Local Government Energy Audit:
Energy Audit Report

Manchester Township Treatment Facility #5 and Operations Office

2515 Ridgeway Road
Manchester Township, NJ 08759

August 1, 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 saving 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.

Table of Contents

Table of Figures

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Treatment Facility #5 and Operations Office.

The goal of an LGEA report is to provide public facilities and local governments with valuable information on their facilities' energy usage. Each LGEA report includes specific energy conservation measures (ECMs) and energy management options, which have been determined to be likely to benefit that facility. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) and other sources which may be available to assist with ECM implementation.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey local governments with controlling their energy costs and help protect our environment by promoting more efficient use of energy resources statewide.

1.1 Facility Summary

Treatment Facility #5 and Operations Office is a 6,803 square foot facility which consists of office spaces, sample and testing rooms, and water treatment equipment. The water treatment plant treats approximately five million gallons per day in the summer and about 1.7 million gallons per day in the winter. The sites contains a one million gallon ground storage tank. Treated water is stored in the tank and distributed throughout the township by three large booster water pumps.

The office section of the facility consists of private offices and a reception area adjacent to the control room. The office area is heated and cooled by individual packaged terminal heat pumps (PTHPs) with electric resistance heaters. There are electric unit heaters in other parts of the facility. Lighting at the Treatment Facility #5 and Operations Office building consists of aging and inefficient T8 fixtures in the interior and HID metal halides in the exterior.

A thorough description of the facility, along with our observations of building systems and equipment, is located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated nine energy conservation measures. Six of the measures are recommended for implementation. Three ECMs were evaluated but not selected for implementation, because of their longer simple payback period. Together the six recommended ECMs represent an opportunity for the Treatment Facility #5 and Operations Office building to reduce its annual energy costs by $57,304 and its annual greenhouse gas emissions by 449,639 lbs CO_2e. We estimate that if all measures are implemented as recommended, the project would pay for itself in energy savings alone in about 0.5 years. A breakdown of current utility costs is shown in Figure 1. The estimated reduction in utility costs for the proposed measures in shown in Figure 2. Together these measures represent an opportunity to reduce Treatment Facility #5 and Operations Office annual energy use by 27% overall.

Figure 1 – Previous 12 Month Utility Costs

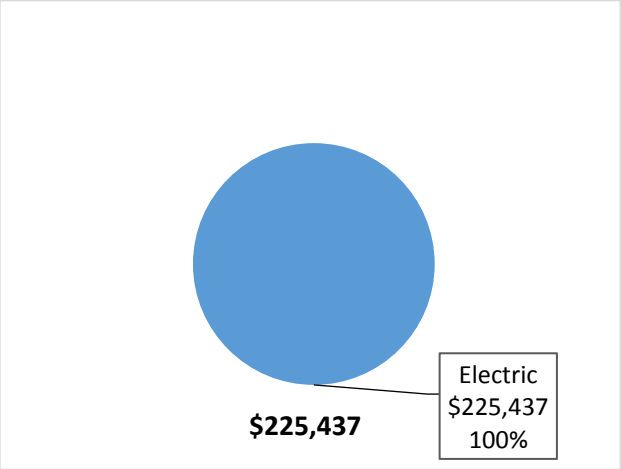
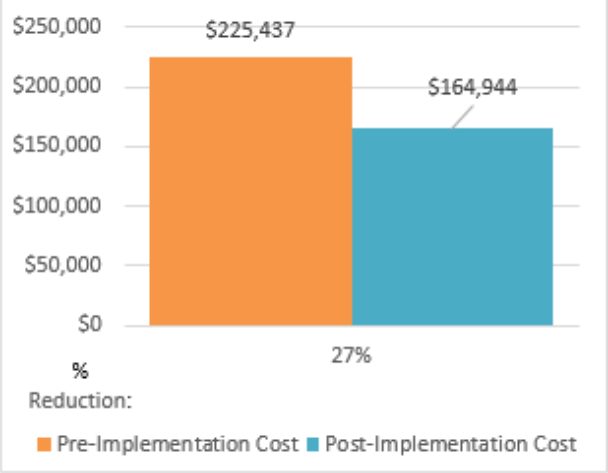


