drive*: a controller used to vary the speed of an electric motor.
WaterSense®	The symbol for water efficiency. The WaterSense® program is managed by the EPA.
Watt (W)	Unit of power commonly used to measure electricity use.