Local Government Energy Audit:
Energy Audit Report

Senior Center

505 DeMott Lane

Somerset, New Jersey 08873

Franklin, Township of Somerset

December 31, 2018

Final Report by:

TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services (TRC) and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain 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. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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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 the Senior Center.

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 townships in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

The Senior Center is a 20,000 square foot facility comprised of various space types within one building. The Senior Center building is one floor and includes a crafts room, library, offices, senior center dining room, billiard room, a commercial kitchen and mechanical space.

Lighting at the Senior Center consists of some aging and inefficient fixtures and HVAC equipment in need of efficient controls. Heating is supplied by two natural gas hot water boilers and in some areas electric resistance heat is present. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated six measures which together represent an opportunity for the Senior Center to reduce annual energy costs by roughly $4,809 and annual greenhouse gas emissions by 37,570 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 4.8 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 the Senior Center's annual energy use by 5%.

Figure 1 – Previous 12 Month Utility Costs

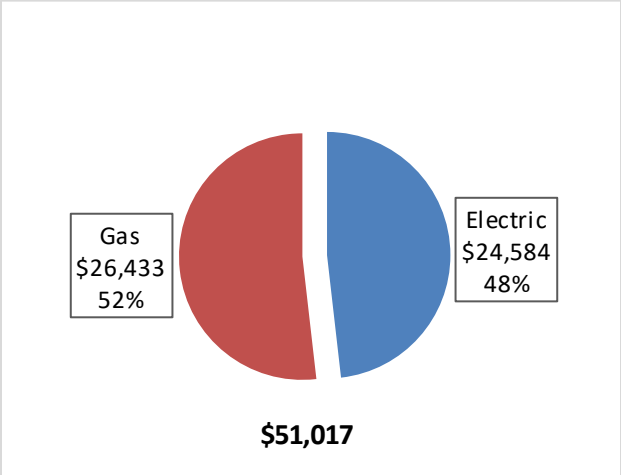
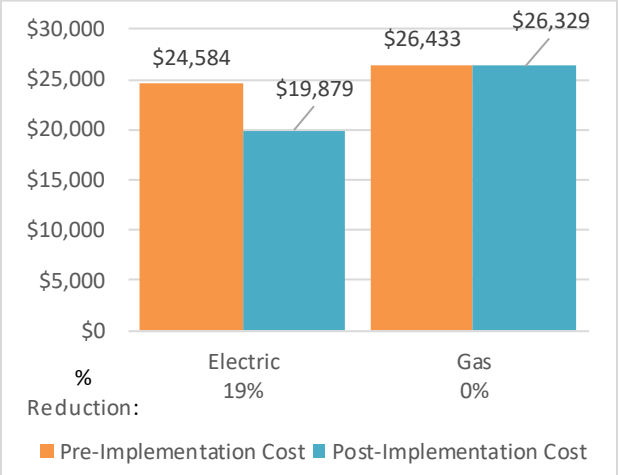


Figure 2 – Potential Post-Implementation Costs



A detailed description of the Senior Center's existing energy use can be found in Section 3.

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.

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			**23,357**	**10.0**	**0.0**	**$3,028.75**	**$13,604.36**	**$1,945.00**	**$11,659.36**	**3.8**	**23,521**
ECM 1	Install LED Fixtures	Yes	12,138	5.6	0.0	$1,573.87	$6,955.20	$175.00	$6,780.20	4.3	12,222
ECM 2	Retrofit Fixtures with LED Lamps	Yes	11,220	4.4	0.0	$1,454.88	$6,649.16	$1,770.00	$4,879.16	3.4	11,298
Lighting Control Measures			**5,516**	**2.2**	**0.0**	**$715.30**	**$5,406.00**	**$585.00**	**$4,821.00**	**6.7**	**5,555**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	5,516	2.2	0.0	$715.30	$5,406.00	$585.00	$4,821.00	6.7	5,555
Variable Frequency Drive (VFD) Measures			**6,108**	**0.8**	**0.0**	**$792.05**	**$6,015.30**	**$0.00**	**$6,015.30**	**7.6**	**6,151**
ECM 4	Install VFDs on Hot Water Pumps	Yes	6,108	0.8	0.0	$792.05	$6,015.30	$0.00	$6,015.30	7.6	6,151
Electric Unitary HVAC Measures			**5,170**	**3.1**	**0.0**	**$670.43**	**$9,075.84**	**$368.00**	**$8,707.84**	**13.0**	**5,206**
	Install High Efficiency Electric AC	No	5,170	3.1	0.0	$670.43	$9,075.84	$368.00	$8,707.84	13.0	5,206
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**150.1**	**$1,775.20**	**$40,421.76**	**$3,704.80**	**$36,716.96**	**20.7**	**17,579**
	Install High Efficiency Hot Water Boilers	No	0	0.0	150.1	$1,775.20	$40,421.76	$3,704.80	$36,716.96	20.7	17,579
HVAC System Improvements			**1,307**	**0.3**	**0.0**	**$169.53**	**$1,000.00**	**$500.00**	**$500.00**	**2.9**	**1,317**
ECM 5	Install Dual Enthalpy Outside Economizer Control	Yes	1,307	0.3	0.0	$169.53	$1,000.00	$500.00	$500.00	2.9	1,317
Domestic Water Heating Upgrade			**0**	**0.0**	**8.8**	**$103.71**	**$43.02**	**$0.00**	**$43.02**	**0.4**	**1,027**
ECM 6	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	8.8	$103.71	$43.02	$0.00	$43.02	0.4	1,027
TOTALS FOR HIGH PRIORITY MEASURES			**36,289**	**13.3**	**8.8**	**$4,809.34**	**$26,068.68**	**$3,030.00**	**$23,038.68**	**4.8**	**37,570**
TOTALS FOR ALL EVALUATED MEASURES			**41,460**	**16.4**	**158.9**	**$7,254.97**	**$75,566.28**	**$7,102.80**	**$68,463.48**	**9.4**	**60,356**

* - 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.