Figure 2 – Potential Post-Implementation Costs



A detailed description of Treatment Facility #5 and Operations Office'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 energy 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 Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**47,420**	**8.5**	**$6,085.67**	**$28,375.01**	**$4,195.00**	**$24,180.01**	**4.0**	**47,752**
ECM 1	Install LED Fixtures	Yes	23,052	5.5	$2,958.43	$21,905.24	$3,150.00	$18,755.24	6.3	23,214
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,525	0.2	$195.76	$468.00	$40.00	$428.00	2.2	1,536
ECM 3	Retrofit Fixtures with LED Lamps	Yes	22,842	2.9	$2,931.47	$6,001.77	$1,005.00	$4,996.77	1.7	23,002
Lighting Control Measures			**5,951**	**0.7**	**$763.73**	**$4,012.00**	**$490.00**	**$3,522.00**	**4.6**	**5,993**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	5,951	0.7	$763.73	$4,012.00	$490.00	$3,522.00	4.6	5,993
Motor Upgrades			**22,686**	**5.0**	**$2,911.41**	**$56,278.07**	**$0.00**	**$56,278.07**	**19.3**	**22,845**
	Premium Efficiency Motors	No	22,686	5.0	$2,911.41	$56,278.07	$0.00	$56,278.07	19.3	22,845
Variable Frequency Drive (VFD) Measures			**391,342**	**101.9**	**$50,222.86**	**$30,000.00**	**$27,000.00**	**$3,000.00**	**0.1**	**394,078**
ECM 5	Program VFDs on the Booster Pumps to Run Slower and Longer	Yes	391,342	101.9	$50,222.86	$30,000.00	$27,000.00	$3,000.00	0.1	394,078
Electric Unitary HVAC Measures			**1,264**	**1.7**	**$162.22**	**$7,659.24**	**$260.00**	**$7,399.24**	**45.6**	**1,273**
	Install High Efficiency Packaged Terminal AC/HP	No	1,264	1.7	$162.22	$7,659.24	$260.00	$7,399.24	45.6	1,273
Domestic Water Heating Upgrade			**1,804**	**0.0**	**$231.46**	**$28.68**	**$0.00**	**$28.68**	**0.1**	**1,816**
ECM 6	Install Low-Flow Domestic Hot Water Devices	Yes	1,804	0.0	$231.46	$28.68	$0.00	$28.68	0.1	1,816
Custom Measures			**902**	**0.0**	**$115.80**	**$2,740.00**	**$0.00**	**$2,740.00**	**23.7**	**909**
	Install Insulation in Opeartions Office Attic	No	902	0.0	$115.80	$2,740.00	$0.00	$2,740.00	23.7	909
TOTALS			**471,369**	**117.9**	**$60,493**	**$129,093**	**$31,945**	**$97,148**	**1.6**	**474,665**
TOTALS (Recommended ECMs)			**446,517**	**111.2**	**$57,304**	**$62,416**	**$31,685**	**$30,731**	**0.5**	**449,639**

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

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

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

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

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

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

Electric 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.

Domestic Hot Water upgrade measures generally involve replacement of older inefficient domestic hot water systems with modern high efficiency water heating equipment, or adding devices that conserve water and reduce hot water energy usage. High efficiency hot water heating systems and water conservation devices can provide equivalent, or greater, hot water service compared to older systems with high flow fixtures at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency, and/or reducing standby losses by cutting excessive use of hot water.

Energy Efficient Practices

TRC also identified nine low-cost (or no-cost) energy efficient practices. A facility's energy performance can be significantly improved by implementing certain behavioral or operational adjustments, or through improved 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 operation and maintenance costs (O&M). Potential opportunities identified at Treatment Facility #5 and Operations Office include:

- Reduce Air Leakage
- Close Doors and Windows
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Install Plug Load Controls
- Replace Computer Monitors
- 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 Treatment Facility #5 and Operations Office. Based on the configuration of the site and its electric and thermal loads there appears to be a low potential for cost-effective installation of solar photovoltaic or combined heat and power measures for this site.

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
- Pay for Performance - Existing Building (P4P)
- SREC (Solar Renewable Energy Certificate) Registration Program
- Energy Savings Improvement Program (ESIP)
- Demand Response Energy Aggregator

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.

Larger facilities with an interest in a more comprehensive whole building approach to energy conservation should consider participating in the Pay for Performance (P4P) program. Projects eligible for this project program must meet minimum savings requirements. Final incentives are calculated based on actual measured performance achieved at the end of the project. The application process is more involved, and it requires working with a qualified P4P contractor, but the process may result in greater energy savings overall and more lucrative incentives, up to 50% of project's total cost.

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. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 Facility Information and Existing Conditions

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Joe Veni	Supervising Engineer	jveni@manchestertwp.com	732-65-8121
Jeff Ruerup	Maintainence Supervisor	jruerup@manchestertwp.com	908-963-6242
TRC Energy Services			
Vish Nimbalkar	Auditor	VNaikNimbalkar@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On March 16, 2017, TRC performed an energy audit at Treatment Facility #5 and Operations Office located in Manchester Township, New Jersey. TRC met with Jeff Ruerup, Maintenance Supervior and Kevin to review the facility operations and help focus our investigation on specific energy-using systems.

The water treatment plant treats approximately five million gallons per day in the summer and about 1.7 million gallons per day in the winter. The site contains a one million gallon ground storage tank. Treated water is stored in the tank and distributed throughout the township by three large booster water pumps.

The source water for the ground storage tank is provided by three well pumps (#10, #11, #12). These well pumps are rated at 1,800 gallons per minute (gpm) and 150 hp each. Water pumped from the wells is pretreated with chemicals – sodium hydrochloride and potassium permanganate – to oxidize the iron molecules which are then removed and stored in filter tanks. Following this, the water is treated with sodium hydrochloride and moved to the ground storage tanks (GST). Municipal water demand is supplied by the GST and the elevated storage tank (EST) (located on Route 37) which also has a one million gallon storage capacity. As the water pressure in the storage tanks drops below 65 psi, the well pumps and the booster pumps turn on and supply water to the tanks.

The office section of the facility consists of private offices and a reception area adjacent to the control room. The office area is heated and cooled by individual packaged terminal heat pumps (PTHPs) with electric resistance heaters. There are electric unit heaters in other part of the facility.

In addition to the above equipment, there are two 20-hp air pumps to backwash the filters. They are used once per month for an hour. Two 15-hp recycle pumps are used to clean filters of the iron deposits. The iron water is then pumped into another smaller storage tank where the iron is collected at the bottom and water is pumped back into the system.

Lighting at Treatment Facility #5 and Operations Office consists of aging and inefficient T8 fixtures in the interior and HID metal halides in the exterior. The interior lights are controlled by manual switches while the exterior lights are controlled by photocells.

