Local Government Energy Audit:
Energy Audit Report




8 Pumping Stations

Long Hill Township

Long Hill, New Jersey 07933

October 26, 2018

Final Report by:

TRC Energy Services

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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 eight Pump Stations.

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 local governments in controlling their energy costs and help protect our environment by reducing energy demand statewide.

1.1 Facility Summary

On Feb. 8, 2017, TRC performed energy audits of the following eight pumping stations in Long Hill Township:

1. Morristown Road Pump Station
2. Valley Road Pump Station
3. New Vernon Road Pump Station
4. Clover Hill Pump Station
5. Heritage Road Pump Station
6. Skyline Drive Pump Station
7. Warren/Union Pump Station
8. Centennial Village Pump Station

Each pump station is typically occupied only a few hours per week. Department of Public Works (DPW) staff typically visit each site daily to record pump motor run hours and check or repair pumping equipment. Most sites consist of a small pump house with a few incandescent or compact fluorescent light bulbs and a few T8 or T12 linear fluorescent tubes. Some of the pump stations are located underground and have no structure, nor lighting fixtures.

Heating (if present) generally consists of a few electric space heaters, which are only turned on as needed in winter. Four of the eight pump stations have no heating. None of the buildings are air conditioned.

Each of the sites has a back-up generator. Three of the generators are gas-fired, four burn diesel fuel, and one burns propane. Fuel usage for this backup generation is negligible. Unless there is a power outage, generators typically run only about 6 hours per year for required testing.

About 97% of energy usage is electric power used for pump motors, pumping control systems, and a few ventilation fans. Pump motors range in size from 2 to 75 horsepower. Motor run hours differ from site to site and seasonally. Most pumps run every day, for a few hours each day, as needed.

Thorough descriptions of each pump station and our observations are provided in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated four measures which together represent an opportunity to reduce the annual energy costs for the eight pump stations in Long Hill Township by about $24,328 and the annual greenhouse gas emissions for the sites by about 176,782 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 3.6 years. The breakdown of existing and potential utility costs, following project implementation, are shown in Figure 1 and Figure 2. Together the 8 sites use about 323,489 kWh at a cost of about $44,830 per year. We estimate that the proposed energy efficiency measures together have the potential to reduce combined annual energy usage for the 8 sites by about 54% overall.

Figure 1 – Previous 12 Month Utility Costs

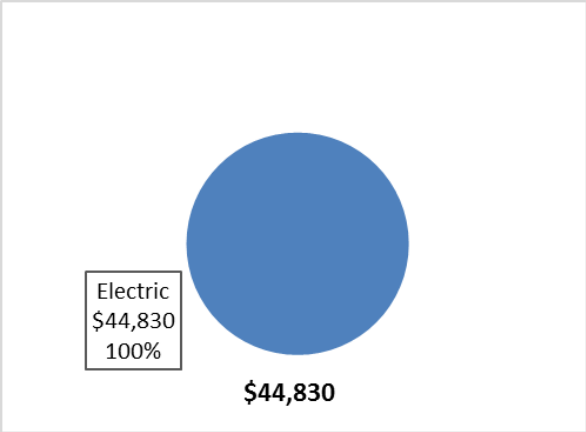
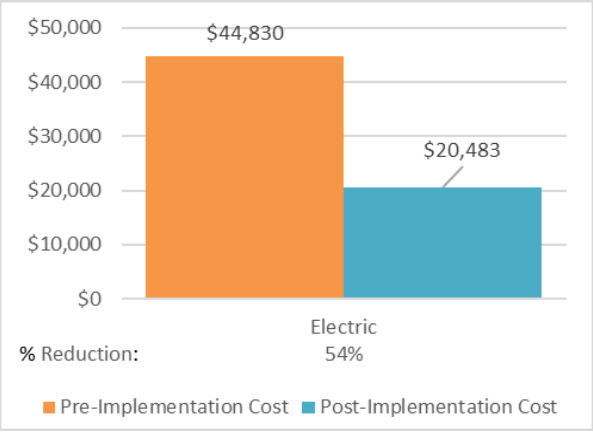