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 Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical 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.

Energy Efficient Practices

TRC also identified seven 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 the Senior Center include:

- Close Doors and Windows
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- 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 the Senior Center. 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	49	kW DC STC
Electric Generation	58,378	kWh/yr
Displaced Cost	$5,080	/yr
Installed Cost	$127,400	

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
- Direct Install
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- 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 SmartStart 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 SmartStart program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives than SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated Direct Install contractor and, in most cases, they will perform the installation work.

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 8.4 for additional information on the ESIP Program.

Additional information on relevant incentive programs is located in Section 8 or: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Carl Hauck	Public Works Manager	carl.hauck@fanklinnj.gov	(732) 249-7800
Designated Representative			
John Beigen	Facility Representative	john.beigen@franklinnj.gov	(732) 841-5544
TRC Energy Services			
Yagna Otia	Auditor	Yotia@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On August 15, 2018, TRC performed an energy audit at the Senior Center located in Somerset, New Jersey. TRC's team met with John Beigen to review the facility operations and help focus our investigation on specific energy-using systems.

The Senior Center is a 20,000 square foot facility comprised of various space types within one building. The Senior Center building is one floor and includes a crafts room, library, offices, senior center dining room, billiard room, a commercial kitchen and mechanical space.

The building was constructed in 1995. Over the last five years the facility has replaced all of its existing T12 fluorescent fixtures with T8 fluorescent fixtures. The site is interested in a new EMS (Energy Management System) but has been unable to fund the project.

2.3 Building Occupancy

The Senior Center building is open Monday through Friday. The typical schedule is presented in the table below. The entire facility is used year-round by the community and camps are run throughout the summer. During a typical day, the facility is occupied by approximately 20 staff and 35 senior citizens.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Senior Center	Weekday	7:30AM - 4:30PM

2.4 Building Envelope

The building is constructed of concrete block, and structural steel with a stone facade. The building has asphalt shingles on the roof perimeter as well as flat roof in core which is covered with black membrane that is in good condition. The building has double pane windows which are in good. The exterior doors are constructed of glass with aluminum frame and in good condition.

Image 1 Building Exterior and Roof

2.5 On-Site Generation

The Senior Center does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

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

Lighting System

Lighting at the facility is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL). Most of the fixtures are 2-lamp or 3-lamp, 4-foot long troffers with diffusers.

A small area of the building and the majority of the office spaces are primarily lit with 18-Watt CFL lamps in recessed can ceiling fixtures.

Lighting control in most spaces is provided by wall switch with some extent of occupancy sensors. The occupancy sensors are either wall or ceiling mounted depending on the space layout. Stairwells, elevator lobbies and main lobby areas do not contain any occupancy sensors and are on 24 hours per day throughout the year.

Image 2 Lighting Fixtures

Hot Water Heating System

The hot water system consists of two Hydrotherm 842 kBtu/hr output, non-condensing hot water boilers (B1 & 2). The boilers have a nominal combustion efficiency of 82%. The boilers are configured in a constant flow primary distribution with two hot water pumps (HHWP1 & 2). Hot water is supplied at 180°F when the outside air temperature is below 50°F and the setpoint is reset to 155°F when the outside air is above 65°F.

Image 3 Hot Water Boiler System

The boilers operate in a lead/lag configuration. More than one boiler may be required during cold weather. The lead boiler is rotated weekly.

The boilers are in good condition and well maintained.

Direct Expansion Air Conditioning System (DX)

Two 2-ton, one 4-ton, three 8.5-ton and two 10-ton Carrier direct-expansion (DX) package units with electric heat along with two 10-ton Lennox packaged units used to provide HVAC needs of the building. The units are located on the roof. The Carrier units utilize a scroll compressor and a DX coil. All units have an outside air economizer to utilize free cooling when the outside air temperature is lower than the return air temperature. The electric heater provides heating as needed.

The unit is controlled by a programmable thermostat located in the gymnasium. The thermostat is set to maintain a heating setpoint of 72°F and a cooling setpoint of 68°F from 7:30 AM to 4:30 PM every day. At night the heating setpoint is 60°F and the cooling setpoint is 78°F.

Image 4 Packaged Units on Roof

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of single 75-gallon storage tank hot water heater with an input rating of 76 kBtu/hr each and a nominal efficiency of 80%. One 500-Watt recirculation pump distributes 120°F water to the entire site. The recirculation pump operates continuously.

Image 5 DHW Heater

Food Service & Laundry Equipment

The school has an all-electric kitchen that is used to prepare approximately 50 lunches per day for the senior citizens and staff. Most of the cooking is done using the two convection ovens.

Image 6 Cooking Equipment

Refrigeration

The facility has a stand-up refrigerator and a stand-up freezer. The refrigerator capacity is 25 cu. ft. and freezer capacity are 24.2 cu. ft. The facility also has an Ice making machine.

Image 7 Refrigeration Equipment

Building Plug Load

There are roughly 16 computer work stations throughout the facility. Roughly 90% of the computers are desktop units with LCD monitors. There is no centralized PC power management software installed.

There are two server closets. The facility has no vending machines.

2.7 Water-Using Systems

There are two restrooms at this facility. A sampling of restrooms found that all of the faucets are rated for 2.2 gallons per minute (gpm) or higher, the toilets are rated at 2.5 gallons per flush (gpf) and the urinals are rated at 2 gpf.