2.3 Building Occupancy

The operations office is open Monday through Friday and the treatment facility is open 24 hours a day, all year. The typical schedule is presented in the table below. During a typical day, the facility is occupied by approximately eight employees.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Operations Office	Weekday	8:00 AM - 6:00 PM
Operations Office	Weekend	Closed
Treatment Facility	Weekday	12:00 AM - 12:00 AM
Treatment Facility	Weekend	12:00 AM - 12:00 AM

2.4 Building Envelope

The building is constructed of concrete block, and structural steel with a cinder block façade. It has a sloped roof finished with asphalt shingles. The building has double pane windows which are in good condition and show little sign of excessive infiltration. The exterior doors are constructed of aluminum frame and glass for the operations office. The doors for the treatment facility are made of metal and in good condition except that the door seals in the breakroom show signs of wear and excessive levels of outside air infiltration. It is recommend that weatherization and caulking measures should be undertaken on the doors and windows of the facility.

2.5 On-Site Generation

The Treatment Facility #5 and Operations Office building 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 lighting equipment.

Lighting System

Lighting at the facility is mostly provided by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some incandescent lamps. Most of the fixtures are 2-lamp 4 foot long troffers with diffusers. There are some 2-foot long U-bend T8 fixtures as well. All exit signs are LEDs.

Lighting control in most spaces is provided by wall switches.

The building's exterior lighting is minimal and consists primarily of metal halide fixtures that are controlled by photocells.

Direct Expansion Air Conditioning System (DX)

Space cooling is provided by four packaged terminal heat pumps (PTHP) which supply the operations offices and control room areas. The units have a heating capacity of 10.8 kBTU/hour and a cooling capacity of one ton each. They have a cooling energy efficiency ratio (EER) of 8.0 and a heating coefficient of performance (COP) or 3.0. The units are controlled by either wall mounted manual thermostats or manual controls located on the units. They are operated all year and are maintained at a constant temperature setpoint between 68°F and 72°F. The treatment facility area has no space cooling is heated via electric unit heaters. The heaters are rated at 17 kBTU/hour and are controlled via manual switches as needed.

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of one Rheemglas electric water heater with an input rating of 27 kW. The water heater has a 50 gallon storage tank. Two recirculation pumps distribute 120°F water to the facility restrooms. The recirculation pumps operate continuously.

2.7 Water-Using Systems

There are two restrooms at this facility. During the audit it was found that the faucets are rated for 2.5 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. These fixtures do not meet modern standards for water conservation in public facilities.

3 SITE ENERGY USE AND COSTS

Utility data for electricity was analyzed to identify opportunities for savings. In addition, data for electricity 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 3.3 for additional information.

3.1 Total Cost of Energy

The following energy consumption and cost data is based on a recent 12-month period of utility billing data which was provided by the customer for all utilities serving the building. A profile of the facility's annual energy consumption cost was developed from this data.

Figure 6 - Utility Summary

Utility Summary for Treatment Facility #5 and Operations Office		
Fuel	**Usage**	**Cost**
Electricity	1,756,628 kWh	$225,437
Total		**$225,437**

The facility has no natural gas, heating oil, propane, or other fuel usage.

3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric rate over a recent 12 month period was found to be $0.128/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.