Figure 2 – Potential Post-Implementation Costs



A detailed description of existing energy usage by the eight pumping stations 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		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		**1,748**	**1.3**	**$242.30**	**$2,577.42**	**$130.00**	**$2,447.42**	**10.1**	**1,761**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	524	0.8	$72.55	$1,926.67	$0.00	$1,926.67	26.6	527
ECM 2	Retrofit Fixtures with LED Lamps	1,225	0.5	$169.75	$650.75	$130.00	$520.75	3.1	1,233
Motor Upgrades		**1,737**	**0.6**	**$240.70**	**$8,999.84**	**$0.00**	**$8,999.84**	**37.4**	**1,749**
ECM 3	Premium Efficiency Motors	1,737	0.6	$240.70	$8,999.84	$0.00	$8,999.84	37.4	1,749
Variable Frequency Drive (VFD) Measures		**172,070**	**39.1**	**$23,845.83**	**$89,763.97**	**$14,400.00**	**$75,363.97**	**3.2**	**173,273**
ECM 4	Install VFDs on Pump Motors	172,070	39.1	$23,845.83	$89,763.97	$14,400.00	$75,363.97	3.2	173,273
TOTALS		**175,555**	**41.0**	**$24,328.84**	**$101,341.23**	**$14,530.00**	**$86,811.23**	**3.6**	**176,782**

* 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.

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.

Energy Efficient Practices

TRC also identified four 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 8 Pump Stations include:

- Ensure Lighting Controls Are Operating Properly
- Turn Off Unneeded Motors
- Reduce Motor Short Cycling
- Perform Routine Motor Maintenance

For details on these energy efficient practices, please refer to Section 5.

On-Site Generation Measures

Each of the pump stations has a gas or diesel-fired backup generator on site.

TRC evaluated the potential for installing solar PV generation at each site. On-site solar generation, if possible, would likely reduce annual electric purchases. Based on our site inspections, none of the sites appears to be large enough for any significant commercial solar development. For some sites, it might be feasible to install small solar array, which would be connected to the grid through the pump station's electric meter. However, most of the pump stations are either adjacent to private property or near wooded areas which might shade on-site solar panels. Overall, the solar potential for the pump station sites appears to be poor. For details on our evaluation and on-site generation potential, please see 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 together, or 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
- 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.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.3 for additional information on the ESIP Program.

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

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Guy Piserchia	Township Committee	guyp@longhillnj.gov	908-578-7010
Tom Sweeny	Director, Public Works	roads@longhillnj.us	908-647-0070
Paul Ferriero	Township Engineer	townshipengineer@longhillnj.us	908-647-0070
Designated Representative			
Neil Henry	Former Town Administrator	n/a	n/a
TRC Energy Services			
Tom Page	Auditor	TPage@TRCsolutions.com	(732) 855-0033

2.2 General Site Information

On February 8, 2017, TRC performed an energy audit at eight pump stations located in Long Hill, New Jersey. TRC's team met with Neil Henry to review the facility operations and help focus our investigation on specific energy-using systems. We inspected the following sites:

1. Morristown Road Pump Station
2. Valley Road Pump Station
3. New Vernon Road Pump Station
4. Clover Hill Pump Station
5. Heritage Road Pump Station
6. Skyline Drive Pump Station
7. Warren/Union Pump Station
8. Centennial Village Pump Station

Each of the pump stations is typically occupied a few hours per week. Department of Public Works (DPW) staff typically visit each site daily to record pump motor run hours and check or repair pumping equipment. Most sites consist of a small pump house with a few incandescent or compact fluorescent light bulbs and a few T8 or T12 linear fluorescent tubes. Some of the pump stations are located underground and have no structure, nor lighting fixtures.

