Local Government Energy Audit:

Energy Audit Report

Building #41 (MPRC) and Building #42 (MPRC Support)

101 Vera King Farris Drive

Galloway, NJ 08205

Stockton University

July 15, 2019

Draft Report by:

TRC Energy Services

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 Energy Services (TRC) reviewed the energy conservation measures and estimates of energy savings were reviewed 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. 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.

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1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Building #41-MPRC (Building #41) and Building #42-MPRC Support (Building #42).

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey universities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Building #41 is a 70,883 square foot recreational facility and Building #42 is a 3,946 square foot facility, each comprised of various space types. The recreational building has three floors and includes a large gymnasium area, snack bar/prep kitchen, classrooms, offices, locker rooms, storage and electrical spaces. The Support building is a single floor and includes primarily mechanical space and also a small office space.

Lighting at Building #41 and #42 consists primarily of linear T8 fluorescent and compact fluorescent lamps (CFLs). There are also some other lighting technologies, including metal halide, incandescent, and LED fixtures. Cooling is provided primarily by a water-cooled electric chiller and supplemented in peak cooling periods with two air-cooled mechanically driven chillers. Heating is provided to the facility by two non-condensing hot water boilers. Six air-handlers with hot water and chilled water coils are on the roof of the recreational building and provide air-conditioning and ventilation to the facilities. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC Energy Services evaluated 16 measures and recommends 15 measures which together represent an opportunity for Building 41 (MPRC) and Building 42 (MPRC Support) to reduce annual energy costs by roughly $121,554 and annual greenhouse gas emissions by 1,028,701 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 4.0 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Building 41 (MPRC) and Building 42 (MPRC Support)'s annual energy use by 27%.

Figure 1 – Previous 12 Month Utility Costs

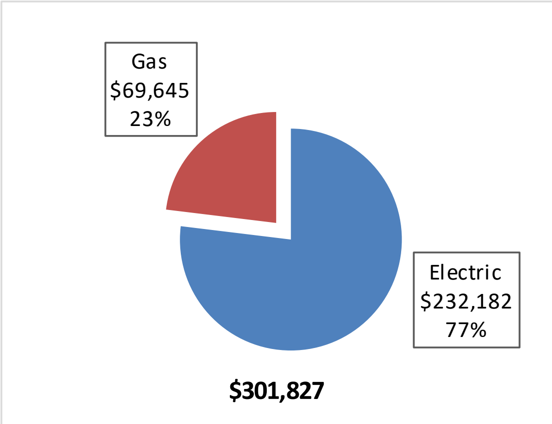
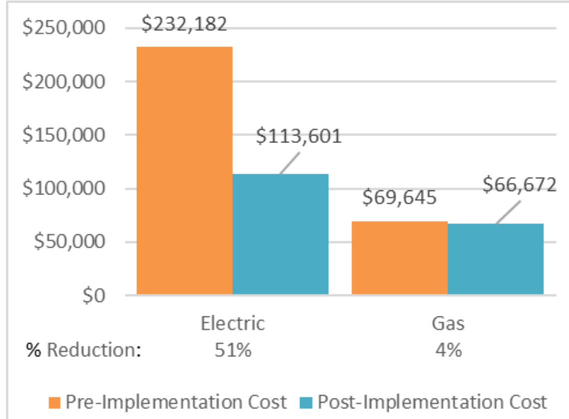


Figure 2 – Potential Post-Implementation Costs



A detailed description of Building #41 and #42's existing energy use can be found in Section 3 "Site Energy Use and Costs".

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4, "Energy Conservation Measures".

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	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			**401,118**	**70.6**	**0.0**	**$48,174.22**	**$172,877.55**	**$8,720.00**	**$164,157.55**	**3.4**	**403,922**
ECM 1	Install LED Fixtures	Yes	247,128	50.6	0.0	$29,680.04	$142,529.06	$2,850.00	$139,679.06	4.7	248,856
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	2,799	0.2	0.0	$336.14	$454.64	$0.00	$454.64	1.4	2,818
ECM 3	Retrofit Fixtures with LED Lamps	Yes	151,191	19.8	0.0	$18,158.04	$29,893.85	$5,870.00	$24,023.85	1.3	152,248
Lighting Control Measures			**39,331**	**5.0**	**0.0**	**$4,723.63**	**$13,830.00**	**$980.00**	**$12,850.00**	**2.7**	**39,606**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	34,399	4.4	0.0	$4,131.30	$7,830.00	$980.00	$6,850.00	1.7	34,639
ECM 5	Install High/Low Lighitng Controls	Yes	4,932	0.6	0.0	$592.33	$6,000.00	$0.00	$6,000.00	10.1	4,966
Motor Upgrades			**11,951**	**2.3**	**0.0**	**$1,435.36**	**$33,364.10**	**$0.00**	**$33,364.10**	**23.2**	**12,035**
ECM 6	Premium Efficiency Motors	Yes	11,951	2.3	0.0	$1,435.36	$33,364.10	$0.00	$33,364.10	23.2	12,035
Variable Frequency Drive (VFD) Measures			**323,554**	**53.8**	**0.0**	**$38,858.84**	**$92,863.25**	**$16,000.00**	**$76,863.25**	**2.0**	**325,816**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	Yes	213,753	45.8	0.0	$25,671.74	$58,278.80	$13,600.00	$44,678.80	1.7	215,248
ECM 8	Install VFDs on Chilled Water Pumps	Yes	53,700	7.9	0.0	$6,449.33	$25,218.40	$0.00	$25,218.40	3.9	54,075
ECM 9	Install VFDs on Cooling Tower Fans	Yes	56,101	0.0	0.0	$6,737.76	$9,366.05	$2,400.00	$6,966.05	1.0	56,494
Electric Chiller Replacement			**184,238**	**49.4**	**0.0**	**$22,126.92**	**$185,124.90**	**$10,965.00**	**$174,159.90**	**7.9**	**185,526**
ECM 10	Install High Efficiency Chillers	Yes	184,238	49.4	0.0	$22,126.92	$185,124.90	$10,965.00	$174,159.90	7.9	185,526
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**226.8**	**$2,291.60**	**$77,689.84**	**$6,528.00**	**$71,161.84**	**31.1**	**26,551**
	Install High Efficiency Hot Water Boilers	No	0	0.0	226.8	$2,291.60	$77,689.84	$6,528.00	$71,161.84	31.1	26,551
HVAC System Improvements			**20,700**	**0.0**	**251.5**	**$5,027.52**	**$16,313.04**	**$0.00**	**$16,313.04**	**3.2**	**50,290**
ECM 11	Implement Demand Control Ventilation	Yes	20,700	0.0	251.5	$5,027.52	$16,313.04	$0.00	$16,313.04	3.2	50,290
Domestic Water Heating Upgrade			**0**	**0.0**	**42.6**	**$430.90**	**$179.25**	**$0.00**	**$179.25**	**0.4**	**4,993**
ECM 12	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	42.6	$430.90	$179.25	$0.00	$179.25	0.4	4,993
Food Service Equipment & Refrigeration Measures			**2,559**	**0.2**	**0.0**	**$307.31**	**$1,977.30**	**$75.00**	**$1,902.30**	**6.2**	**2,577**
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	1,265	0.2	0.0	$151.92	$303.30	$0.00	$303.30	2.0	1,274
ECM 14	Refrigeration Controls	Yes	1,294	0.1	0.0	$155.39	$1,674.00	$75.00	$1,599.00	10.3	1,303
Plug Load Equipment Control - Vending Machine			**3,909**	**0.0**	**0.0**	**$469.44**	**$920.00**	**$0.00**	**$920.00**	**2.0**	**3,936**
ECM 15	Vending Machine Control	Yes	3,909	0.0	0.0	$469.44	$920.00	$0.00	$920.00	2.0	3,936
TOTALS FOR HIGH PRIORITY MEASURES			**987,359**	**181.3**	**294.1**	**$121,554.15**	**$517,449.39**	**$36,740.00**	**$480,709.39**	**4.0**	**1,028,701**
TOTALS FOR ALL EVALUATED MEASURES			**987,359**	**181.3**	**520.9**	**$123,845.75**	**$595,139.23**	**$43,268.00**	**$551,871.23**	**4.5**	**1,055,251**

* - All incentives presented in this table are based on NJ Smart Start Building 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).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measures save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Motor Upgrades generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

Electric Chiller measures generally involve replacing older inefficient hydronic chillers with modern energy efficient systems. New chillers can provide equivalent cooling compared to older chillers at a reduced energy cost. These measures save energy by reducing chiller energy usage, due to improved electrical and heat transfer efficiency.

Gas Heating (HVAC/Process) measures generally involve replacing older inefficient hydronic heating systems with modern energy efficient systems. Gas heating systems can provide equivalent heating compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel demands for heating, due to improved combustion and heat transfer efficiency.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperature conditions. These measures save energy by reducing the demand on HVAC systems and the amount of time systems operate.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Food Service Equipment & Refrigeration measures generally involve improvements in the efficiency of cooking, food service, dishwashing, and food storage equipment. These measures may include more efficient convection ovens, steamers, ice machines, or refrigeration. These measures save energy by reducing the energy usage with more energy efficient equipment.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlet when not in use.