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

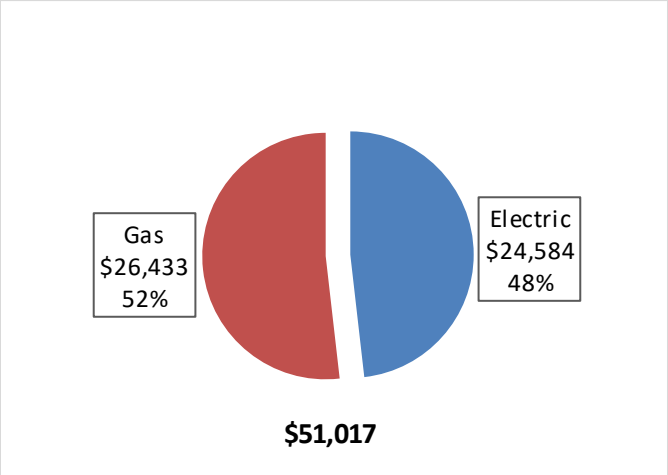
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Senior Center		
Fuel	**Usage**	**Cost**
Electricity	189,591 kWh	$24,584
Natural Gas	22,355 Therms	$26,433
Total		**$51,017**

The current annual energy cost for this facility is $51,017 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was $0.130/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. The monthly electricity consumption and peak demand are shown in the chart below. The electric energy profile is normal for electrically cooled and partially electrically heated building in a temperate climate. The low usage in February is likely due to the short billing cycle.

Figure 9 - Electric Usage & Demand

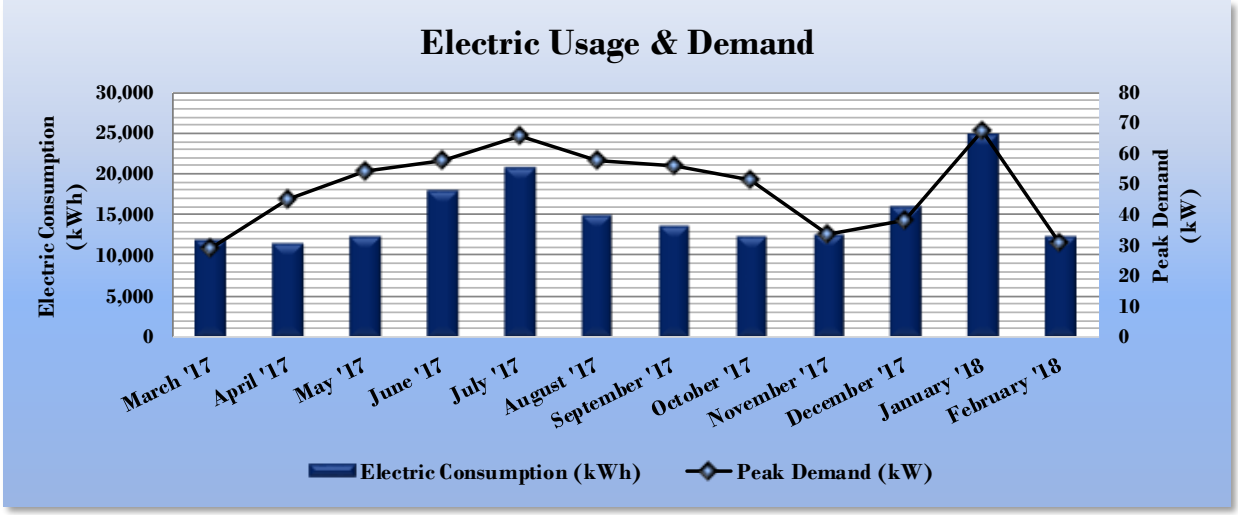


Figure 10 - Electric Usage & Demand

Electric Billing Data for Senior Center					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
4/3/17	27	11,840	29		$404
5/4/17	30	11,520	45		$1,441
6/5/17	30	12,320	54		$2,109
7/5/17	29	17,920	58		$2,788
8/2/17	26	20,800	66		$3,219
9/1/17	28	15,040	58		$2,460
10/3/17	31	13,760	56		$1,735
11/1/17	27	12,320	51		$1,553
12/4/17	32	12,480	34		$1,489
1/8/18	33	16,000	38		$1,883
2/1/18	22	24,960	67		$2,972
3/6/18	34	12,320	30		$1,455
Totals	**349**	**181,280**	**67.2**	**$0**	**$23,507**
Annual	**365**	**189,591**	**67.2**	**$0**	**$24,584**

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $1.182/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. The natural gas energy profile is normal for a heated building in a temperate climate. The low usage in February is likely due to the short billing cycle.