Heating (if present) generally consists of a few electric space heaters, which are used as needed in winter. Four of the eight pump stations have no heating. None of the buildings are air conditioned.

Each site has a back-up generator for emergencies. Three of the generators are gas-fired, four burn diesel fuel, and one burns propane. Fuel usage for backup generation is negligible. Unless there is a power outage, generators typically run approximately 6 hours per year for required testing.

Approximately 97% of energy usage is electric power used for pumping, plus related fans and control systems. Pump motors range in size from 2 to 75 horsepower. Motor run hours vary from site to site and seasonally. Most pumps run every day, for a few hours each day, as needed.

Our observations at each site are summarized below. Lists of all major equipment at each pump station is provided in Appendix A.

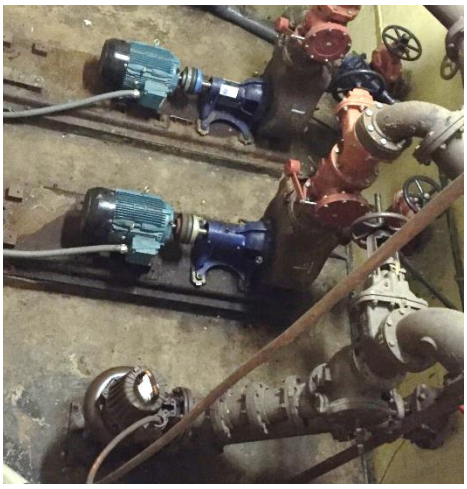
2.3 Morristown Road Pump Station

Morristown Road Pump Station is a 602-ft^2 brick building located at 279 Morristown Road. It has a flat concrete roof, steel doors, and operable window slats for ventilation. It is occupied by DPW staff a few hours per week to record daily motor run hours, perform scheduled maintenance, and make necessary repairs to equipment.

Energy-Using Equipment

Major equipment on site includes: three pumps (and related controls), eight light fixtures, one ceiling-mounted electric space heater, and one back-up emergency generator.

Motors



Pumps are located below ground, accessed by a spiral stairway. Pump 1 has a 7.5-hp motor. Pumps 2 and 3 have 10-hp motors each. Motor ages were estimated. Pump motor 1 is the oldest. Based on the unit's run hours, it appears to be more than 20 years old, which is beyond the equipment's rated useful life. Pumps 2 and 3 are newer, but both are estimated to be over 10 years old and near the end of their rated useful life as well.

The pumps all run at constant speed. Each of them typically runs for several hours a day, every day. Pumping hours vary seasonally. Based on the electric bills, the pumps generally run longer hours at this site than at most others. The electric cost for pumping at this site is about $8,000 per year. Peak operation seems to occur in the winter and early spring. (For more information on electric usage, see Section 3.2).

Lighting

Building lighting consists of eight T12 linear fluorescent fixtures. Lighting is used only when occupied and is controlled by wall switches.

Heating

The building has one 20,000 Btu ceiling-mounted electric space heater with fan, which is controlled by a manual thermostat and used only when needed by building occupants.

On-Site Generation

The site has one diesel-fired 60-kW Onan emergency generator, which has a new 275-gal diesel fuel tank. The generator typically runs only about 30 minutes per month for required testing. The site uses a very small amount of diesel fuel per year.

2.4 Valley Road Pump Station

Valley Road Pump Station is located at 342 Valley Road in the parking lot of the Chimney Rock Inn. The pumps are located underground. There is no structure at the site, only a fenced-in area with concrete pads and a manhole leading down to the pumps. It is occupied by DPW staff a few hours per week to record daily motor run hours, perform scheduled maintenance, and make necessary repairs to equipment.

Energy-Using Equipment

Major equipment on site includes: two pumps (and related controls) and one back-up emergency generator.

Motors

The site has two submersible pumps. They are 4-hp each. The pumps are located below ground, down a ladder accessed through a steel hatch. A Square-D panel above ground contains the pump controls. The pump operation and run hours are checked daily. The motors are about six years old.