Energy Efficient Practices

TRC also identified nine low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Building #41 and #42 include:

- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Perform Routine Motor Maintenance
- Assess Chillers & Request Tune-Ups
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Water Conservation

For details on these Energy Efficient Practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Building #41 and #42. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	107	kW DC STC
Electric Generation	127,477	kWh/yr
Displaced Cost	$11,090	/yr
Installed Cost	$361,700	

For details on our evaluation and on-site generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart (SS)
- Energy Savings Improvement Program (ESIP)

For facilities wanting 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 in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SS incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SS program. More details on this program and others are available in Section 8.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (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. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.3 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce 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. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage 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 DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 Facility Information and Existing Conditions

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Charles (Skip) West , AIA	Director, Office of Facilities Planning & Construction	Charles.West@stockton.edu	(609) 626-5522
Designated Representative			
Michael J. Ferraro II	Energy Systems Specialist	Michael.Ferraro@stockton.edu	(609) 652-4884
TRC Energy Services			
Vish Nimbalkar, P.E.	Auditor	VNaikNimbalkar@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On October 18, 2018, TRC performed an energy audit at Building #41 and #42 located in Galloway, New Jersey. TRC's team met with Michael J. Ferraro II to review the facility operations and help focus our investigation on specific energy-using systems.

Building #41 is a 70,883 square foot recreational facility and Building #42 is a 3,946 square foot facility, each comprised of various space types. The recreational building has three floors and includes a large gymnasium area, snack bar/prep kitchen, classrooms, offices, locker rooms, storage and electrical spaces. The Support building is a single floor and includes primarily mechanical space and also a small office space.

Lighting at Building #41 and #42 consists primarily of linear T8 fluorescent and compact fluorescent lamps (CFLs). There are also some other lighting technologies, including metal halide, incandescent, and LED fixtures. Cooling is provided primarily by a water-cooled electric chiller and supplemented in peak cooling periods with two air-cooled mechanically driven chillers. Heating is provided to the facility by two non-condensing hot water boilers. Six air-handlers with hot water and chilled water coils are on the roof of the recreational building and provide air-conditioning and ventilation to the facilities.

Both buildings were constructed in 2000.

2.3 Building Occupancy

The recreational portion of the facility is open every day to the campus community. The support building is open Monday through Friday. The typical schedule is presented in the table below. The entire facility is used year-round and run throughout the summer. During a typical day, the recreational facility is occupied by approximately 300 faculty and/or students and the support facility is occupied by about 5 staff.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Building 41 (MPRC)	Weekday	8:00AM to 11:00PM
Building 41 (MPRC)	Weekend	8:00AM to 9:00PM
Building 42 (MPRC Support)	Weekday	8:00AM to 4:00PM
Building 42 (MPRC Support)	Weekend	Closed

2.4 Building Envelope

The buildings are constructed of structural steel with metal siding. Most of the building has a metal roof with solar panels. There is also a portion which has a flat roof covered with a black membrane and per the site contact in need if replacement. The school should consult with a qualified roofing contractor to confirm. The buildings have double pane windows which are in good condition and show little sign of excessive infiltration. The exterior doors are constructed of aluminum, some with large glass panes, and is in good condition.

Figure 7 - Building Envelope

2.5 On-Site Generation

Stockton University installed a 1,200 kW-DC solar energy project in March 2015. The project included photovoltaic (PV) arrays on parking lot canopies, one of which is interconnected near Building #37. The systems provide 6% of the electricity required by the campus.

Marina Energy is the power purchase agreement provider and financier of the solar energy system.

2.6 Energy-Using Systems

Lighting System

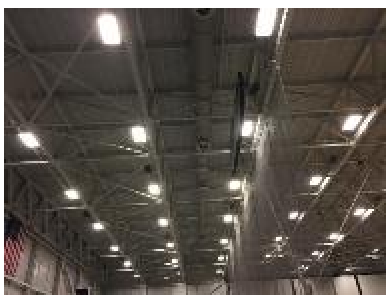
Interior lighting at Building 42 is provided by linear 32-Watt fluorescent T8 lamps with electronic ballasts. Fixtures are 2-lamp 4-foot long troffers with diffusers. Lighting control is provided by manual wall switches.

Interior lighting at Building 41 is provided mostly by compact fluorescent lamps (CFLs) and linear 32-Watt fluorescent T8 lamps with electronic ballasts as well as some metal halide, incandescent, LED and T12 linear fluorescent fixtures. Most of the linear fluorescent fixtures are 2-lamp or 1-lamp, 4-foot long troffers with diffusers. The gym area lighting is provided by 8-lamp 4-foot long T5 high output linear fluorescent fixtures.

Lighting control in most spaces is provided by manual wall switches. There are occupancy sensors in some areas as well. The occupancy sensors are either wall or ceiling mounted depending on the space layout.

The buildings' exterior lighting consists of metal halide fixtures and LED lamps. There are also large pole fixtures each with 24 metal halide 1,000 Watt lamps used for field lighting.

Figure 8 – Lighting Technologies



Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's lighting equipment.

Chilled and Condenser Water System

The buildings are served by a chilled water plant located in Building 42. The chiller plant consists of a 255 ton Trane water-cooled screw chiller as well as two 65 ton Tecogen mechanically driven air-cooled reciprocating chillers. The Trane chiller is configured in a primary-secondary distribution loop with a constant flow primary pump and two constant flow secondary pumps. The primary pump has a 10 hp motor. One of the secondary pumps has a 15 hp motor and serves the air-handling units on the roof. The other secondary pump has a 1.5 hp pump and serves fan coil units. All pumps have stand-by pumps of equal horsepower in reserve.

The Tecogen chillers provide chilled water to the facilities during peak cooling demand periods through a constant flow pump with a 7.5 hp motor. The Tecogen chiller pump also has a standby of equal horsepower.

Chilled water is distributed to the facility at 45°F. The Trane chiller is original equipment to the facility and the Tecogen chillers were installed approximately 5 years after the facility was constructed. The chillers are in adequate condition.

The condenser water system consists of a two-cell BAC cooling tower. The tower has a single 40 hp fan motor. Condenser water is supplied to the chillers by a 20 hp constant flow pump. The condenser water pump also has a standby pump of equivalent horsepower. The condenser water temperature is maintained at 85°F. The cooling tower is original equipment and in an adequate condition.

Figure 9 – Chilled and Condenser Water Equipment

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of facility's chilled water equipment.

Hot Water Heating System

The hot water system consists of two Weil McLain 2,176 kBtu/hr output non-condensing boilers in Building #42. The boilers have a nominal combustion efficiency of 80%. The boilers are configured in a primary-secondary distribution with a single constant flow primary pump and three constant flow secondary pumps. All pumps have standby pumps of equivalent motor horsepower. The primary boiler loop has a 3 hp pump motor. One of the secondary pumps has a 0.75 hp motor and serves fan coil units, another has a 1.5 hp motor and serves the domestic hot water system, and the last has a 3 hp motor and serves the air-handling units on the roof. Hot water is supplied at 180°F.

The boilers operate in a lead/lag configuration. Both boilers may be required during cold weather. The boilers are original equipment and in adequate condition.

Figure 10 – Heating Hot Water Equipment

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of facility's heating equipment.

Heating, Ventilation, and Air-Conditioning (HVAC)

There are six air handling units (AHU 1-6) that serve Building #41. Each AHU draws air from its own return air shaft and supplies air to its own air shaft.

All AHUs are located on the roof of the recreational building. All air-handlers have constant volume supply fans, and five of the AHUs also have constant volume return fans. AHU 1 has a 20 hp supply fan motor. AHUs 2-6 have 15 hp supply fan motors and 15 hp return fan motors. Supply air temperature is set between 50°F and 55°F for cooling and between 80°F and 95°F for heating.

Figure 11 – HVAC Equipment

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's air conditioning system equipment.

Domestic Hot Water Heating System

The domestic hot water heating system for the facility is in Building #42 and consists of an indirect hot water tank with an equivalent input rating of approximately of 300 kBtu/hr and a nominal efficiency of 80%. The water heater has an approximately 250 gallon storage tank. Hot water from the boiler is tempered down from 180°F to the desired supply temperature for domestic hot water use.

Figure 12 – Domestic Hot Water Equipment

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's domestic hot water equipment.

Food Service Equipment

The facility has a small kitchen area in Building #41 that is used to prepare meals for the students and staff. The kitchen has two double stacked full convection gas ovens which has an exhaust hood over them.

Figure 13 – Food Service Equipment

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's food service and laundry equipment.

Refrigeration

The kitchen in Building #41 has a walk-in refrigerator that is used to store food. The walk-in space temperature is maintained by a single Bohn evaporator fan. The kitchen also has two free standing commercial size refrigerators and one commercial free-standing freezer as well as an ice making machine.

Figure 14 – Refrigeration Equipment

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's refrigeration equipment.

Building Plug Load

There are various plug load appliances throughout Building #41 such as printers, copiers, televisions, microwaves, and coffee makers.

The facility also has two refrigerated and two non-refrigerated vending machines.

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's plug load equipment.

2.7 Water-Using Systems

There are 25 lavatory faucets in Building #41 rated for 2 gpm or higher throughout the facility.

The school also has men's and women's locker rooms.

3 SITE ENERGY USE AND COSTS

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

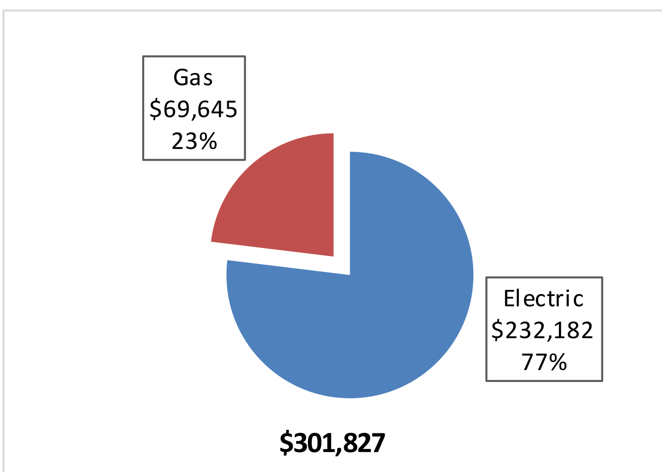
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 15 - Utility Summary

'tility Summary for Building 41 (MPRC) and Building 42 (MPRC Suppor		
Fuel	Usage	Cost
Electricity	1,933,243 kWh	$232,182
Natural Gas	68,915 Therms	$69,645
Total		$301,827

The current annual energy cost for this facility is $301,827 as shown in the chart below.