Figure 7 - Electric Usage & Demand

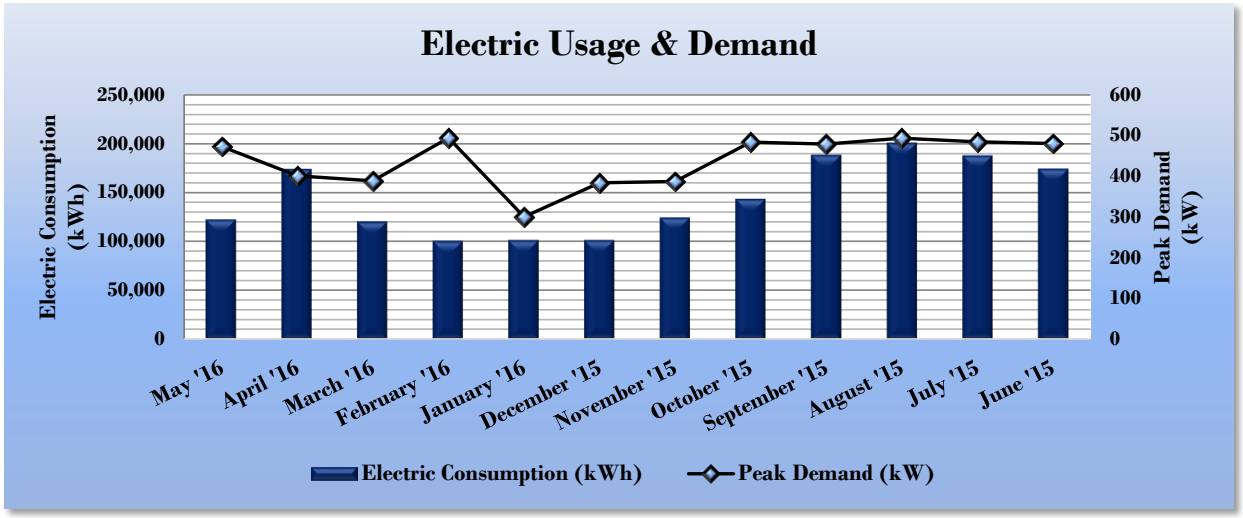


Figure 8 - Electric Usage & Demand

Electric Billing Data for Treatment Facility #5 and Operations Office					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
5/24/16	28	122,417	472.7		$17,001
4/25/16	31	173,713	401.3		$21,569
3/24/16	28	120,396	389.0		$15,667
2/24/16	27	100,407	494.2		$13,030
1/27/16	29	101,182	300.5		$13,096
12/28/15	32	101,244	384.0		$13,530
11/25/15	39	124,294	387.4		$16,076
10/26/15	30	143,353	484.0		$18,659
9/25/15	29	188,195	479.5		$23,666
8/26/15	29	200,500	493.9		$25,342
7/27/15	31	187,725	484.9		$23,640
6/25/15	28	173,951	480.6		$21,689
Totals	**361**	**1,737,377**	**494.2**	**$0**	**$222,966**
Annual	**365**	**1,756,628**	**494.2**	**$0**	**$225,437**

3.3 Benchmarking

The Energy Use Intensity (EUI) is a measure of a facility's energy consumption per average gallon per day of output. It is a standard metric for comparing water treatment plant energy performance. Comparing the EUI of a facility with the national median EUI for that facility type illustrates whether the facility uses more energy per unit of output compared to the median for such facilities. EUI is presented in both site energy use intensity and source energy use intensity. Site EUI is the amount of fuel and electricity consumed by a facility as reflected in utility bills. Source EUI includes energy consumed offsite to generate the energy consumed at the site, factoring in electric production and distribution losses. As shown in Figure 9 and 10 below the facility appears to be very close to the national median.

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 9 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Treatment Facility #5 and Operations Office	National Median Building Type: Other - General
Source Energy Use Intensity (kBtu/ft^2)	6.7	6.61
Site Energy Use Intensity (kBtu/ft^2)	2.1	2.27

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

Figure 10 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Treatment Facility #5 and Operations Office	National Median Building Type: Other - General
Source Energy Use Intensity (kBtu/ft^2)	4.6	6.61
Site Energy Use Intensity (kBtu/ft^2)	1.5	2.27

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. This building is not is one of the building categories that are eligible to receive an ENERGY STAR® score in Portfolio Manager®.

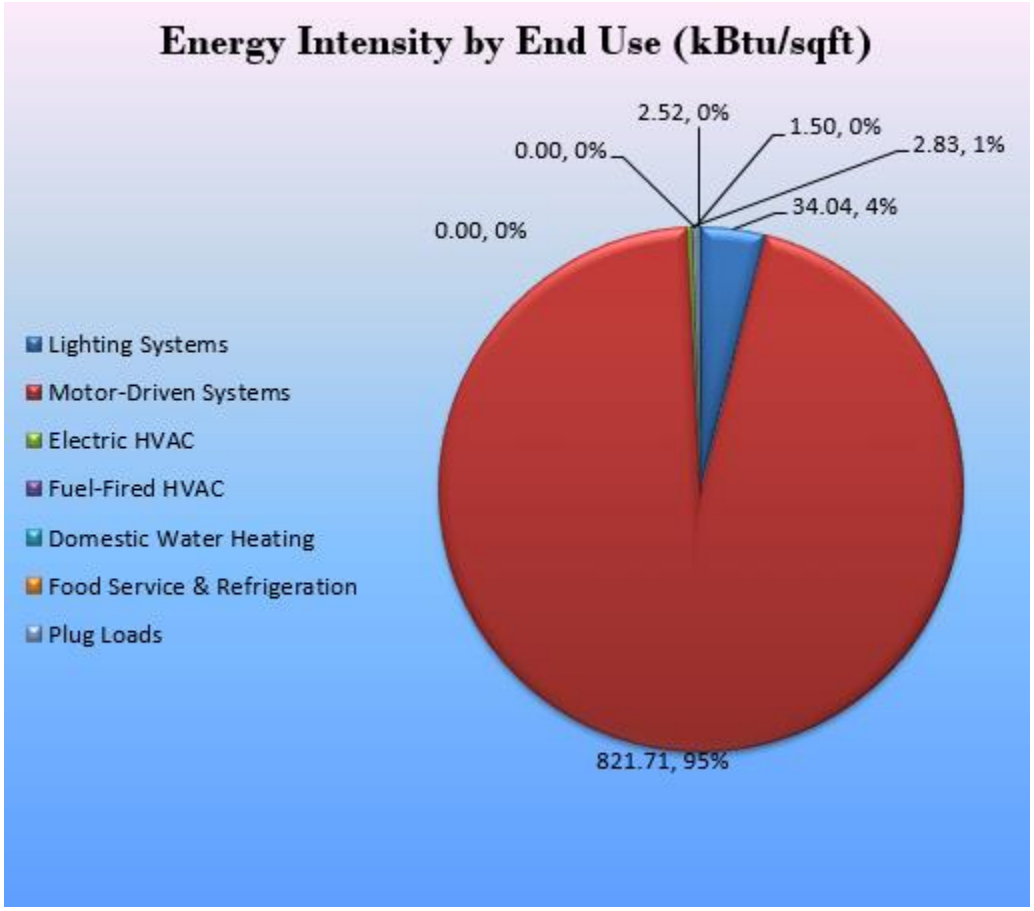
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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.