The pump motors run at constant speed, typically only a few hours per day. Run hours are slightly higher in the winter, but do not vary much throughout the year for this site. The total annual electric bill for pumping at the site is typically less than $1000. (For more information on electric usage, see Section 3.2).

Lighting

The site has no lighting.

Heating

The site has no building and no HVAC equipment.

On-Site Generation

The site has one 1300-hp Cummins natural gas-fired emergency generator. The generator typically runs only about 30 min per month for required testing. The site uses an insignificant amount of natural gas per year.

2.5 New Vernon Road Pump Station

New Vernon Road Pump Station is a 1075-ft^2 brick building located at 40 New Vernon Road, across the street from the Meyersville Ballfield. It has a flat concrete roof, steel doors, and no windows. It is occupied by DPW staff a few hours per week to record daily motor run hours, perform scheduled maintenance, and make necessary repairs to equipment.

Energy-Using Equipment

Major equipment on site includes: two pumps (and related controls), 10 light fixtures, one ceiling-mounted electric space heater, and one back-up emergency generator.

Motors

New Vernon Pump Station has two main pumps, both with 35-hp motors. Pumps are below ground in the pit. Ages were estimated from run hours. Both pump motors are believed to be more than 10 years old.

The pumps are run at constant speed, usually for a few hours each day. Run hours for both motors appear to be highest from January through March. Usage appears to be fairly constant throughout the rest of the year. Electric costs for pumping at this site are more than $9000 per year. (For more information on electric usage, see Section 3.2).

Lighting

Interior lighting is mostly of T8 linear fluorescent fixtures, plus compact fluorescent bulbs to light the pit. Three fixtures with incandescent bulbs light the exterior of the building.

Heating

The building has one 20,000 Btu ceiling-mounted electric space heater with fan, which is controlled by a manual thermostat and used only when needed by building occupants.

On-Site Generation

The site has one diesel-fired 175-kW Onan emergency generator and a 275-gal diesel fuel tank. The generator typically runs only about 30 minutes per month for required testing. The site uses an insignificant amount of diesel fuel per year.

2.6 Clover Hill Pump Station

Clover Hill Pump Station is a 300-ft^2 brick building located at 53 Rainbow Drive. It has a flat concrete roof, steel doors, and one window with steel slats for ventilation. It is occupied by DPW staff a few hours per week to record daily motor run hours, perform scheduled maintenance, and make necessary repairs to equipment.

Energy-Using Equipment

Major equipment on site includes: two pumps (and related controls), three light fixtures, one ceiling-mounted electric space heater, and one back-up emergency generator.

Motors

Clover Hill Pump Station has two main pumps. The pump motors are 18 hp and 20 hp. The pumps are below ground in the pit. The pump motors are estimated to be 17 years old.

The pumps are run at constant speed, usually for a few hours each day. Run hours appear to be highest from December through February. Usage appears to be fairly constant throughout the rest of the year. Electric costs for pumping at this site are about $5,700 per year. (For more information on electric usage, see Section 3.2).

Lighting

Interior lighting is provided by 8-ft T12 linear fluorescent fixtures. One fixture with an incandescent bulb lights the exterior of the building.

Heating

The building has one 24,000 Btu Dayton ceiling-mounted electric space heater with fan, which is controlled by a manual thermostat and used only when needed by building occupants.

On-Site Generation

The site has one propane-fired 85-kW Westinghouse emergency generator and an 1800-gal propane tank. The generator typically runs about 30 minutes per month for required testing. The site uses an insignificant amount of propane per year.

2.7 Heritage Road Pump Station

Heritage Road Pump Station is a 150-ft^2 wooden building located at 632 Heritage Road. It has a sloped roof with asphalt shingles, one door made of wood and glass, and no windows. It is occupied by DPW staff a few hours per week to record daily motor run hours, perform scheduled maintenance, and make necessary repairs to equipment.