Figure 16 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by Atlantic City Electric. The average electric cost over the past 12 months was $0.120/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. Electricity demand and consumption is greatest in the summer months due to increased cooling loads of the facility. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 17 - Graph of 12 Months Electric Usage & Demand

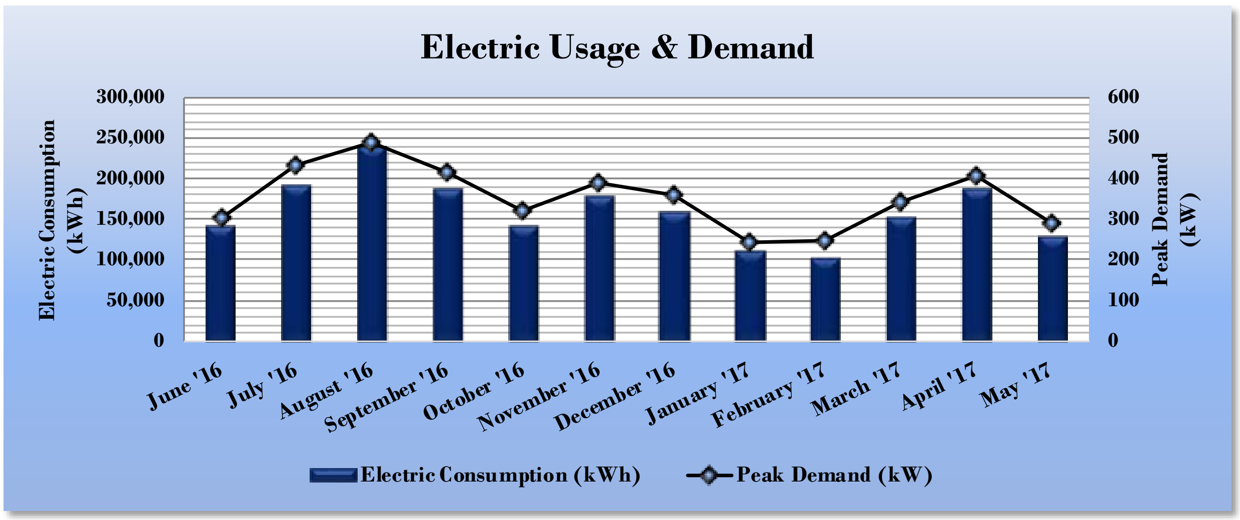


Figure 18 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for Building 41 (MPRC) and Building 42 (MPRC Support)						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
6/30/16	30	142,348	303		$17,096	Yes
7/31/16	31	191,751	434		$23,029	Yes
8/31/16	31	240,735	490		$28,912	Yes
9/30/16	30	187,388	414		$22,505	Yes
10/31/16	31	142,815	320		$17,152	Yes
11/30/16	30	179,759	388		$21,589	Yes
12/31/16	31	159,242	359		$19,125	Yes
1/31/17	31	112,158	244		$13,470	Yes
2/28/17	28	104,714	247		$12,576	Yes
3/31/17	31	154,852	342		$18,598	Yes
4/30/17	30	187,711	408		$22,544	Yes
5/31/17	31	129,770	290		$15,585	Yes
Totals	365	1,933,243	490	$0	$232,182	12
Annual	365	1,933,243	490	$0	$232,182	

3.3 Natural Gas Usage

Natural gas is provided by South Jersey Gas. The average gas cost for the past 12 months is $1.011/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. Higher than expected summer gas use can be attributed to the indirect domestic hot water system which requires the use of the boiler, as well as the mechanically driven chillers which operate during peak cooling periods.

Figure 19 - Graph of 12 Months Natural Gas Usage

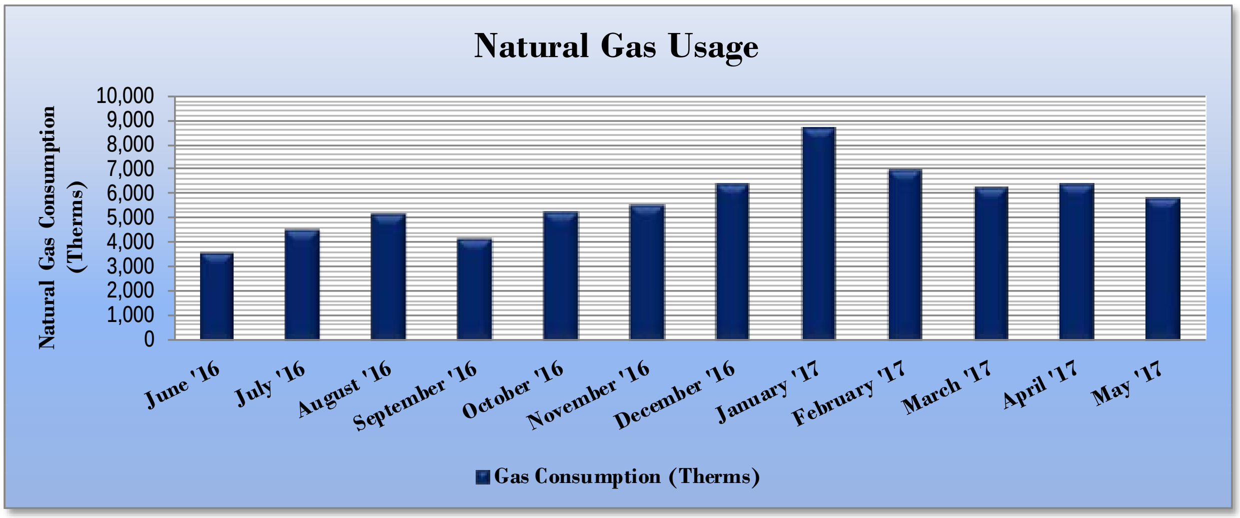


Figure 20 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Building 41 (MPRC) and Building 42 (MPRC Support)				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
6/30/16	30	3,599	$3,638	Yes
7/31/16	31	4,539	$4,587	Yes
8/31/16	31	5,177	$5,232	Yes
9/30/16	30	4,171	$4,215	Yes
10/31/16	31	5,267	$5,323	Yes
11/30/16	30	5,553	$5,612	Yes
12/31/16	31	6,402	$6,470	Yes
1/31/17	31	8,748	$8,840	Yes
2/28/17	28	6,970	$7,044	Yes
3/31/17	31	6,252	$6,318	Yes
4/30/17	30	6,416	$6,483	Yes
5/31/17	31	5,822	$5,883	Yes
Totals	365	68,915	$69,645	12
Annual	365	68,915	$69,645	

3.4 Benchmarking

This facility was benchmarked using *Portfolio Manager®*, an online tool created and managed by the U.S. Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager® analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® Score for select building types.

Energy Use Intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. 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.

Figure 21 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Building 41 (MPRC) and Building 42 (MPRC Support)	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	373.5	262.6
Site Energy Use Intensity (kBtu/ft^2)	180.2	130.7

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the Table below:

Figure 22 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Building 41 (MPRC) and Building 42 (MPRC Support)	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	228.0	262.6
Site Energy Use Intensity (kBtu/ft^2)	131.3	130.7

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. Currently this facility is not eligible to receive a benchmarking score.
A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this facility, see **Appendix B: EPA Statement of Energy Performance**.

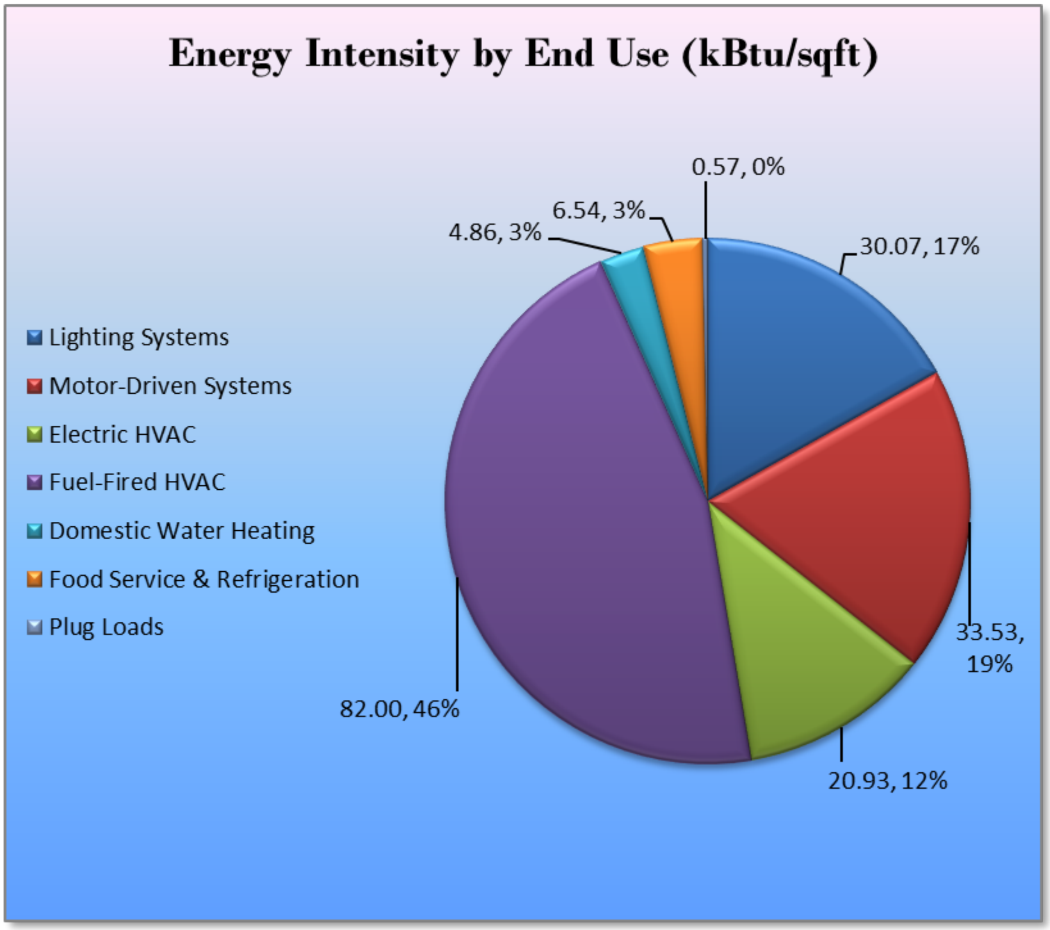
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager® account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager® regularly, so that you can keep track of your building's performance. 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.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 23 - Energy Balance (% and kBtu/SF)