3.4 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 11 - Energy Balance (kBtu/SF)



4 Energy Conservation Measures

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Treatment Facility #5 and Operations Office 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 12 – 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		**47,420**	**8.5**	**0.0**	**$6,085.67**	**$28,375.01**	**$4,195.00**	**$24,180.01**	**4.0**	**47,752**
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ECM 4	Install Occupancy Sensor Lighting Controls	5,951	0.7	0.0	$763.73	$4,012.00	$490.00	$3,522.00	4.6	5,993
Variable Frequency Drive (VFD) Measures		**391,342**	**101.9**	**0.0**	**$50,222.86**	**$30,000.00**	**$27,000.00**	**$3,000.00**	**0.1**	**394,078**
ECM 5	Program VFDs on the Booster Pumps to Run Slower and Longer	391,342	101.9	0.0	$50,222.86	$30,000.00	$27,000.00	$3,000.00	0.1	394,078
Domestic Water Heating Upgrade		**1,804**	**0.0**	**0.0**	**$231.46**	**$28.68**	**$0.00**	**$28.68**	**0.1**	**1,816**
ECM 6	Install Low-Flow Domestic Hot Water Devices	1,804	0.0	0.0	$231.46	$28.68	$0.00	$28.68	0.1	1,816
TOTALS		**446,517**	**111.2**	**0.0**	**$57,303.71**	**$62,415.69**	**$31,685.00**	**$30,730.69**	**0.5**	**449,639**

* - 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.

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 13 below.

Figure 13 – 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		47,420	8.5	0.0	$6,085.67	$28,375.01	$4,195.00	$24,180.01	4.0	47,752
ECM 1	Install LED Fixtures	23,052	5.5	0.0	$2,958.43	$21,905.24	$3,150.00	$18,755.24	6.3	23,214
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,525	0.2	0.0	$195.76	$468.00	$40.00	$428.00	2.2	1,536
ECM 3	Retrofit Fixtures with LED Lamps	22,842	2.9	0.0	$2,931.47	$6,001.77	$1,005.00	$4,996.77	1.7	23,002

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	2,792	0.4	0.0	$358.35	$10,962.38	$450.00	$10,512.38	29.3	2,812
Exterior	20,260	5.1	0.0	$2,600.09	$10,942.86	$2,700.00	$8,242.86	3.2	20,402

Measure Description

We recommend replacing existing fixtures containing high intensity discharge and 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 tubes and more than ten times longer than many incandescent lamps.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	1,525	0.2	0.0	$195.76	$468.00	$40.00	$428.00	2.2	1,536
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

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

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	22,842	2.9	0.0	$2,931.47	$6,001.77	$1,005.00	$4,996.77	1.7	23,002
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing linear and florescent fixtures 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 tubes 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 14 below.

Figure 14 – 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		5,951	0.7	0.0	$763.73	$4,012.00	$490.00	$3,522.00	4.6	5,993
ECM 4	Install Occupancy Sensor Lighting Controls	5,951	0.7	0.0	$763.73	$4,012.00	$490.00	$3,522.00	4.6	5,993

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 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,951	0.7	0.0	$763.73	$4,012.00	$490.00	$3,522.00	4.6	5,993

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, office spaces, and the treatment facility areas. 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 15 below.

Figure 15 – 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		391,342	101.9	0.0	$50,222.86	$30,000.00	$27,000.00	$3,000.00	0.1	394,078
ECM 5	Program VFDs on the Booster Pumps to Run Slower and Longer	391,342	101.9	0.0	$50,222.86	$30,000.00	$27,000.00	$3,000.00	0.1	394,078

ECM 5: Program Booster Pumps VFDs to Run Slower and Longer

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)
391,342	101.9	0.0	$50,222.86	$30,000.00	$27,000.00	$3,000.00	0.1	394,078

Measure Description

This measure evaluates programming the VFDs on the three 150-hp booster pumps to run at reduced speed in conjunction with demand at the GST. The pumps operate as needed to supply fresh water to the GST. During the summer, all three pumps may be needed to operate to keep up with the additional demand of land irrigation. However, in the winter time only two pumps are required to run at any given time.

We recommend operating these large pumps at reduced speeds for a longer period to provide the same volume of water. Any short-term shortfalls in well capacity can be accommodated using the GST. Treatment facility staff indicated that they would consider trying out the reduced speed approach during reduced demand periods.

Energy savings would result from reducing pump motor speed (and power). The magnitude of energy savings is based on the amount of time at reduced loads. The calculations assume the pump speed and flow will be reduced 20% and the pumps will operate 20% longer. This is a conservative estimate and additional savings can be achieved if the speed of the pumps can be further reduced.

4.1.4 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 16 below.

Figure 16 - 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		**1,804**	**0.0**	**0.0**	**$231.46**	**$28.68**	**$0.00**	**$28.68**	**0.1**	**1,816**
ECM 6	Install Low-Flow Domestic Hot Water Devices	1,804	0.0	0.0	$231.46	$28.68	$0.00	$28.68	0.1	1,816

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)
1,804	0.0	0.0	$231.46	$28.68	$0.00	$28.68	0.1	1,816

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 and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy.