Energy-Using Equipment

Major equipment on site includes: two pumps (and related controls), two light fixtures, two ceiling-mounted electric space heaters, one exhaust fan, and one back-up emergency generator.

Motors

Heritage Road Pump Station has two main pumps. Pump motors are both 5 hp. Pumps are below ground in the pit. Pump motors are about eight years old.

There is one exhaust fan with a fractional horsepower motor.

The pumps are run at constant speed, usually for a few hours each day. Run hours appear to be highest during the winter months. Usage appears to be fairly constant throughout the rest of the year. Electric costs for pumping at this site are about $2500 per year. (For more information on electric usage, see Section 3.2).

Lighting

Interior lighting is provided by two fixtures with incandescent bulbs. The site has no exterior lighting.

Heating

The building has two 16,000-Btu Markel ceiling-mounted electric space heaters with fans, which are controlled by a manual thermostat and used by building occupants only when needed.

On-Site Generation

The site has one natural gas-fired Cummins emergency generator. The generator typically runs only about 30 minutes per month for required testing. The site uses an insignificant amount of natural gas per year.

2.8 Skyline Drive Pump Station

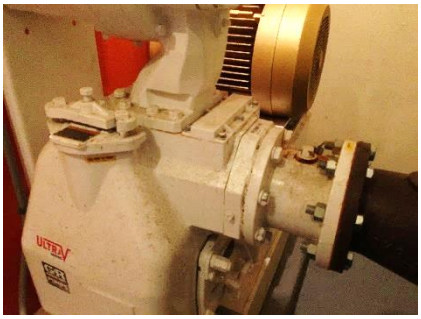
Skyline Drive Pump Station is an 884-ft^2 brick building located at 279 Skyline Drive. It has a sloped roof with asphalt shingles, one steel and glass door, and two windows. The building has two lower levels accessed by a metal stairway. The building is occupied by DPW staff a few hours per week to record daily motor run hours, perform scheduled maintenance, and make necessary repairs to equipment.

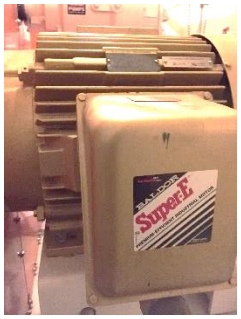
Energy-Using Equipment

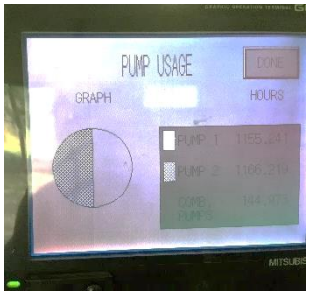
Major equipment on site includes: two large pumps (and related controls), nine light fixtures, two ceiling-mounted electric space heaters, three exhaust fans, and one back-up emergency generator.

Motors

Skyline Drive Pump Station has two main pumps. They are Gorman-Rupp Ultra-V centrifugal pumps with Mitsubishi controls. Each is powered by a Baldor Super-E 75-hp motors. The pump motors are new. They were installed in 2016. The building also has three exhaust fans, all with fractional horsepower motors.







The pumps are run at constant speed, usually for a few hours each day. Run hours appear to be highest during the winter months and lowest in the summer. This site has the largest pumps and the largest annual energy usage of any of the pump stations. The annual electric cost for pumping at this site is over $15,000 per year. (For more information on electric usage, see Section 3.2).

Lighting

Interior lighting is a mixture of T8 and T12 linear fluorescent fixtures. There are also some fixtures with CFL or incandescent light bulbs. The building has one exterior incandescent light fixture.

Heating

The building has two 16,000-Btu ceiling-mounted electric space heaters, Chromalox and Premier units with fans, which are controlled by manual thermostats and used by building occupants as needed.