4 Energy Conservation Measures

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Building #41 and #42 regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey's Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 24 – Summary of Recommended 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		**401,118**	**70.6**	**0.0**	**$48,174.22**	**$172,877.55**	**$8,720.00**	**$164,157.55**	**3.4**	**403,922**
ECM 1	Install LED Fixtures	247,128	50.6	0.0	$29,680.04	$142,529.06	$2,850.00	$139,679.06	4.7	248,856
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	2,799	0.2	0.0	$336.14	$454.64	$0.00	$454.64	1.4	2,818
ECM 3	Retrofit Fixtures with LED Lamps	151,191	19.8	0.0	$18,158.04	$29,893.85	$5,870.00	$24,023.85	1.3	152,248
Lighting Control Measures		**39,331**	**5.0**	**0.0**	**$4,723.63**	**$13,830.00**	**$980.00**	**$12,850.00**	**2.7**	**39,606**
ECM 4	Install Occupancy Sensor Lighting Controls	34,399	4.4	0.0	$4,131.30	$7,830.00	$980.00	$6,850.00	1.7	34,639
ECM 5	Install High/Low Lighitng Controls	4,932	0.6	0.0	$592.33	$6,000.00	$0.00	$6,000.00	10.1	4,966
Motor Upgrades		**11,951**	**2.3**	**0.0**	**$1,435.36**	**$33,364.10**	**$0.00**	**$33,364.10**	**23.2**	**12,035**
ECM 6	Premium Efficiency Motors	11,951	2.3	0.0	$1,435.36	$33,364.10	$0.00	$33,364.10	23.2	12,035
Variable Frequency Drive (VFD) Measures		**323,554**	**53.8**	**0.0**	**$38,858.84**	**$92,863.25**	**$16,000.00**	**$76,863.25**	**2.0**	**325,816**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	213,753	45.8	0.0	$25,671.74	$58,278.80	$13,600.00	$44,678.80	1.7	215,248
ECM 8	Install VFDs on Chilled Water Pumps	53,700	7.9	0.0	$6,449.33	$25,218.40	$0.00	$25,218.40	3.9	54,075
ECM 9	Install VFDs on Cooling Tower Fans	56,101	0.0	0.0	$6,737.76	$9,366.05	$2,400.00	$6,966.05	1.0	56,494
Electric Chiller Replacement		**184,238**	**49.4**	**0.0**	**$22,126.92**	**$185,124.90**	**$10,965.00**	**$174,159.90**	**7.9**	**185,526**
ECM 10	Install High Efficiency Chillers	184,238	49.4	0.0	$22,126.92	$185,124.90	$10,965.00	$174,159.90	7.9	185,526
HVAC System Improvements		**20,700**	**0.0**	**251.5**	**$5,027.52**	**$16,313.04**	**$0.00**	**$16,313.04**	**3.2**	**50,290**
ECM 11	Implement Demand Control Ventilation	20,700	0.0	251.5	$5,027.52	$16,313.04	$0.00	$16,313.04	3.2	50,290
Domestic Water Heating Upgrade		**0**	**0.0**	**42.6**	**$430.90**	**$179.25**	**$0.00**	**$179.25**	**0.4**	**4,993**
ECM 12	Install Low-Flow Domestic Hot Water Devices	0	0.0	42.6	$430.90	$179.25	$0.00	$179.25	0.4	4,993
Food Service Equipment & Refrigeration Measures		**2,559**	**0.2**	**0.0**	**$307.31**	**$1,977.30**	**$75.00**	**$1,902.30**	**6.2**	**2,577**
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors	1,265	0.2	0.0	$151.92	$303.30	$0.00	$303.30	2.0	1,274
ECM 14	Refrigeration Controls	1,294	0.1	0.0	$155.39	$1,674.00	$75.00	$1,599.00	10.3	1,303
Plug Load Equipment Control - Vending Machine		**3,909**	**0.0**	**0.0**	**$469.44**	**$920.00**	**$0.00**	**$920.00**	**2.0**	**3,936**
ECM 15	Vending Machine Control	3,909	0.0	0.0	$469.44	$920.00	$0.00	$920.00	2.0	3,936
TOTALS		**987,359**	**181.3**	**294.1**	**$121,554.15**	**$517,449.39**	**$36,740.00**	**$480,709.39**	**4.0**	**1,028,701**

* - All incentives presented in this table are based on NJ Smart Start Building 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).

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 25 below.

Figure 25 – Summary of Lighting Upgrade 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		401,118	70.6	0.0	$48,174.22	$172,877.55	$8,720.00	$164,157.55	3.4	403,922
ECM 1	Install LED Fixtures	247,128	50.6	0.0	$29,680.04	$142,529.06	$2,850.00	$139,679.06	4.7	248,856
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	2,799	0.2	0.0	$336.14	$454.64	$0.00	$454.64	1.4	2,818
ECM 3	Retrofit Fixtures with LED Lamps	151,191	19.8	0.0	$18,158.04	$29,893.85	$5,870.00	$24,023.85	1.3	152,248

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended upgrades for each lighting measure.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	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)
Interior	6,650	0.9	0.0	$798.67	$1,517.66	$50.00	$1,467.66	1.8	6,696
Exterior	240,478	49.8	0.0	$28,881.37	$141,011.41	$2,800.00	$138,211.41	4.8	242,159

Measure Description

We recommend replacing existing fixtures in Building #41 containing metal halide lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Interior lobby fixtures and exterior building and grounds fixtures, including field lighting, have been recommended or replacement.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of existing sources.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	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)
Interior	2,799	0.2	0.0	$336.14	$454.64	$0.00	$454.64	1.4	2,818
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing T12 linear fluorescent fixtures in Building #41 by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent tubes.

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	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)
Interior	151,191	19.8	0.0	$18,158.04	$29,893.85	$5,870.00	$24,023.85	1.3	152,248
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting interior T8 linear fluorescents in Building #41 and #42, incandescent, and compact fluorescent lighting technologies in Building #41 with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs 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.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent sources and more than 10 times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Figure 26 – Summary of Lighting Control 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 Control Measures		39,331	5.0	0.0	$4,723.63	$13,830.00	$980.00	$12,850.00	2.7	39,606
ECM 4	Install Occupancy Sensor Lighting Controls	34,399	4.4	0.0	$4,131.30	$7,830.00	$980.00	$6,850.00	1.7	34,639
ECM 5	Install High/Low Lighitng Controls	4,932	0.6	0.0	$592.33	$6,000.00	$0.00	$6,000.00	10.1	4,966

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended lighting controls upgrades for each lighting measure.

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

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)
34,399	4.4	0.0	$4,131.30	$7,830.00	$980.00	$6,850.00	1.7	34,639

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in Building #41 in restrooms, classrooms, offices areas, the gym area, kitchen, and locker rooms. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 5: Install High/Low Lighting Controls

Summary of Measure Economics

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)
4,932	0.6	0.0	$592.33	$6,000.00	$0.00	$6,000.00	10.1	4,966

Measure Description

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in Building #41 in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Recommended areas for such lighting control are interior corridors and lobbies.

Lighting fixtures with these controls operate at default low levels when the area is not occupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. The lighting systems are switched to full lighting levels whenever an occupant is detected. Fixtures are automatically switched back to low level after an area has been vacant for a preset period of time. Energy savings results from only providing full lighting levels when it is required.

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage needs to be provided to ensure that lights turn on in each area as an occupant approaches. High/Low controls have been indicated for the facilities' hallways and lobbies.

Additional savings from reduced lighting maintenance may also result from this measure, due to reduced lamp operation.

4.1.3 Motor Upgrades

ECM 6: Premium Efficiency Motors

Summary of Measure Economics

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)
11,951	2.3	0.0	$1,435.36	$33,364.10	$0.00	$33,364.10	23.2	12,035

Measure Description

The replacement of standard efficiency motors with NEMA Premium™ efficiency motors has been proposed primarily to account for costs associated with the requirement for upgrading to inverter duty rated motors when installing variable frequency drives (see related ECMs, below). Due to the marginal payback of this measure, motor replacement should be reconsidered if variable frequency drives are not going to be installed. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the New Jersey's Clean Energy Program Protocols to Measure Resource Savings. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

Please see discussion below regarding the requirement for inverter duty motors with variable frequency drives. It should be noted that the premium efficiency motor replacements discussed above would not be cost effective on the basis of energy savings alone because the project payback exceeds the expected life of the replacement equipment.

Please see **Appendix A: Equipment Inventory & Recommendations** for more information on existing and proposed motor upgrades.