Low-flow devices reduce the overall water flow from the fixture, while still providing 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 17 – 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)
Motor Upgrades	**22,686**	**5.0**	**0.0**	**$2,911.41**	**$56,278.07**	**$0.00**	**$56,278.07**	**19.3**	**22,845**
Premium Efficiency Motors	22,686	5.0	0.0	$2,911.41	$56,278.07	$0.00	$56,278.07	19.3	22,845
Electric Unitary HVAC Measures	**1,264**	**1.7**	**0.0**	**$162.22**	**$7,659.24**	**$260.00**	**$7,399.24**	**45.6**	**1,273**
Install High Efficiency Packaged Terminal AC/HP	1,264	1.7	0.0	$162.22	$7,659.24	$260.00	$7,399.24	45.6	1,273
Custom Measures	**902**	**0.0**	**0.0**	**$115.80**	**$2,740.00**	**$0.00**	**$2,740.00**	**23.7**	**909**
Install Insulation in Opeartions Office Attic	902	0.0	0.0	$115.80	$2,740.00	$0.00	$2,740.00	23.7	909
TOTALS	**24,852**	**6.7**	**0.0**	**$3,189.43**	**$66,677.31**	**$260.00**	**$66,417.31**	**20.8**	**25,026**

* - 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).

Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
22,686	5.0	0.0	$2,911.41	$56,278.07	$0.00	$56,278.07	19.3	22,845

Measure Description

We recommend replacing standard efficiency motors with *NEMA Premium™* efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

Reasons for not Recommending

Some of the booster pumps motors have an age which is greater than two-thirds of their rated equipment useful life (EUL). In our evaluation of ECMs we use the simple payback criteria to decide whether or not to recommend each measure for implementation. This measure had a payback period which was longer than the EUL for a new premium efficiency motor. As a result, it has not been included in among the recommended ECMs at this time.

However, when this measure is combined with all other proposed measures, the combined payback period is still less than two years. So, the facility might choose to include this upgrade along with the recommended ECMs, despite the slightly longer payback.

Install High Efficiency PTHP

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)
1,264	1.7	0.0	$162.22	$7,659.24	$260.00	$7,399.24	45.6	1,273

Measure Description

We recommend replacing packaged terminal heat pumps (PTHP) with high efficiency PTHP. 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 and a higher HPSF rating indicates more efficient heating mode for heat pumps. 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 heating and cooling loads, and the estimated annual operating hours.

Reasons for not Recommending

In our evaluation of ECMs we use the simple payback criteria to decide whether or not to recommend each measure for implementation. This measure had a payback period which was longer than the EUL for a new premium efficiency motor. As a result, it has not been included in among the recommended ECMs at this time. However, when this measure is combined with all other proposed measures, the combined payback period is still less than two years. So, the facility may choose to include this upgrade along with other ECMs, despite its longer payback.

Install Insulation in Operations Office Attic

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)
902	0.0	0.0	$115.80	$2,740.00	$0.00	$2,740.00	23.7	909

Measure Description

During the audit, the facility contact mentioned that the attic space of the operations office area was not properly insulated. We recommend that facility evaluate installing new R30 fiberglass insulation so as to avoid heat loss and save energy during both the heating and cooling season. As a rule of thumb, 16% HVAC energy can be saved by properly insulating office space.

Reasons for not Recommending

While evaluating the ECMs, we use the simple payback criteria to decide whether or not to recommend a measure. This measure had a payback period which was greater than the 2/3 of the rated EUL for new insulation, as a result has not been recommended to implementation.

However, when this measure is combined with all other proposed measures, the combined payback period is still less than two years. So, the facility might choose to include this upgrade along with the recommended ECMs, despite its longer payback.

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.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

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.

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.

Use Fans to Reduce Cooling Load

Utilizing ceiling fans to supplement cooling is a low cost strategy to reduce cooling load considerably. Thermostat settings can be increased by 4°F with no change in overall occupant comfort when the wind chill effect of moving air is employed for cooling.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5°F-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Replace Computer Monitors

Replacing old computer monitors or displays with efficient monitors will reduce energy use. ENERGY STAR® rated monitors have specific requirements for on mode power consumption as well as idle and sleep mode power. According to the ENERGY STAR® website monitors that have earned the ENERGY STAR® label are 25% more efficient than standard monitors.

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 4.1.4 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) 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.

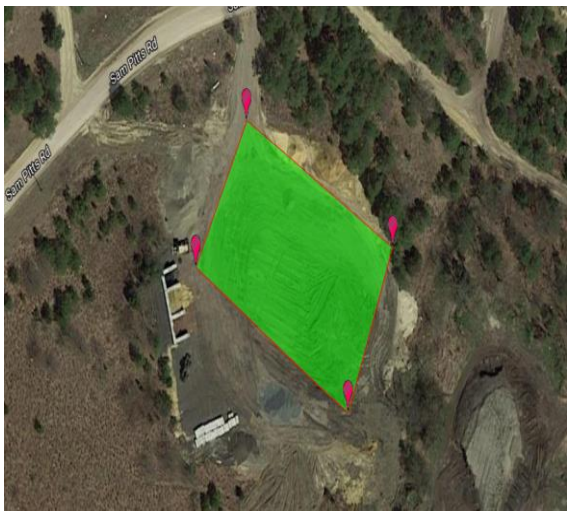
The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines 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