On-Site Generation

The site has one 250-kW diesel Cummins emergency generator and a 250-gal diesel fuel tank. The generator typically runs about 30 minutes per month for required testing. The site uses an insignificant amount of diesel fuel per year.

2.9 Warren / Union Pump Station

Warren/Union Pump Station is located at 15 Union Street, near the intersection with Union Ave. The pumps are located underground. There is no enclosed structure at the site, only a raised concrete platform and with steel hatches leading down to the pumps. The site is occupied by DPW staff a few hours per week to record daily motor run hours, perform scheduled maintenance, and make necessary repairs to equipment.

Energy-Using Equipment

Major equipment on site includes: two pumps (and related controls) and one back-up emergency generator.

Motors

The site has two submersible ABS pumps. The pump motors are 14-hp each. The pumps are located below ground, down a ladder accessed through a steel hatch. A Mitsubishi control panel above ground contains the pump controls. The pump operation and run hours are typically checked daily. Both motors were replaced about two years ago.

The pump motors run at constant speed, typically only a few hours per day. Run hours vary throughout the year, through tend to be slightly higher in the winter, but do not vary much throughout the year for this site. The total annual electric bill for pumping at the site is typically less than $1800. (For more information on electric usage, see Section 3.2).

Lighting

The site has no lighting.

Heating

The site has no building and no HVAC equipment.

On-Site Generation

The site has one portable 50-kW Cummins diesel emergency generator and a 100-gal diesel fuel tank. The generator typically runs only about 30 minutes per month for required testing. The site uses an insignificant amount of diesel fuel per year.

2.10 Centennial Village Pump Station

Centennial Village Pump Station is located between 17 and 33 Norwood Drive. The pumps are located underground. There is no structure at the site, only some concrete equipment pads and a manhole with a steel hatch leading down to the pumps. The site is occupied by DPW staff a few hours per week to record daily motor run hours, perform scheduled maintenance, and make necessary repairs to equipment.

Energy-Using Equipment

Major equipment on site includes: two submersible pumps (and related controls) and one back-up emergency generator.

Motors

The site has two submersible pumps. They are 2 hp each. The pumps are located below ground, down a ladder accessed through a steel hatch. A steel box above ground contains a PRIMEX control panel to monitor pump operation and record run hours. The motors are estimated to be about six years old.

The pump motors run at constant speed, typically only a few hours per day. Run hours are slightly higher in the winter, but pump usage in general is fairly. The total annual electric bill for pumping at the site is typically about $700. (For more information on electric usage, see Section 3.2).

Lighting

The site has no lighting.

Heating

The site has no building and no HVAC equipment.

On-Site Generation

The site has one 1300-hp Cummins natural gas-fired emergency generator. The generator typically runs only about 30 minutes per month for required testing. The site uses an insignificant amount of natural gas per year.

Please see Appendix A: Equipment Inventory & Recommendations for a detailed list of the pump stations equipment.

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

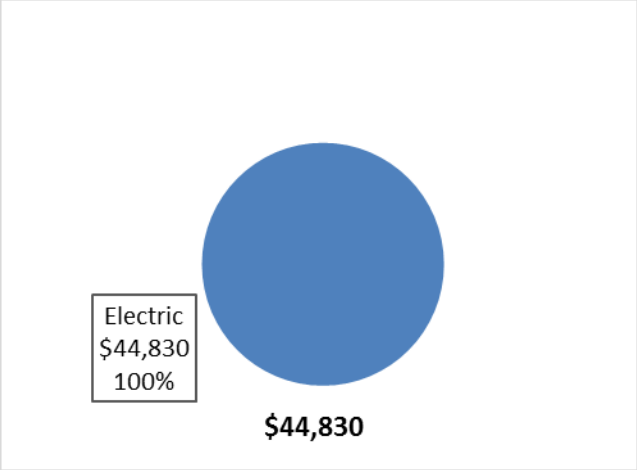
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 5 - Utility Summary

Utility Summary for 8 Pump Stations		
Fuel	**Usage**	**Cost**
Electricity	323,489 kWh	$44,830
Total		**$44,830**

The current annual energy cost for this facility is $44,830 as shown in the chart below. The sites use only electric power, plus a negligible amount of fuel for on-site emergency generators.