Figure 11 - Natural Gas Usage

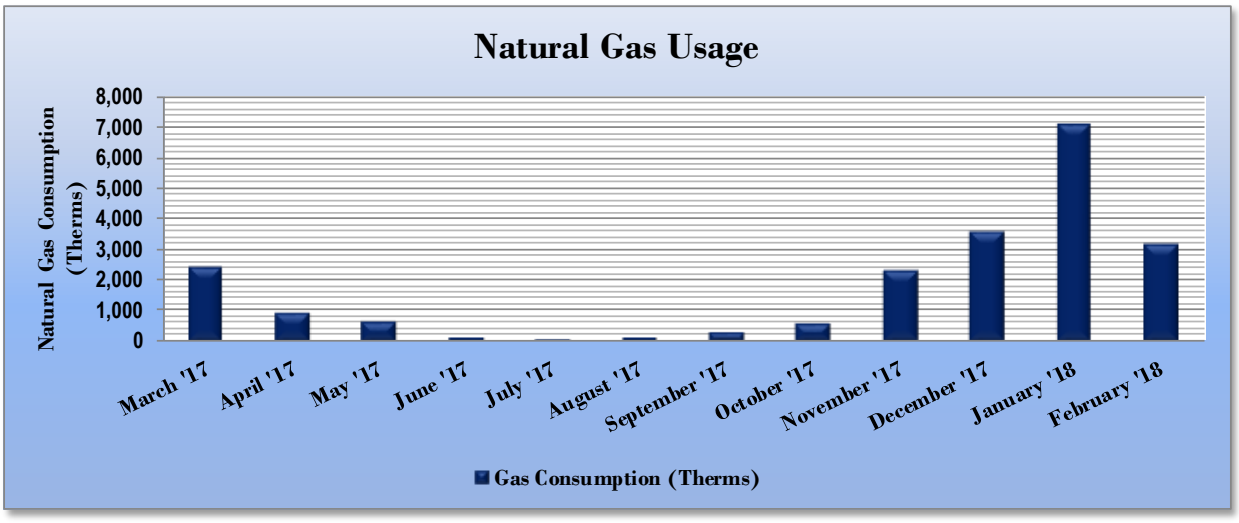


Figure 12 - Natural Gas Usage

Gas Billing Data for Senior Center			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
4/3/17	27	2,418	$1,443
5/4/17	30	929	$1,281
6/5/17	30	641	$1,330
7/5/17	29	139	$1,813
8/2/17	26	56	$2,077
9/1/17	28	120	$1,539
10/3/17	31	289	$1,435
11/1/17	27	607	$1,761
12/4/17	32	2,312	$2,115
1/8/18	33	3,567	$2,574
2/1/18	22	7,101	$5,298
3/6/18	34	3,196	$2,607
Totals	**349**	**21,376**	**$25,274**
Annual	**365**	**22,355**	**$26,433**

3.4 Benchmarking

This facility was benchmarked using Portfolio Manager®, an online tool created and managed by the United States 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.

The EUI 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 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Senior Center	National Median Building Type: Municipal
Source Energy Use Intensity (kBtu/ft^2)	218.9	148.1
Site Energy Use Intensity (kBtu/ft^2)	144.1	67.3

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

Figure 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Senior Center	National Median Building Type: Municipal
Source Energy Use Intensity (kBtu/ft^2)	199.0	148.1
Site Energy Use Intensity (kBtu/ft^2)	137.5	67.3

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. Your building is not one of the building categories that are eligible to receive a score.

A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance.

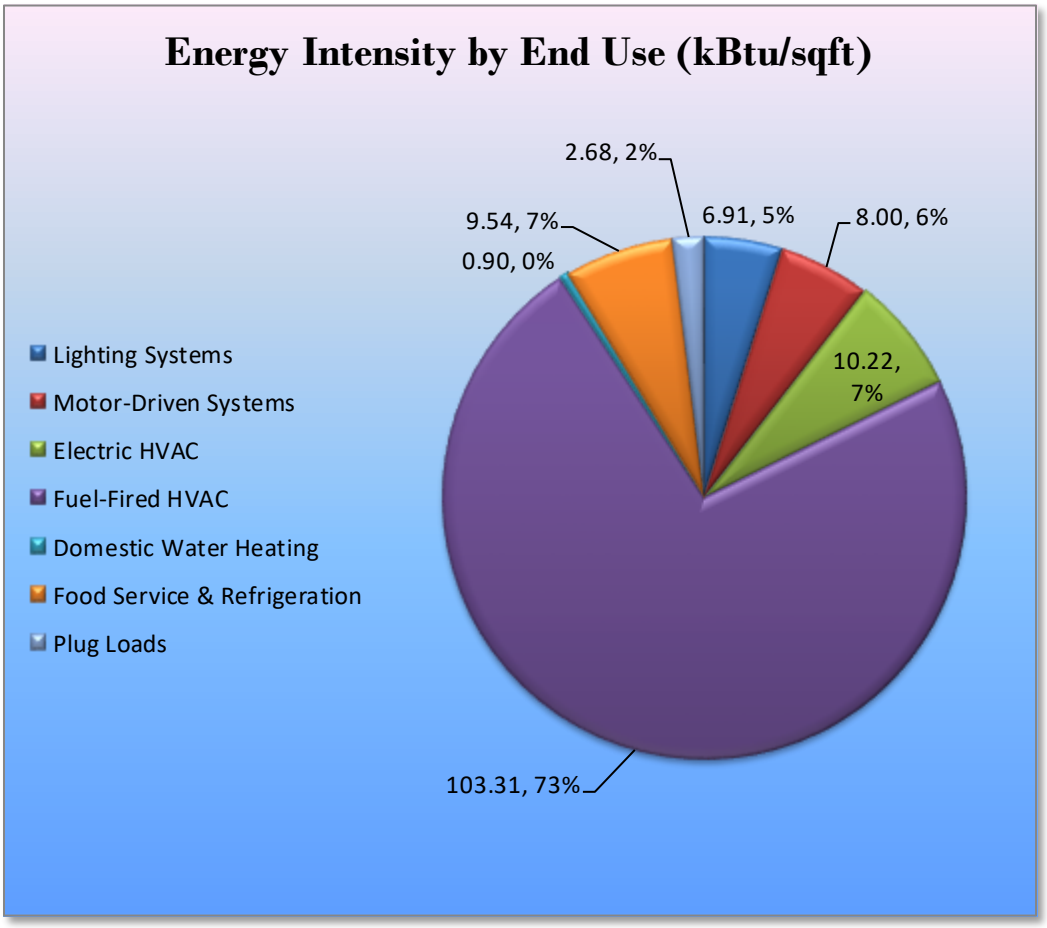
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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 15 - 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 Senior Center 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 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 16 – 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		**23,357**	**10.0**	**0.0**	**$3,028.75**	**$13,604.36**	**$1,945.00**	**$11,659.36**	**3.8**	**23,521**
ECM 1	Install LED Fixtures	12,138	5.6	0.0	$1,573.87	$6,955.20	$175.00	$6,780.20	4.3	12,222
ECM 2	Retrofit Fixtures with LED Lamps	11,220	4.4	0.0	$1,454.88	$6,649.16	$1,770.00	$4,879.16	3.4	11,298
Lighting Control Measures		**5,516**	**2.2**	**0.0**	**$715.30**	**$5,406.00**	**$585.00**	**$4,821.00**	**6.7**	**5,555**
ECM 3	Install Occupancy Sensor Lighting Controls	5,516	2.2	0.0	$715.30	$5,406.00	$585.00	$4,821.00	6.7	5,555
Variable Frequency Drive (VFD) Measures		**6,108**	**0.8**	**0.0**	**$792.05**	**$6,015.30**	**$0.00**	**$6,015.30**	**7.6**	**6,151**
ECM 4	Install VFDs on Hot Water Pumps	6,108	0.8	0.0	$792.05	$6,015.30	$0.00	$6,015.30	7.6	6,151
HVAC System Improvements		**1,307**	**0.3**	**0.0**	**$169.53**	**$1,000.00**	**$500.00**	**$500.00**	**2.9**	**1,317**
ECM 5	Install Dual Enthalpy Outside Economizer Control	1,307	0.3	0.0	$169.53	$1,000.00	$500.00	$500.00	2.9	1,317
Domestic Water Heating Upgrade		**0**	**0.0**	**8.8**	**$103.71**	**$43.02**	**$0.00**	**$43.02**	**0.4**	**1,027**
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	8.8	$103.71	$43.02	$0.00	$43.02	0.4	1,027
TOTALS		**36,289**	**13.3**	**8.8**	**$4,809.34**	**$26,068.68**	**$3,030.00**	**$23,038.68**	**4.8**	**37,570**