4.1.4 Variable Frequency Drive Measures

For equipment with proposed VFDs, we have included replacing the controlled motor with a new motor —unless the existing motor meets or exceeds IHP 2014 standards—to conservatively account for the cost of an inverter duty rated motor. The savings and cost associated with the new motor are presented with the Premium Efficiency Motor measures. If the proposed VFD measure is not selected for implementation the motor replacement should be reevaluated. Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 27 below.

Figure 27 – Summary of Variable Frequency Drive 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)
Variable Frequency Drive (VFD) Measures		**323,554**	**53.8**	**0.0**	**$38,858.84**	**$92,863.25**	**$16,000.00**	**$76,863.25**	**2.0**	**325,816**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	213,753	45.8	0.0	$25,671.74	$58,278.80	$13,600.00	$44,678.80	1.7	215,248
ECM 8	Install VFDs on Chilled Water Pumps	53,700	7.9	0.0	$6,449.33	$25,218.40	$0.00	$25,218.40	3.9	54,075
ECM 9	Install VFDs on Cooling Tower Fans	56,101	0.0	0.0	$6,737.76	$9,366.05	$2,400.00	$6,966.05	1.0	56,494

Please see **Appendix A: Equipment Inventory & Recommendations** for more information about current motors systems and VFD recommendations.

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

Summary of Measure Economics

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)
213,753	45.8	0.0	$25,671.74	$58,278.80	$13,600.00	$44,678.80	1.7	215,248

Measure Description

We recommend installing variable frequency drives (VFDs) to control supply fan motor speeds to convert the six constant-volume, single-zone air handling units into variable-air-volume (VAV) systems at Building #41. 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 will cause the VFD to modulate fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature. Energy savings results from reducing fan speed (and power) when there is a reduced load required for the zone. The magnitude of energy savings is based on the estimated amount of time that fan motors operate at partial load.

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

ECM 8: Install VFDs on Chilled Water Pumps

Summary of Measure Economics

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)
53,700	7.9	0.0	$6,449.33	$25,218.40	$0.00	$25,218.40	3.9	54,075

Measure Description

We recommend installing variable frequency drives (VFD) to control chilled water pumps in Building 42. This measure requires that chilled water coils be served by 2-way valves and that a differential pressure sensor be installed in the chilled water loop. As the chilled water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing 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.

For systems with variable chilled water flow through the chiller, the minimum flow to prevent the chiller from tripping off will have 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.

ECM 9: Install VFDs on Cooling Tower Fans

Summary of Measure Economics

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)
56,101	0.0	0.0	$6,737.76	$9,366.05	$2,400.00	$6,966.05	1.0	56,494

Measure Description

We recommend installing a variable frequency drive (VFD) to control the cooling tower fan motor at Building #42. 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 results 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.

4.1.5 Electric Chiller Replacement

ECM 10: Install High Efficiency Chillers

Summary of Measure Economics

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)
184,238	49.4	0.0	$22,126.92	$185,124.90	$10,965.00	$174,159.90	7.9	185,526

Measure Description

We recommend replacing older inefficient electric Trane chiller with a new high efficiency chiller at Building #42. The type of chiller to be installed depends on the magnitude of the cooling load and variability of the cooling load profile. 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.

The savings result from the improvement in chiller efficiency and matching the right type of chiller to the cooling load. The energy savings associated with this measure is 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. Energy savings are maximized by proper selection of new equipment based on the cooling load profile.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measure upgrades.

4.1.6 HVAC System Upgrades

Our recommendation for HVAC system improvements are summarized in Figure 28 below.

Figure 28 - Summary of HVAC System Improvement 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)
HVAC System Improvements		20,700	0.0	251.5	$5,027.52	$16,313.04	$0.00	$16,313.04	3.2	50,290
ECM 11	Implement Demand Control Ventilation	20,700	0.0	251.5	$5,027.52	$16,313.04	$0.00	$16,313.04	3.2	50,290

ECM 11: Implement Demand Control Ventilation (DCV)

Summary of Measure Economics

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)
20,700	0.0	251.5	$5,027.52	$16,313.04	$0.00	$16,313.04	3.2	50,290

Measure Description

Demand control ventilation (DCV) monitors indoor air CO_2 content to measure room occupancy. This data is used to regulate the amount of outdoor provided to the space for ventilation. In order to ensure adequate air quality, standard ventilation systems often provide outside air based on a space's estimated maximum occupancy. However, during low occupancy periods, the space may be over ventilated. This wastes energy through excessive fan more usage and additional cost to heat and cool the excessive air flow. DCV reduces unnecessary outdoor air intake by regulating ventilation based on actual occupancy levels, saving significant amounts of energy. DCV is most suited for facilities where occupancy levels vary significantly hour to hour and day to day.

Energy savings associated with DCV are based on hours of operation, space occupancy, system air flow, outside air reduction, and other factors. Energy savings results from eliminating unnecessary ventilation and space conditioning. The recreation building is a good candidate for DCV owing to the range of occupancy and the associated variation in required airflow. The project includes DCV for all six air handling units at Building #41.

4.1.7 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 29 below.

Figure 29 - Summary of Domestic Water Heating 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)
Domestic Water Heating Upgrade		0	0.0	42.6	$430.90	$179.25	$0.00	$179.25	0.4	4,993
ECM 12	Install Low-Flow Domestic Hot Water Devices	0	0.0	42.6	$430.90	$179.25	$0.00	$179.25	0.4	4,993

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on the facility's existing domestic hot water equipment and recommended system upgrades.

ECM 12: Install Low-Flow DHW Devices

Summary of Measure Economics

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)
0	0.0	42.6	$430.90	$179.25	$0.00	$179.25	0.4	4,993

Measure Description

We recommend installing low-flow domestic hot water devices in Building 41 to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators can reduce hot water usage relative to standard aerators, which saves energy.

Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.1.8 Food Service Equipment & Refrigeration Measures

Food service and refrigeration measures recommendations are summarized in Figure 30 below.

Figure 30 - Summary of Food Service Equipment & Refrigeration 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)
Food Service Equipment & Refrigeration Measures		2,559	0.2	0.0	$307.31	$1,977.30	$75.00	$1,902.30	6.2	2,577
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors	1,265	0.2	0.0	$151.92	$303.30	$0.00	$303.30	2.0	1,274
ECM 14	Refrigeration Controls	1,294	0.1	0.0	$155.39	$1,674.00	$75.00	$1,599.00	10.3	1,303

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing food service and refrigeration and our recommended measures for this category.

ECM 13: Refrigerator/Freezer Case Electrically Commutated Motors

Summary of Measure Economics

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)
1,265	0.2	0.0	$151.92	$303.30	$0.00	$303.30	2.0	1,274

Measure Description

We recommend replacing the shaded pole or permanent split capacitor (PSC) motor with an electronically commutated (EC) motor in the walk-in coolers in Building #41. These fractional horsepower EC motors are significantly more efficient than mechanically commutated, brushed motors, particularly at low speeds or partial load. By employing variable-speed technology, EC motors are able to optimize fan usage. Because these motors are brushless and utilize DC power, losses due to friction and phase shifting are eliminated. Savings for this measure take into account both the increased efficiency of the motor as well as the reduction in refrigeration load due to motor heat loss.

ECM 14: Walk-In Cooler Controls

Summary of Measure Economics

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)
1,294	0.1	0.0	$155.39	$1,674.00	$75.00	$1,599.00	10.3	1,303

Measure Description

We recommend the installation of additional controls to optimize the operation of the walk-in cooler in Building #41.

Many walk-in coolers have evaporator fans which run continuously. The measure adds a control system feature to automatically shut off evaporator fans when the cooler's thermostat is not calling for cooling.

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.

4.1.9 Plug Load Equipment Control - Vending Machines

ECM 15: Vending Machine Control

Summary of Measure Economics

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)
3,909	0.0	0.0	$469.44	$920.00	$0.00	$920.00	2.0	3,936

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use in Building #41. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

4.2 ECMs Evaluated But Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 31 – Summary of Measures Evaluated, But Not Recommended

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)
Gas Heating (HVAC/Process) Replacement	0	0.0	226.8	$2,291.60	$77,689.84	$6,528.00	$71,161.84	31.1	26,551
Install High Efficiency Hot Water Boilers	0	0.0	226.8	$2,291.60	$77,689.84	$6,528.00	$71,161.84	31.1	26,551
TOTALS	0	0.0	226.8	$2,291.60	$77,689.84	$6,528.00	$71,161.84	31.1	26,551

* - All incentives presented in this table are based on NJ Smart Start Building 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).

Install High Efficiency Hot Water Boilers

Summary of Measure Economics

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)
0	0.0	226.8	$2,291.60	$77,689.84	$6,528.00	$71,161.84	31.1	26,551

Measure Description

We evaluated replacing older inefficient hot water boilers with high efficiency hot water boilers in Building #42. Significant improvements have been made in combustion technology resulting in increased overall boiler efficiency. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

The most notable efficiency improvement is condensing hydronic boilers that can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130 °F. Therefore, condensing hydronic boilers were only evaluated when the return water temperature is less than 130°F during most of the operating hours. As a result, condensing hydronic boilers are not recommended for this site.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

Reasons for not Recommending

The payback for replacing the boilers is longer than the effective useful life of the replacement equipment. Note: The boilers at this site also provide the facilities' domestic hot water. Further study is recommended to determine the cost and savings associated with disaggregating hot water heating from space heating and turning off the heating boilers when not needed.

5 Energy Efficient Practices

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Perform Proper Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20% - 60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6 – 12 months.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of 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.