Figure 6 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over a recent 12-month period for all sites combined was $0.139/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 total monthly electricity consumption and peak demand are shown in the chart below.

Figure 7 - Electric Usage & Demand – All Sites Combined

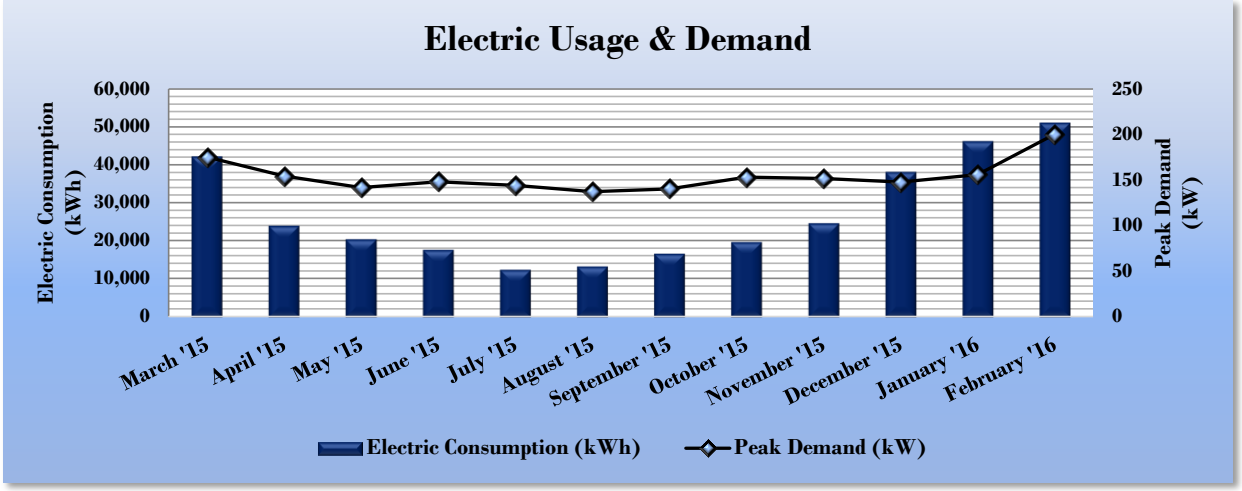


Figure 8 - Electric Usage & Demand – All Sites Combined

Electric Billing Data for 8 Pump Stations					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Total Electric Cost	TRC Estimated Usage?
4/13/15	31	42,021	175.1	$5,389	No
5/13/15	30	23,911	154.3	$3,245	No
6/12/15	30	20,408	141.6	$3,029	No
7/13/15	31	17,662	147.9	$2,658	No
8/12/15	30	12,391	144.0	$2,046	No
9/14/15	33	13,274	137.0	$2,167	No
10/13/15	29	16,593	140.1	$2,516	No
11/12/15	30	19,672	153.1	$2,856	No
12/14/15	32	24,553	151.4	$3,569	No
1/13/16	30	37,950	147.6	$5,006	No
2/12/16	30	46,013	155.8	$5,931	No
3/14/16	31	50,814	200.0	$6,664	No
Totals	**367**	**325,262**	**200.0**	**$45,076**	0
Annual	**365**	**323,489**	**200.0**	**$44,830**	

None of the pump station sites have any significant natural gas, propane, or diesel fuel usage, although small amounts are used at each site to run emergency back-up generators. Graphs of monthly electric usage and power demand for each individual site are provided below.