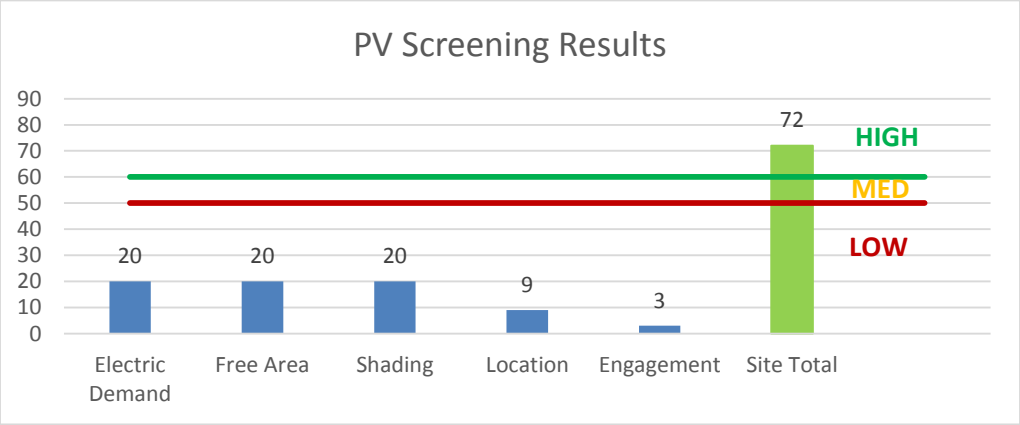
Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical 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.

The facility requested TRC to analyze the solar potential at a former landfill site owned by the township located at 1360 Route 70, Whiting, New Jersey. The image below shows the area considered for the solar PV The area is approximately 117,000 sq. feet.



A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the site has a high potential for cost-effective installation of a PV array. Please refer to the Municipal Building energy audit report for further details on the cost and savings analysis of installing solar PV at the location shown above. TRC recommends that the site be assessed by a qualified solar installer. Site conditions need to be assessed and options for sale of power or usage by municipal buildings need to be more fully explored in order to determine project cost-effectiveness.

Figure 18 - Photovoltaic Screening



Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (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 developed new solar projects and insight into future SREC pricing. Refer to Section 8.3 for additional information.

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

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

6.2 Combined Heat and Power

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

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

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a low potential for installing a cost-effective CHP system.

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

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

7 Demand Response

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

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

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

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

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

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (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.

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

Figure 19 - 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 Fluorescent Fixtures with LED Lamps and Drivers	x			x		
ECM 3	Retrofit Fixtures with LED Lamps	x			x		
ECM 4	Install Occupancy Sensor Lighting Controls	x			x		
ECM 5	Program VFDs on the Booster Pumps to Run Slower and Longer		x		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 Pay for Performance - Existing Buildings

Overview

The Pay for Performance – Existing Buildings (P4P EB) program is designed for larger customers with a peak demand over 200 kW in any of the preceding 12 months. Under this program the minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings. P4P is a generally a good option for medium to large sized facilities looking to implement as many measures as possible under a single project in order to achieve deep energy savings. This program has an added benefit of evaluating a broad spectrum of measures that may not otherwise qualify under other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also utilize the P4P program.

Incentives

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

How to Participate

To participate in the P4B EB program you will need to contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, the Partner will help further evaluate the measures identified in this report through development of the Energy Reduction Plan (ERP), assist you in implementing selected measures, and verify actual savings one year after the installation. At each of these three milestones your Partner will also facilitate securing program incentives.

Approval of the final scope of work is required by the program prior to installation completion. Although installation can be accomplished by a contractor of your choice (some P4P Partners are also contractors) or by internal personnel, the Partner must remain involved to ensure compliance with the program guidelines and requirements.

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

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. SRECs 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 SRECs 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 description 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.

8.5 Demand Response Energy Aggregator

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 the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

See Section 7 for additional information.

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
Booster pump room	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,720	Relamp	No	20	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,720	0.54	4,266	0.0	$547.47	$1,170.00	$200.00	1.77
Filter room	43	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,720	Relamp	Yes	43	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,004	1.46	11,590	0.0	$1,487.39	$3,325.50	$535.00	1.88
Lockout center	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,720	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,004	0.20	1,617	0.0	$207.54	$621.00	$95.00	2.53
Sample room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,720	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,004	0.10	809	0.0	$103.77	$445.50	$65.00	3.67
Break room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,720	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,004	0.17	1,348	0.0	$172.95	$562.50	$85.00	2.76
NA Hypochloride room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,720	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,004	0.17	1,348	0.0	$172.95	$562.50	$85.00	2.76
Control room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,720	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,004	0.20	1,617	0.0	$207.54	$621.00	$95.00	2.53
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,720	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,004	0.07	539	0.0	$69.18	$233.00	$20.00	3.08
Restroom	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,720	Fixture Replacement	Yes	2	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	38	4,004	0.06	458	0.0	$58.73	$1,334.04	$50.00	21.86
Jeff's office	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,720	Fixture Replacement	Yes	4	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	38	4,004	0.12	915	0.0	$117.46	$2,706.08	$135.00	21.89
Jeff's office	2	Incandescent: 75W	Wall Switch	75	5,720	Relamp	No	2	LED Screw-In Lamps: 15W LED	Wall Switch	15	5,720	0.10	776	0.0	$99.54	$107.51	$10.00	0.98
Front office	5	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,720	Fixture Replacement	Yes	5	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	38	4,004	0.14	1,144	0.0	$146.82	$3,315.11	$160.00	21.49
Patricia's office	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,720	Fixture Replacement	Yes	6	LED - Fixtures: Ambient 2x4 Fixture	Occupancy Sensor	38	4,004	0.17	1,373	0.0	$176.19	$3,924.13	$185.00	21.22
Patricia's office	3	Incandescent: 75W	Wall Switch	75	5,720	Relamp	Yes	3	LED Screw-In Lamps: 15W LED	Occupancy Sensor	15	4,004	0.16	1,251	0.0	$160.51	$431.26	$50.00	2.38
Closet	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	5,720	Fixture Replacement	No	1	LED - Fixtures: Ambient 2x4 Fixture	Wall Switch	38	5,720	0.02	155	0.0	$19.91	$609.02	$25.00	29.34
Booster pump room	4	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	5,720	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,004	0.22	1,750	0.0	$224.63	$738.00	$75.00	2.95
Booster pump room	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filter room	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
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
Control room	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Front office	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
Pole lights	8	Metal Halide: (1) 400W Lamp	Daylight Dimming	458	2,860	Fixture Replacement	No	8	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	90	2,860	2.40	9,514	0.0	$1,221.03	$3,520.00	$800.00	2.23
Wall packs	19	Metal Halide: (1) 175W Lamp	Daylight Dimming	215	2,860	Fixture Replacement	No	19	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	40	2,860	2.71	10,746	0.0	$1,379.05	$7,422.86	$1,900.00	4.00
Well #12	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,720	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,004	0.27	2,156	0.0	$276.72	$738.00	$115.00	2.25