* - 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

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 17 below.

Figure 17 – 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		**23,357**	**10.0**	**0.0**	**$3,028.75**	**$13,604.36**	**$1,945.00**	**$11,659.36**	**3.8**	**23,521**
ECM 1	Install LED Fixtures	12,138	5.6	0.0	$1,573.87	$6,955.20	$175.00	$6,780.20	4.3	12,222
ECM 2	Retrofit Fixtures with LED Lamps	11,220	4.4	0.0	$1,454.88	$6,649.16	$1,770.00	$4,879.16	3.4	11,298

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.

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	10,620	4.7	0.0	$1,377.06	$5,365.44	$135.00	$5,230.44	3.8	10,694
Exterior	1,518	0.9	0.0	$196.81	$1,589.76	$40.00	$1,549.76	7.9	1,528

Measure Description

We recommend replacing existing fixtures containing fluorescent, HID, or incandescent 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.

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

ECM 2: 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	11,220	4.4	0.0	$1,454.88	$6,649.16	$1,770.00	$4,879.16	3.4	11,298
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing incandescent, halogen or other lighting technologies 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 a fluorescent tube and more than ten times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 18 below.

Figure 18 – 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		**5,516**	**2.2**	**0.0**	**$715.30**	**$5,406.00**	**$585.00**	**$4,821.00**	**6.7**	**5,555**
ECM 3	Install Occupancy Sensor Lighting Controls	5,516	2.2	0.0	$715.30	$5,406.00	$585.00	$4,821.00	6.7	5,555

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.

ECM 3: 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)
5,516	2.2	0.0	$715.30	$5,406.00	$585.00	$4,821.00	6.7	5,555

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in restrooms, storage rooms, offices and dining room. 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.

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 19 below.

Figure 19 – 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		**6,108**	**0.8**	**0.0**	**$792.05**	**$6,015.30**	**$0.00**	**$6,015.30**	**7.6**	**6,151**
ECM 4	Install VFDs on Hot Water Pumps	6,108	0.8	0.0	$792.05	$6,015.30	$0.00	$6,015.30	7.6	6,151

ECM 4: Install VFDs on Hot 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)
6,108	0.8	0.0	$792.05	$6,015.30	$0.00	$6,015.30	7.6	6,151

Measure Description

We recommend installing a variable frequency drives (VFD) to control hot water pumps. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot 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 hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.4 HVAC System Upgrades

Our recommendation for HVAC system improvement are summarized in Figure 20 below.

Figure 20 - 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		**1,307**	**0.3**	**0.0**	**$169.53**	**$1,000.00**	**$500.00**	**$500.00**	**2.9**	**1,317**
ECM 5	Install Dual Enthalpy Outside Economizer Control	1,307	0.3	0.0	$169.53	$1,000.00	$500.00	$500.00	2.9	1,317

ECM 5: Install Dual-Enthalpy Economizers

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)
1,307	0.3	0.0	$169.53	$1,000.00	$500.00	$500.00	2.9	1,317

Measure Description

Dual enthalpy economizers are used to control a ventilation system's outside air intake in order to reduce a facility's total cooling load. A dual-enthalpy economizer monitors the air temperature and humidity of both the outside and return air. The control supplies the lowest energy (temperature and humidity) air to the air handling system. When outside air conditions allow, outside air can be used for cooling instead of running the air handling system's compressor. This reduces the demand on the cooling system, lowering its usage hours and saving energy.

Savings result from using outside air instead of mechanical cooling when outside air conditions permit.

4.1.5 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 21 below.

Figure 21 - 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**	**8.8**	**$103.71**	**$43.02**	**$0.00**	**$43.02**	**0.4**	**1,027**
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	8.8	$103.71	$43.02	$0.00	$43.02	0.4	1,027

ECM 6: 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	8.8	$103.71	$43.02	$0.00	$43.02	0.4	1,027

Measure Description

We recommend installing low-flow domestic hot water devices 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.