Assess Chillers & Request Tune-Ups

Chillers are responsible for a substantial portion of a commercial building's overall energy usage. When components of a chiller are not optimized, this can quickly result in a noticeable increase in energy bills. Chiller diagnostics can produce a 5% to 10% cost avoidance potential from discovery and implementation of low/no cost optimization strategies.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Check for and Seal Duct Leakage

Duct leakage in commercial buildings typically accounts for 5 to 25 percent of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building, significantly increasing cooling and heating costs. By sealing sources of leakage, cooling, heating, and ventilation energy use can be reduced significantly, depending on the severity of air leakage.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer’s instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, 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. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any 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 any 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 over three to four years old have a technician inspect the sacrificial anode annually.

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. 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. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.7 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at 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.

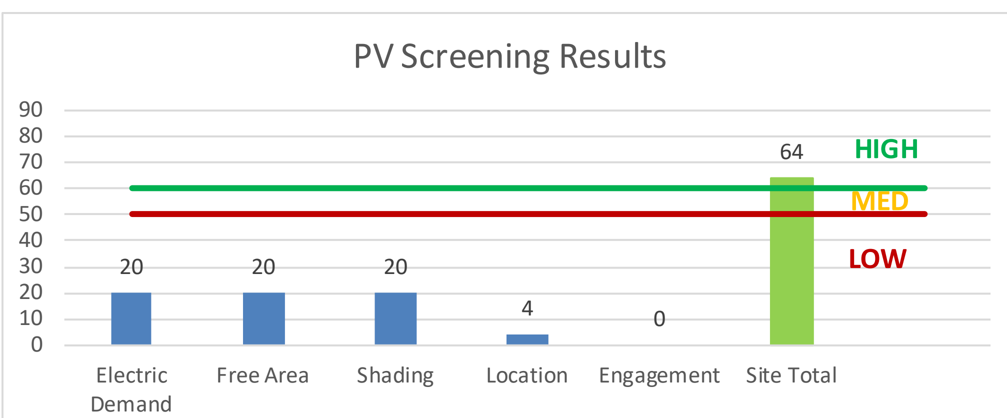
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

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

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for additional PV at the site. An additional PV array located over the main parking lot may be feasible. If Building 41 (MPRC) and Building 42 (MPRC Support) is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 32 - Photovoltaic Screening



Solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.6 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

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

6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use 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 a **Low** potential for installing a cost-effective CHP system.

Infrequent thermal load and lack of space near the existing boilers are the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

7 Demand Response

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage 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 DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

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

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

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

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other DR program information.

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

All Stockton University buildings participate in electricity demand response since 2012. Curtailment service provider is awarded by bid. The Program meets or exceeds goal every year.

8 Project Funding / Incentives

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 33 for a list of the eligible programs identified for each recommended ECM.

Figure 33 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	X					
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	X					
ECM 3	Retrofit Fixtures with LED Lamps	X					
ECM 4	Install Occupancy Sensor Lighting Controls	X					
ECM 5	Install High/Low Lighitng Controls						
ECM 6	Premium Efficiency Motors						
ECM 7	Install VFDs on Constant Volume (CV) HVAC	X					
ECM 8	Install VFDs on Chilled Water Pumps	X					
ECM 9	Install VFDs on Cooling Tower Fans	X					
ECM 10	Install High Efficiency Chillers	X					
ECM 11	Implement Demand Control Ventilation						
ECM 12	Install Low-Flow Domestic Hot Water Devices						
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors						
ECM 14	Refrigeration Controls	X					
ECM 15	Vending Machine Control	X					

SmartStart (SS) is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install (DI) caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

The SmartStart (SS) program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

<u>Equipment with Prescriptive Incentives Currently Available</u>:

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

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SS prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SS program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the Retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, 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

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

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

8.2 SREC Registration Program

The SREC Registration Program (SRP) 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 in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

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 SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec.

8.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract", whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. 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 can be leveraged to help further reduce the total project cost of eligible measures.

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 utilized 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. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: [www.njcleanenergy.com/ESIP.](www.njcleanenergy.com/ESIP)

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

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 is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. 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 is typically dependent upon whether a customer seeks 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 is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: 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	Watts per Fixture	Annual Operating Hours	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
Bldg 42 - Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,500	0.11	834	0.0	$100.16	$416.06	$40.00	3.75
Bldg 42 - Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,500	0.12	959	0.0	$115.19	$146.06	$40.00	0.92
Bldg 42 - Generator	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,000	0.15	1,139	0.0	$136.73	$219.09	$60.00	1.16
Bldg 42 - CH Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,500	0.31	2,398	0.0	$287.97	$635.15	$135.00	1.74
Bldg 41 - Room 310	6	Compact Fluorescent: Three Lamp Pin-Base CFL	Wall Switch	120	5,000	Relamp	Yes	6	LED Screw-In Lamps: Three Lamp Pin-based LED	Occupancy Sensor	84	3,500	0.27	2,111	0.0	$253.58	$630.00	$35.00	2.35
Bldg 41 - Elevator Lobby	4	Compact Fluorescent: One Lamp Screw-in CFL	Wall Switch	23	5,000	Relamp	No	4	LED Screw-In Lamps: One Lamp Screw-in LED	Wall Switch	16	5,000	0.02	159	0.0	$19.06	$68.90	$20.00	2.57
Bldg 41 - Room 310d	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	5,000	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,000	0.05	368	0.0	$44.20	$130.06	$40.00	2.04
Bldg 41 - Room 310d	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 41 - Athletic Training	16	Compact Fluorescent: Three Lamp Pin-Base CFL	Wall Switch	120	5,000	Relamp	Yes	16	LED Screw-In Lamps: Three Lamp Pin-based LED	Occupancy Sensor	84	3,500	0.72	5,630	0.0	$676.21	$1,500.00	$70.00	2.11
Bldg 41 - Fitness	26	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	23	3,500	None	No	26	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	23	3,500	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 41 - Restroom	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	5,000	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,000	0.05	368	0.0	$44.20	$130.06	$40.00	2.04
Bldg 41 - Hallway	34	Compact Fluorescent: One Lamp Screw-in CFL	Wall Switch	23	5,000	Relamp	Yes	34	LED Screw-In Lamps: One Lamp Screw-in LED	High/Low Control	16	3,500	0.29	2,293	0.0	$275.42	$1,785.65	$170.00	5.87
Bldg 41 - Press Box 318	4	Incandescent: One Lamp Screw-in Incandecent	Wall Switch	60	5,000	Relamp	Yes	4	LED Screw-In Lamps: One Lamp Screw-in LED	Occupancy Sensor	9	3,500	0.16	1,235	0.0	$148.34	$338.90	$55.00	1.91
Bldg 41 - Athletic Office 303	8	Compact Fluorescent: Three Lamp Pin-Base CFL	Wall Switch	120	5,000	Relamp	Yes	8	LED Screw-In Lamps: Three Lamp Pin-based LED	Occupancy Sensor	84	3,500	0.36	2,815	0.0	$338.11	$750.00	$35.00	2.11
Bldg 41 - 303f	2	Compact Fluorescent: Three Lamp Pin-Base CFL	Occupancy Sensor	120	3,500	Relamp	No	2	LED Screw-In Lamps: Three Lamp Pin-based LED	Occupancy Sensor	84	3,500	0.05	290	0.0	$34.80	$120.00	$0.00	3.45
Bldg 41 - 303e	6	Compact Fluorescent: Three Lamp Pin-Base CFL	Occupancy Sensor	120	3,500	Relamp	No	6	LED Screw-In Lamps: Three Lamp Pin-based LED	Occupancy Sensor	84	3,500	0.16	869	0.0	$104.41	$360.00	$0.00	3.45
Bldg 41 - 303d	2	Compact Fluorescent: Three Lamp Pin-Base CFL	Occupancy Sensor	120	3,500	Relamp	No	2	LED Screw-In Lamps: Three Lamp Pin-based LED	Occupancy Sensor	84	3,500	0.05	290	0.0	$34.80	$120.00	$0.00	3.45
Bldg 41 - 303c	2	Compact Fluorescent: Three Lamp Pin-Base CFL	Occupancy Sensor	120	3,500	Relamp	No	2	LED Screw-In Lamps: Three Lamp Pin-based LED	Occupancy Sensor	84	3,500	0.05	290	0.0	$34.80	$120.00	$0.00	3.45
Bldg 41 - 303b	2	Compact Fluorescent: Three Lamp Pin-Base CFL	Occupancy Sensor	120	3,500	Relamp	No	2	LED Screw-In Lamps: Three Lamp Pin-based LED	Occupancy Sensor	84	3,500	0.05	290	0.0	$34.80	$120.00	$0.00	3.45
Bldg 41 - 303a	2	Compact Fluorescent: Three Lamp Pin-Base CFL	Occupancy Sensor	120	3,500	Relamp	No	2	LED Screw-In Lamps: Three Lamp Pin-based LED	Occupancy Sensor	84	3,500	0.05	290	0.0	$34.80	$120.00	$0.00	3.45
Bldg 41 - 301 Office	6	Compact Fluorescent: Three Lamp Pin-Base CFL	Wall Switch	120	5,000	Relamp	Yes	6	LED Screw-In Lamps: Three Lamp Pin-based LED	Occupancy Sensor	84	3,500	0.27	2,111	0.0	$253.58	$630.00	$35.00	2.35
Bldg 41 - 393 Lobby	4	Compact Fluorescent: One Lamp Screw-in CFL	Wall Switch	23	5,000	Relamp	No	4	LED Screw-In Lamps: One Lamp Screw-in LED	Wall Switch	16	5,000	0.02	159	0.0	$19.06	$68.90	$20.00	2.57
Bldg 41 - Closet 393	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,000	0.02	190	0.0	$22.79	$36.52	$10.00	1.16
Bldg 41 - 300b	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	5,000	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,000	0.05	368	0.0	$44.20	$130.06	$40.00	2.04
Bldg 41 - Stairwell	10	Compact Fluorescent: Two Lamp Screw-in CFL	Wall Switch	46	5,000	Relamp	No	10	LED Screw-In Lamps: Two Lamp Screw-in LED	Wall Switch	32	5,000	0.10	794	0.0	$95.30	$344.50	$100.00	2.57