Motor Inventory & Recommendations

		Existing Conditions											Proposed Conditions					Energy Impact & Financial Analysis					
Location	rea(s)/System(s) Serv	Motor Quantity	Motor Application	HP Per Motor	*Motor RPM*	*Motor Type*	Full Load Efficiency	*Motor Load Factor*	VFD Control?	*Additional Motor Description*	Annual Operating Hours	Total kW	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	*VFD Measure Code*	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total NJCEP Incentives	Combined Payback w/ Incentives in Years
Sample room	Laboratory	5	Process Pump	0.3	1,200	Enclosed	65.0%	80.0%	No		2,745	1.53	Yes	73.4%	No	N/A		0.13	481	$61.69	$2,953.69	$0.00	47.88
Booster pump 1	All	1	Process Pump	150.0	1,800	Enclosed	93.6%	80.0%	No	The motor does have a VFD installed but it is only used for	5,110	95.64	No	93.6%	Yes	P	1	34.02	139,080	$17,848.79	$10,000.00	$9,000.00	0.06
Booster pump 2	All	1	Process Pump	150.0	1,800	Enclosed	93.6%	80.0%	No	The motor does have a VFD installed but it is only used for	5,110	95.64	Yes	95.8%	Yes	P	1	35.48	155,161	$19,912.52	$24,380.60	$9,000.00	0.77
Booster pump 3	All	1	Process Pump	150.0	1,800	Enclosed	94.1%	80.0%	No	The motor does have a VFD installed but it is only used for	3,833	95.13	Yes	95.8%	Yes	P	1	34.97	113,026	$14,505.13	$24,380.60	$9,000.00	1.06
Treatment facility	All	1	Process Pump	15.0	1,800	Enclosed	91.0%	80.0%	No		3,391	9.84	Yes	92.4%	No	N/A		0.11	505	$64.86	$1,891.42	$0.00	29.16
Treatment facility	All	1	Process Pump	15.0	1,800	Enclosed	91.0%	80.0%	No		3,391	9.84	Yes	92.4%	No	N/A		0.11	505	$64.86	$1,891.42	$0.00	29.16
Lockout room	All	3	Process Pump	0.3	1,800	Enclosed	65.0%	75.0%	No		2,745	0.86	Yes	73.4%	No	N/A		0.07	270	$34.70	$1,367.88	$0.00	39.42
Backwash area	All	2	Process Pump	20.0	1,800	Enclosed	91.0%	75.0%	No		3,391	24.59	Yes	93.0%	No	N/A		0.39	1,793	$230.16	$5,031.86	$0.00	21.86
Well #12	East region	1	Process Pump	150.0	1,800	Enclosed	93.6%	80.0%	No		1,460	95.64	Yes	95.8%	No	N/A		1.63	3,207	$411.53	$14,380.60	$0.00	34.94

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
Jeff's office	Jeff's office	1	Packaged Terminal HP	1.00	10.80	Yes	1	Packaged Terminal HP	1.00	10.80	14.00	3.30	No	0.42	316	0.0	$40.55	$1,914.81	$65.00	45.61
Patricia's office	Patricia's office	1	Packaged Terminal HP	1.00	10.80	Yes	1	Packaged Terminal HP	1.00	10.80	14.00	3.30	No	0.42	316	0.0	$40.55	$1,914.81	$65.00	45.61
Control room	Control room	1	Packaged Terminal HP	1.00	10.80	Yes	1	Packaged Terminal HP	1.00	10.80	14.00	3.30	No	0.42	316	0.0	$40.55	$1,914.81	$65.00	45.61
Front office	Front office	1	Packaged Terminal HP	1.00	10.80	Yes	1	Packaged Terminal HP	1.00	10.80	14.00	3.30	No	0.42	316	0.0	$40.55	$1,914.81	$65.00	45.61

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
Booster pump room	All	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
Restroom	4	Faucet Aerator (Lavatory)	2.50	1.00	0.00	1,804	0.0	$231.46	$28.68	$0.00	0.12

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Break room	1	Table fan	100.0	No
Break room	2	Microwave	1,000.0	No
Break room	1	Refrigerator	600.0	No
Control room	2	Desktop computer	75.0	No
Jeff's office	1	Desktop computer	75.0	No
Jeff's office	1	Printer	150.0	No
Patricia's office	1	Desktop computer	75.0	No
Patricia's office	1	Large printer	515.0	No
Front office	1	Large printer	515.0	No