4.2 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 22 – 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)
Electric Unitary HVAC Measures	**5,170**	**3.1**	**0.0**	**$670.43**	**$9,075.84**	**$368.00**	**$8,707.84**	**13.0**	**5,206**
Install High Efficiency Electric AC	5,170	3.1	0.0	$670.43	$9,075.84	$368.00	$8,707.84	13.0	5,206
Gas Heating (HVAC/Process) Replacement	**0**	**0.0**	**150.1**	**$1,775.20**	**$40,421.76**	**$3,704.80**	**$36,716.96**	**20.7**	**17,579**
Install High Efficiency Hot Water Boilers	0	0.0	150.1	$1,775.20	$40,421.76	$3,704.80	$36,716.96	20.7	17,579
TOTALS	**5,170**	**3.1**	**150.1**	**$2,445.63**	**$49,497.60**	**$4,072.80**	**$45,424.80**	**18.6**	**22,786**

* - 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 Air Conditioning Units

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)
5,170	3.1	0.0	$670.43	$9,075.84	$368.00	$8,707.84	13.0	5,206

Measure Description

We reevaluated replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Reasons for not Recommending

Replacing existing air conditioning units with more efficient air conditioning units will result in energy savings, however, the cost of installation will outweigh the energy saving advantages resulting in a very long payback. This makes the measure financially not viable therefore not recommended based on energy savings alone.

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	150.1	$1,775.20	$40,421.76	$3,704.80	$36,716.96	20.7	17,579

Measure Description

We recommend replacing older inefficient hot water boilers with high efficiency hot water boilers. 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.

Reasons for not Recommending

Replacing existing hot water boilers with high efficiency condensing boilers will result in energy savings, however, the cost of installation will outweigh the energy saving advantages resulting in a very long payback. This makes the measure financially not viable therefore not recommended based on energy savings alone.

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.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

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.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost-effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

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.

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

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.

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 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 4.1.5 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.

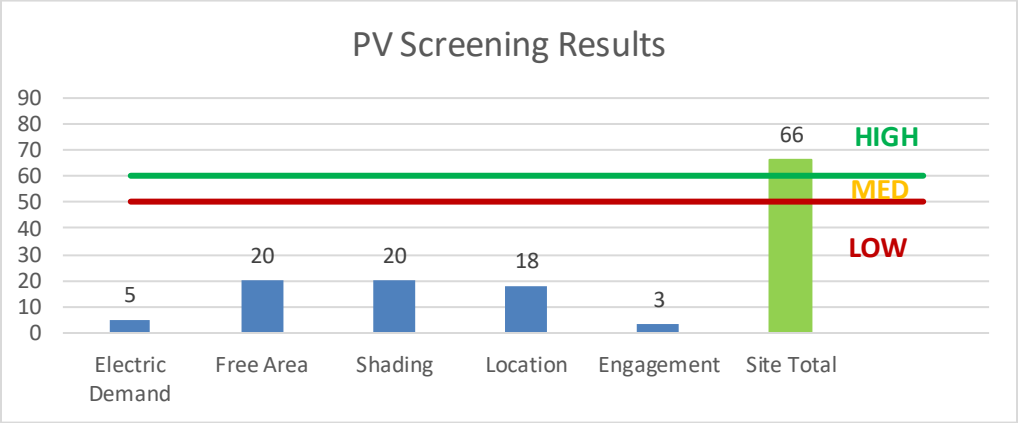
6.1 Photovoltaic

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.

There is 10,300 square feet of free area, ease of installation (roof), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the building may be feasible. If the Senior Center is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 23 - Photovoltaic Screening



Potential	High	
System Potential	49	kW DC STC
Electric Generation	58,378	kWh/yr
Displaced Cost	$5,080	/yr
Installed Cost	$127,400	

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.

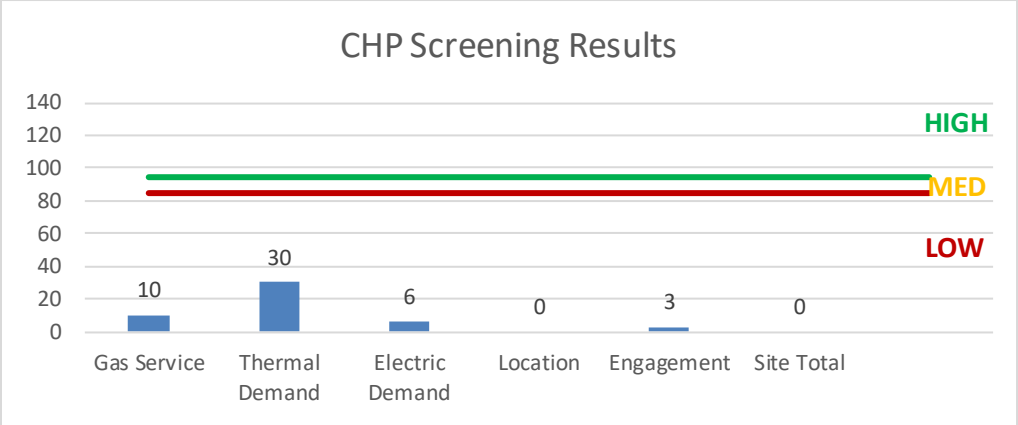
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste 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.

The magnitude, type, and duration of the thermal demand, the coincident electric load, and the ease of interconnection contribute to the potential for CHP at the site. If the Senior Center is interested in pursuing the installation of CHP, we recommended a more detailed feasibility study be conducted.

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/.

Figure 24 - Combined Heat and Power Screening



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 (http://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 (http://www.pjm.com/training/training%20material.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.

This facility is not a good candidate for DR curtailment.

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 25 for a list of the eligible programs identified for each recommended ECM.