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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
Bldg 41 - Stairwell	10	Compact Fluorescent: Two Lamp Screw-in CFL	Wall Switch	46	5,000	Relamp	No	10	LED Screw-In Lamps: Two Lamp Screw-in LED	Wall Switch	32	5,000	0.10	794	0.0	$95.30	$344.50	$100.00	2.57
Bldg 41 - 225 Lobby	6	Compact Fluorescent: One Lamp Screw-in CFL	Wall Switch	23	5,000	Relamp	No	6	LED Screw-In Lamps: One Lamp Screw-in LED	Wall Switch	16	5,000	0.03	238	0.0	$28.59	$103.35	$30.00	2.57
Bldg 41 - 218 Locker Room	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,500	0.06	447	0.0	$53.73	$414.92	$35.00	7.07
Bldg 41 - 218 Locker Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	5,000	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,500	0.05	377	0.0	$45.27	$54.77	$50.00	0.11
Bldg 41 - 218 Locker Room	1	Compact Fluorescent: One Lamp Screw-in CFL	Wall Switch	23	5,000	Relamp	Yes	1	LED Screw-In Lamps: One Lamp Screw-in LED	Occupancy Sensor	16	3,500	0.01	67	0.0	$8.10	$17.23	$40.00	-2.81
Bldg 41 - Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,000	0.02	190	0.0	$22.79	$36.52	$10.00	1.16
Bldg 41 - Lounge	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,500	0.09	671	0.0	$80.59	$487.38	$35.00	5.61
Bldg 41 - Mens Locker	4	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	27	5,000	Relamp	Yes	4	LED - Linear Tubes: (1) 3' Lamp	Occupancy Sensor	11	3,500	0.06	452	0.0	$54.28	$343.03	$35.00	5.67
Bldg 41 - Mens Locker	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	5,000	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,500	0.10	754	0.0	$90.53	$109.55	$65.00	0.49
Bldg 41 - Mens Locker	3	Compact Fluorescent: Two Lamp Screw-in CFL	Wall Switch	46	5,000	Relamp	Yes	3	LED Screw-In Lamps: Two Lamp Screw-in LED	Occupancy Sensor	32	3,500	0.05	405	0.0	$48.60	$103.35	$65.00	0.79
Bldg 41 - Mens Locker	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,500	0.17	1,342	0.0	$161.18	$704.76	$35.00	4.16
Bldg 41 - 210 Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,000	0.02	190	0.0	$22.79	$36.52	$10.00	1.16
Bldg 41 - Hallway	36	Compact Fluorescent: One Lamp Screw-in CFL	Wall Switch	23	5,000	Relamp	Yes	36	LED Screw-In Lamps: One Lamp Screw-in LED	High/Low Control	16	3,500	0.31	2,428	0.0	$291.62	$1,820.10	$180.00	5.62
Bldg 41 - 205 Classroom	8	Compact Fluorescent: Two Lamp Screw-in CFL	Wall Switch	80	5,000	Relamp	Yes	8	LED Screw-In Lamps: Two Lamp Screw-in LED	Occupancy Sensor	56	3,500	0.24	1,877	0.0	$225.40	$545.60	$115.00	1.91
Bldg 41 - Classroom 205	24	Incandescent: One Lamp Screw-in Incandescent	Wall Switch	60	5,000	Relamp	Yes	24	LED Screw-In Lamps: One Lamp Screw-in LED	Occupancy Sensor	9	3,500	0.95	7,411	0.0	$890.01	$953.40	$190.00	0.86
Bldg 41 - Elevator Lobby	9	Compact Fluorescent: One Lamp Screw-in CFL	Wall Switch	23	5,000	Relamp	Yes	9	LED Screw-In Lamps: One Lamp Screw-in LED	High/Low Control	16	3,500	0.08	607	0.0	$72.90	$555.03	$45.00	7.00
Bldg 41 - Kitchen	9	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,500	Relamp	No	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,500	0.19	1,051	0.0	$126.17	$652.14	$0.00	5.17
Bldg 41 - Kitchen	8	Compact Fluorescent: One Lamp Screw-in CFL	Wall Switch	23	5,000	Relamp	Yes	8	LED Screw-In Lamps: One Lamp Screw-in LED	Occupancy Sensor	16	3,500	0.07	540	0.0	$64.80	$407.80	$75.00	5.14
Bldg 41 - 1st Floor Lobby	28	Compact Fluorescent: One Lamp Screw-in CFL	Wall Switch	23	5,000	Relamp	Yes	28	LED Screw-In Lamps: One Lamp Screw-in LED	High/Low Control	16	3,500	0.24	1,889	0.0	$226.81	$1,482.30	$140.00	5.92
Bldg 41 - Hallway	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,500	0.49	3,836	0.0	$460.75	$1,184.24	$160.00	2.22
Bldg 41 - Office 110	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,500	0.06	447	0.0	$53.73	$144.92	$35.00	2.05
Bldg 41 - Office 110	8	Compact Fluorescent: One Lamp Screw-in CFL	Wall Switch	23	5,000	Relamp	Yes	8	LED Screw-In Lamps: One Lamp Screw-in LED	Occupancy Sensor	16	3,500	0.07	540	0.0	$64.80	$407.80	$75.00	5.14
Bldg 41 - Closet	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	5,000	0.02	167	0.0	$20.03	$72.46	$0.00	3.62
Bldg 41 - Mens Restroom	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	3,500	Relamp	No	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,500	0.10	564	0.0	$67.68	$146.06	$40.00	1.57
Bldg 41 - Mens Restroom	2	Compact Fluorescent: One Lamp Screw-in CFL	Occupancy Sensor	23	3,500	Relamp	No	2	LED Screw-In Lamps: One Lamp Screw-in LED	Occupancy Sensor	16	3,500	0.01	56	0.0	$6.67	$34.45	$10.00	3.67

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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
Bldg 41 - Womens Restroom	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	3,500	Relamp	No	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,500	0.10	564	0.0	$67.68	$146.06	$40.00	1.57
Bldg 41 - Womens Restroom	2	Compact Fluorescent: One Lamp Screw-in CFL	Occupancy Sensor	23	3,500	Relamp	No	2	LED Screw-In Lamps: One Lamp Screw-in LED	Occupancy Sensor	16	3,500	0.01	56	0.0	$6.67	$34.45	$10.00	3.67
Bldg 41 - Display	9	Linear Fluorescent - T12: 3' T12 (30W) - 1L	None	46	8,760	Relamp & Reballast	Yes	9	LED - Linear Tubes: (1) 3' Lamp	Occupancy Sensor	11	6,132	0.26	3,504	0.0	$420.86	$724.64	$35.00	1.64
Bldg 41 - Lobby	33	Compact Fluorescent: One Lamp Screw-in CFL	Wall Switch	23	5,000	Relamp	Yes	33	LED Screw-In Lamps: One Lamp Screw-in LED	High/Low Control	16	3,500	0.28	2,226	0.0	$267.31	$1,768.43	$165.00	6.00
Bldg 41 - Lobby	10	Metal Halide: (1) 150W Lamp	Wall Switch	190	5,000	Fixture Replacement	Yes	10	LED - Fixtures: Downlight Recessed	High/Low Control	57	3,500	1.10	8,631	0.0	$1,036.55	$1,917.66	$50.00	1.80
Bldg 41 - Lockers	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	5,000	0.04	334	0.0	$40.05	$144.92	$0.00	3.62
Bldg 41 - Ticket Booth	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	5,000	0.04	334	0.0	$40.05	$144.92	$0.00	3.62
Bldg 41 - Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,000	0.02	190	0.0	$22.79	$36.52	$10.00	1.16
Bldg 41 - Hallway	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 41 - 122 Office	5	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,500	Relamp	No	5	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,500	0.11	584	0.0	$70.09	$362.30	$0.00	5.17
Bldg 41 - Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,000	0.02	190	0.0	$22.79	$36.52	$10.00	1.16
Bldg 41 - Locker Room 1	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,500	Relamp	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,500	0.13	700	0.0	$84.11	$434.76	$0.00	5.17
Bldg 41 - Locker Room 1	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	3,500	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,500	0.05	282	0.0	$33.84	$73.03	$20.00	1.57
Bldg 41 - Locker Room 1	8	Compact Fluorescent: One Lamp Screw-in CFL	Occupancy Sensor	23	3,500	Relamp	No	8	LED Screw-In Lamps: One Lamp Screw-in LED	Occupancy Sensor	16	3,500	0.04	222	0.0	$26.68	$137.80	$40.00	3.67
Bldg 41 - Locker Room 2	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,500	Relamp	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,500	0.13	700	0.0	$84.11	$434.76	$0.00	5.17
Bldg 41 - Locker Room 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	3,500	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,500	0.05	282	0.0	$33.84	$73.03	$20.00	1.57
Bldg 41 - Locker Room 2	8	Compact Fluorescent: One Lamp Screw-in CFL	Occupancy Sensor	23	3,500	Relamp	No	8	LED Screw-In Lamps: One Lamp Screw-in LED	Occupancy Sensor	16	3,500	0.04	222	0.0	$26.68	$137.80	$40.00	3.67
Bldg 41 - Hallway	10	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,500	Relamp	No	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,500	0.21	1,167	0.0	$140.19	$724.60	$0.00	5.17
Bldg 41 - Closets	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,000	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,000	0.17	1,328	0.0	$159.52	$255.61	$70.00	1.16
Bldg 41 - Gym Area	80	Linear Fluorescent - T5HO: 4' T5HO (54W) - 8L	Wall Switch	468	5,000	Relamp	Yes	80	LED - Linear Tubes: (8) 4' T5HO (25W) Lamps	Occupancy Sensor	204	3,500	19.15	149,592	0.0	$17,966.00	$15,091.60	$3,410.00	0.65
Bldg 41 - Gym Area	28	Compact Fluorescent: Two Lamp Screw-in CFL	Wall Switch	46	5,000	Relamp	Yes	28	LED Screw-In Lamps: Two Lamp Screw-in LED	Occupancy Sensor	32	3,500	0.48	3,777	0.0	$453.62	$1,504.60	$350.00	2.55
Bldg 41 - Gym Area	10	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	10	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 41 - Scaling Area	36	Compact Fluorescent: One Lamp Screw-in CFL	Wall Switch	13	5,000	Relamp	Yes	36	LED Screw-In Lamps: One Lamp Screw-in LED	Occupancy Sensor	9	3,500	0.18	1,372	0.0	$164.83	$1,430.10	$285.00	6.95
Bldg 41 - Exterior	18	LED Screw-In Lamps: One Lamp Screw-in LED	None	15	4,380	None	No	18	LED Screw-In Lamps: One Lamp Screw-in LED	None	15	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 41 - Exterior	8	Metal Halide: (1) 150W Lamp	None	190	4,380	Fixture Replacement	No	8	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	57	4,380	0.78	5,359	0.0	$643.66	$7,727.72	$800.00	10.76