Figure 25 - 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		X			
ECM 2	Retrofit Fixtures with LED Lamps	X		X			
ECM 3	Install Occupancy Sensor Lighting Controls	X		X			
ECM 4	Install VFDs on Hot Water Pumps	X		X			
ECM 5	Install Dual Enthalpy Outside Economizer Control			X			
ECM 6	Install Low-Flow Domestic Hot Water Devices			X			

SmartStart 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 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 SmartStart 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 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.

Equipment with Prescriptive Incentives Currently Available:

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

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 SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart 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 Direct Install

Overview

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

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the Direct Install program you will need to contact the participating contractor assigned to the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct Install website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since Direct Install offers a free assessment of eligible measures, Direct Install is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

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

8.3 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) 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.

8.4 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.

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
Exterior	8	Mercury Vapor: (1) 175W Lamp	Daylight Dimming	205	1,170	Fixture Replacement	No	8	LED - Fixtures: Other	Daylight Dimming	62	1,170	0.93	1,518	0.0	$196.81	$1,589.76	$40.00	7.87
Women	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	480	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	336	0.18	119	0.0	$15.49	$489.09	$95.00	25.45
Men	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	480	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	336	0.18	119	0.0	$15.49	$489.09	$95.00	25.45
Dining Room	52	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,340	Relamp	Yes	52	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,638	3.11	10,092	0.0	$1,308.68	$4,607.56	$1,145.00	2.65
Stage Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	240	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	168	0.15	51	0.0	$6.60	$280.32	$45.00	35.66
Mechanical Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,340	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,638	0.10	331	0.0	$42.89	$225.55	$30.00	4.56
Kitchen Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	240	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	168	0.15	51	0.0	$6.60	$280.32	$45.00	35.66
Kitchen	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,340	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,638	0.41	1,323	0.0	$171.57	$708.18	$155.00	3.22
Crafts Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.51	1,357	0.0	$175.97	$817.73	$185.00	3.60
Changing Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,340	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,638	0.10	331	0.0	$42.89	$379.55	$65.00	7.33
Storage 3	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	240	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	168	0.54	181	0.0	$23.46	$700.24	$160.00	23.03
Storage 2	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	240	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	168	0.10	34	0.0	$4.40	$225.55	$30.00	44.45
Vestibule	2	LED Screw-In Lamps: LED Bulb - 1L	Wall Switch	11	2,340	None	Yes	2	LED Screw-In Lamps: LED Bulb - 1L	Occupancy Sensor	11	1,638	0.01	17	0.0	$2.16	$116.00	$0.00	53.70
Hallway	29	LED Screw-In Lamps: LED Bulb - 1L	Wall Switch	11	2,340	None	Yes	29	LED Screw-In Lamps: LED Bulb - 1L	Occupancy Sensor	11	1,638	0.07	242	0.0	$31.32	$116.00	$0.00	3.70
Exterior	1	LED Screw-In Lamps: LED Bulb - 1L	Daylight Dimming	11	1,170	None	No	1	LED Screw-In Lamps: LED Bulb - 1L	Daylight Dimming	11	1,170	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Crafts Room	5	LED Screw-In Lamps: LED Bulb - 1L	Wall Switch	11	1,920	None	Yes	5	LED Screw-In Lamps: LED Bulb - 1L	Occupancy Sensor	11	1,344	0.01	34	0.0	$4.43	$116.00	$20.00	21.67
Storage	18	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	240	None	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	168	0.19	64	0.0	$8.26	$116.00	$0.00	14.04
Senior Supervisor	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,340	None	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,638	0.02	69	0.0	$8.95	$116.00	$20.00	10.73
Recreation Department	12	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,920	None	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.13	340	0.0	$44.06	$270.00	$35.00	5.33
Office 2	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,920	None	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.02	57	0.0	$7.34	$116.00	$20.00	13.07
Office 1	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,920	None	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.02	57	0.0	$7.34	$116.00	$20.00	13.07
Library	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,920	None	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.10	255	0.0	$33.04	$270.00	$35.00	7.11
Roof Access Room	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	240	None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	240	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	480	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	336	0.03	19	0.0	$2.45	$116.00	$20.00	39.22
Billiards Room	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.04	113	0.0	$14.69	$116.00	$20.00	6.54

	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
Women	3	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	480	None	Yes	3	LED - Linear Tubes: (1) 3' Lamp	Occupancy Sensor	11	336	0.01	5	0.0	$0.66	$116.00	$20.00	144.44
Men	3	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	480	None	Yes	3	LED - Linear Tubes: (1) 3' Lamp	Occupancy Sensor	11	336	0.01	5	0.0	$0.66	$116.00	$20.00	144.44
Exterior	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	75	1,170	None	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	75	1,170	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Library	3	LED - Fixtures: Ceiling Mount	Wall Switch	17	1,920	None	Yes	3	LED - Fixtures: Ceiling Mount	Occupancy Sensor	17	1,344	0.01	33	0.0	$4.30	$116.00	$20.00	22.30
Hallway	51	LED - Fixtures: Ceiling Mount	Wall Switch	17	2,340	None	Yes	51	LED - Fixtures: Ceiling Mount	Occupancy Sensor	17	1,638	0.21	688	0.0	$89.18	$116.00	$0.00	1.30
Exterior	8	LED - Fixtures: Ceiling Mount	Daylight Dimming	19	1,170	None	No	8	LED - Fixtures: Ceiling Mount	Daylight Dimming	19	1,170	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	13	LED - Fixtures: Ceiling Mount	Daylight Dimming	17	1,170	None	No	13	LED - Fixtures: Ceiling Mount	Daylight Dimming	17	1,170	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stage	27	Halogen Incandescent: Halogen Bulb - 1L	High/Low Control	250	1,638	Fixture Replacement	No	27	LED - Fixtures: Other	High/Low Control	38	1,638	4.67	10,620	0.0	$1,377.06	$5,365.44	$135.00	3.80
Stage	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Recreation Department	1	Exit Signs: LED - 2 W Lamp	None	6	1,920	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	1,920	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Hallway	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
Hallway	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Dining Room	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	4	Compact Fluorescent: F36 Bulb (36W) - 1L	Wall Switch	36	2,340	Relamp	Yes	4	LED - Fixtures: Other	Occupancy Sensor	25	1,638	0.06	196	0.0	$25.37	$152.00	$0.00	5.99
Stage	6	Compact Fluorescent: 4 Pin (18W) - 1L	Wall Switch	18	2,340	Relamp	Yes	6	LED - Fixtures: Other	Occupancy Sensor	13	1,638	0.04	146	0.0	$18.89	$152.00	$20.00	6.99
Hallway	7	Compact Fluorescent: 4 Pin (18W) - 1L	Wall Switch	18	2,340	Relamp	Yes	7	LED - Fixtures: Other	Occupancy Sensor	13	1,638	0.05	170	0.0	$22.03	$158.00	$0.00	7.17
Billiards Room	12	Compact Fluorescent: 4 Pin (18W) - 1L	Wall Switch	18	1,920	Relamp	Yes	12	LED - Fixtures: Other	Occupancy Sensor	13	1,344	0.09	239	0.0	$30.99	$342.00	$35.00	9.91

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
Mechanical Room	Boiler	1	Heating Hot Water Pump	3.0	87.5%	No	2,745	No	87.5%	Yes	1	0.39	3,054	0.0	$396.02	$3,007.65	$0.00	7.59
Mechanical Room	Boiler	1	Heating Hot Water Pump	3.0	87.5%	No	2,745	No	87.5%	Yes	1	0.39	3,054	0.0	$396.02	$3,007.65	$0.00	7.59
Roof	Kitchen Exhaust Fan	1	Kitchen Hood Exhaust Fan	0.3	73.4%	No	5,250	No	73.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Senior Center	1	Return Fan	0.3	73.4%	No	2,745	No	73.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Senior Center	1	Exhaust Fan	0.3	73.4%	No	2,745	No	73.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Senior Center	1	Supply Fan	0.5	78.2%	No	2,745	No	78.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Senior Center	2	Return Fan	0.3	73.4%	No	2,745	No	73.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Senior Center	2	Exhaust Fan	0.3	73.4%	No	2,745	No	73.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Senior Center	2	Supply Fan	3.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Senior Center	3	Supply Fan	3.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Senior Center	6	Return Fan	0.3	73.4%	No	2,745	No	73.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Boiler	2	Water-Source Heat Pump Circulation Pump	0.2	67.5%	No	2,745	No	67.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	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
Roof	Senior Center	2	Packaged AC	2.00		Yes	1	Packaged AC	2.00		14.00		Yes	1.68	3,239	0.0	$419.98	$5,037.92	$434.00	10.96
Roof	Senior Center	1	Packaged AC	4.00		Yes	1	Packaged AC	2.00		14.00		Yes	0.89	1,908	0.0	$247.44	$5,037.92	$434.00	18.61
Roof	Senior Center	3	Packaged AC	8.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Senior Center	2	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	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
Mechanical Room	Senior Center	1	Non-Condensing Hot Water Boiler	842.00	Yes	1	Condensing Hot Water Boiler	842.00	91.00%	Et	0.00	0	150.1	$1,775.20	$20,210.88	$1,852.40	10.34
Mechanical Room	Senior Center	1	Non-Condensing Hot Water Boiler	842.00	Yes	1	Condensing Hot Water Boiler	842.00	91.00%	Et	0.00	0	0.0	$0.00	$20,210.88	$1,852.40	0.00
Mechanical Room	Mechancial Room	1	Warm Air Unit Heater	80.30	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	Kitchen	1	Warm Air Unit Heater	80.30	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	Storage	1	Warm Air Unit Heater	80.30	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
Mechanical Room	Senior Center	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation 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
Restrooms	6	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	8.8	$103.71	$43.02	$0.00	0.41

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
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	Yes	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
Kitchen	1	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
Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Convection Oven (Half Size)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Insulated Food Holding Cabinet (Full Size)	No	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?
Offices	16	Computers	100.0	No
Offices	1	Laptop	80.0	No
Offices	1	Small Printer	45.0	No
Offices	1	Medium Printer	80.0	Yes
Copy Area	2	Big Printer	1,100.0	Yes
Offices	1	Paper Shredder	80.0	No
Dining Room	3	Projector	300.0	No
Kitchen	3	Microwave	800.0	No
Lunch Room	1	Large Refrigerator	300.0	No
Kitchen	1	Toaster Oven	1,200.0	No
Library	5	CRT TV	250.0	No
Billiards Room	1	Plasma TV	200.0	No
Lounge	1	LED TV	150.0	Yes

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Franklin Township Senior Center

Primary Property Type: Social/Meeting Hall
Gross Floor Area (ft²): 20,000
Built: 1995

For Year Ending: February 28, 2018
Date Generated: August 31, 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
Franklin Township Senior Center 505 DeMott Lane Somerset, New Jersey 08873	Township of Franklin 475 DeMott Lane Somerset, NJ 08873 732-249-7800	Carl Hauck 475 DeMott Lane Somerset, NJ 08873 732-249-7800 carl.hauck@twp.franklin.nj.us

Property ID: 6449812

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
137.5 kBtu/ft²

Source EUI
198.6 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	2,129,332 (78%)
Electric - Grid (kBtu)	619,790 (22%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	75.9
National Median Source EUI (kBtu/ft²)	109.6
% Diff from National Median Source EUI	81%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	176

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)