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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
Bldg 41 - Showbox	20	Metal Halide: (1) 250W Lamp	None	295	4,380	Fixture Replacement	No	20	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	89	4,380	3.04	20,803	0.0	$2,498.42	$18,611.28	$2,000.00	6.65
Bldg 41 - Field Lighting	4	Metal Halide: (24) 1000W Lamp	None	25,920	3,000	Fixture Replacement	No	4	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	None	7,776	3,000	53.42	250,387	0.0	$30,071.50	$114,672.40	$0.00	3.81

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?	Annual Operating Hours	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
Bldg 42: Mechanical Room	Condenser Water System	1	Cooling Tower Fan	40.0	93.0%	No	4,067	Yes	94.1%	Yes	1	0.19	57,131	0.0	$6,861.42	$13,371.80	$2,400.00	1.60
Bldg 42: Mechanical Room	Condenser Water System	1	Condenser Water Pump	20.0	91.0%	No	3,391	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 42: Mechanical Room	Chilled Water System	1	Chilled Water Pump	10.0	89.5%	No	3,391	Yes	91.7%	Yes	1	1.33	12,458	0.0	$1,496.19	$5,151.50	$0.00	3.44
Bldg 42: Mechanical Room	Chilled Water System	1	Chilled Water Pump	1.5	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 42: Mechanical Room	Heating/Domestic Hot Water	1	Heating Hot Water Pump	1.5	84.0%	No	2,745	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 42: Mechanical Room	Heating/Domestic Hot Water	2	Heating Hot Water Pump	3.0	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 42: Mechanical Room	Chilled Water System	1	Chilled Water Pump	7.5	88.5%	No	3,391	Yes	91.0%	Yes	1	1.01	9,467	0.0	$1,136.97	$4,738.24	$0.00	4.17
Bldg 42: Mechanical Room	Chilled Water System	1	Chilled Water Pump	15.0	91.0%	No	3,391	Yes	93.0%	Yes	1	1.95	18,354	0.0	$2,204.30	$7,041.17	$0.00	3.19
Bldg 42: Mechanical Room	Heating/Domestic Hot Water	1	Heating Hot Water Pump	0.8	81.8%	No	2,745	No	81.8%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 42: Mechanical Room	Condenser Water System	1	Condenser Water Pump	20.0	91.0%	No	1,300	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 42: Mechanical Room	Chilled Water System	1	Chilled Water Pump	10.0	89.5%	No	1,300	Yes	91.7%	Yes	1	1.33	4,776	0.0	$573.59	$5,151.50	$0.00	8.98
Bldg 42: Mechanical Room	Chilled Water System	1	Chilled Water Pump	1.5	82.5%	No	1,100	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 42: Mechanical Room	Heating/Domestic Hot Water	1	Heating Hot Water Pump	1.5	84.0%	No	1,100	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 42: Mechanical Room	Primary Heating Hot Water	2	Heating Hot Water Pump	3.0	86.5%	No	1,100	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 42: Mechanical Room	Chilled Water System	1	Chilled Water Pump	7.5	88.5%	No	1,300	Yes	91.0%	Yes	1	1.01	3,629	0.0	$435.88	$4,738.24	$0.00	10.87
Bldg 42: Mechanical Room	Chilled Water System	1	Chilled Water Pump	15.0	91.0%	No	1,300	Yes	93.0%	Yes	1	1.95	7,036	0.0	$845.06	$7,041.17	$0.00	8.33
Bldg 42: Mechanical Room	Heating/Domestic Hot Water	1	Heating Hot Water Pump	0.8	81.8%	No	1,100	No	81.8%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 41: Roof	AHU 2-6	5	Supply Fan	15.0	91.0%	No	4,400	Yes	93.0%	Yes	5	20.87	98,230	0.0	$11,797.40	$35,205.85	$6,000.00	2.48
Bldg 41: Roof	AHU 2-6	5	Return Fan	15.0	91.0%	No	4,400	Yes	93.0%	Yes	5	20.87	98,230	0.0	$11,797.40	$35,205.85	$6,000.00	2.48
Bldg 41: Kitchen	Over Ovens	1	Kitchen Hood Exhaust Fan	0.1	68.5%	No	5,250	No	68.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		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?	Annual Operating Hours	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
Bldg 41: Roof	AHU 1	1	Supply Fan	20.0	91.0%	No	4,400	Yes	93.0%	Yes	1	5.57	26,195	0.0	$3,145.97	$8,582.03	$1,600.00	2.22

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)	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
Bldg 42: Outside	Auxiliary Chilled Water	2	Air-Cooled Reciprocating Chiller	65.00	No							0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 42: Mechanical Room	Chilled Water	1	Water-Cooled Screw Chiller	255.00	Yes	1	Water-Cooled Screw Chiller	Variable	255.00	0.68	0.43	49.38	184,238	0.0	$22,126.92	$185,124.90	$10,965.00	7.87

Fuel Heating/Cooling 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)	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
Bldg 42: Mechanical Room	Heating Hot Water	2	Non-Condensing Hot Water Boiler	2,176.00	Yes	2	Non-Condensing Hot Water Boiler	2,176.00	85.00%	Et	0.00	0	226.8	$2,291.60	$77,689.84	$6,528.00	31.05
Bldg 42: Outside	Chilled Water System	2	Mechanically Driven Chiller	756.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Demand Control Ventilation Recommendations

		Recommendation Inputs				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	Number of Zones	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	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
Bldg 41 - Roof	AHU 1-6	12	230.00		4,350.00	0.00	20,700	251.5	$5,027.52	$16,313.04	$0.00	3.24

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	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
Bldg 42: Mechanical Room	Entire Facility	1	Indirect System	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommendation Inputs				Energy Impact & Financial Analysis						
Location	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
Bldg 41	25	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	42.6	$430.90	$179.25	$0.00	0.42

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions			Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Bldg 41 - Kitchen	1	Cooler (35F to 55F)	Yes	No	Yes	0.21	2,559	0.0	$307.31	$1,977.30	$75.00	6.19

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	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
Bldg 41 - Kitchen	2	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bldg 41 - Kitchen	1	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	ENERGY STAR Qualified?	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
Bldg 41 - Kitchen	2	Ice Making Head (<450 lbs/day), Batch	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	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
Bldg 41: Kitchen	4	Gas Convection Oven (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Bldg 41	9	Small Printer	20.0	
Bldg 41	3	Medium Printer	200.0	
Bldg 41	1	Large Printer	515.0	
Bldg 41	8	40" TV	120.0	
Bldg 41	2	Microwaves	1,000.0	
Bldg 41	1	Coffee Maker	400.0	
Bldg 41	5	Minifridge	30.0	

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	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
Bldg 41	2	Refrigerated	Yes	0.00	3,224	0.0	$387.16	$460.00	$0.00	1.19
Bldg 41	2	Non-Refrigerated	Yes	0.00	685	0.0	$82.27	$460.00	$0.00	5.59

Appendix B: EPA Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Building #41/42 - Multipurpose Rec Center (Big Blue) / MPRC support

Primary Property Type: Other - Recreation
Gross Floor Area (ft²): 74,829
Built: 2000

For Year Ending: April 30, 2017
Date Generated: December 03, 2018

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
Building #41/42 - Multipurpose Rec Center (Big Blue) / MPRC support 101 Vera King Farris Drive Galloway, New Jersey 08205	Stockton University 101 Vera King Farris Drive Galloway, NJ 08205 (____)____-______	Dan Cordle 101 Vera King Farris Drive Galloway, NJ 08205 609-652-4221 Dan.Cordle@stockton.edu

Property ID: 6623658

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
189.3 kBtu/ft²

Source EUI
354.7 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	6,703,135 (47%)	
Electric - Solar (kBtu)	1,332,475 (9%)	
Natural Gas (kBtu)	6,133,236 (43%)	

National Median Comparison

National Median Site EUI (kBtu/ft²)	59.8
National Median Source EUI (kBtu/ft²)	112
% Diff from National Median Source EUI	217%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	1,005

Signature & Stamp of Verifying Professional

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

Signature: ________________________Date: ___________

Licensed Professional

____ ________
,
(____)____-______
____

Professional Engineer Stamp (if applicable)