Figure 9 – Morristown Road Pump Station - Monthly Electric Usage & Demand

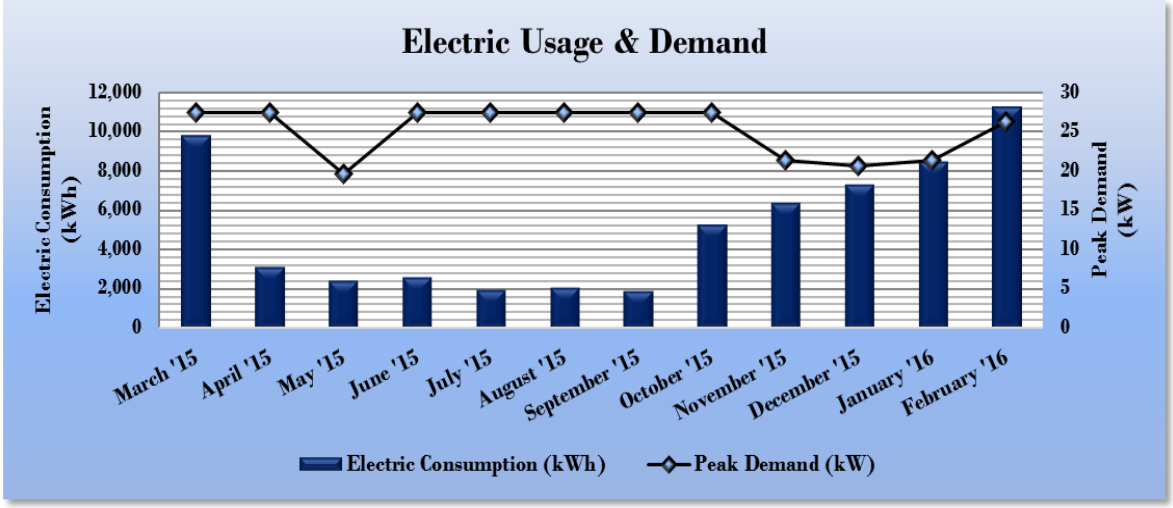


Figure 10 - Valley Road Pump Station - Monthly Electric Usage & Demand

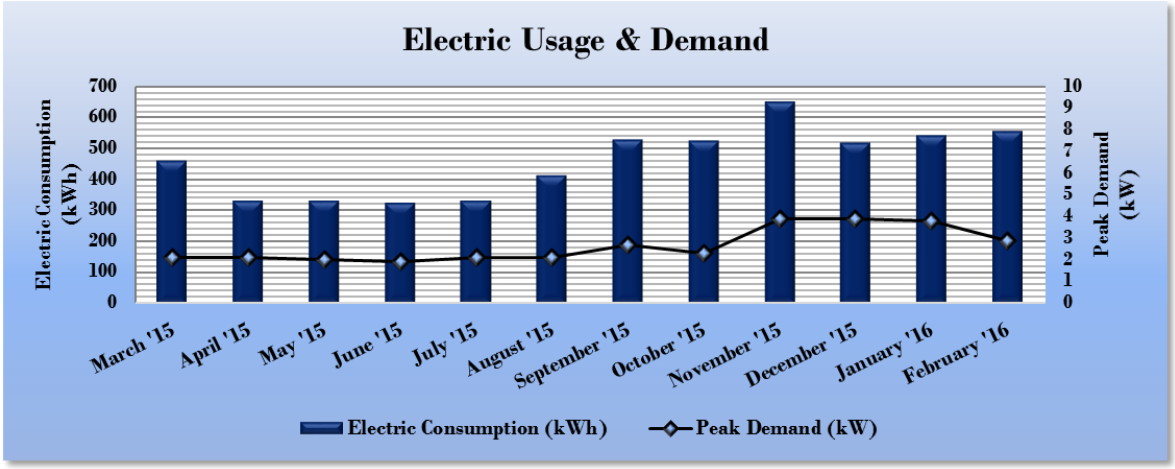


Figure 11 – New Vernon Pump Station - Monthly Electric Usage & Demand

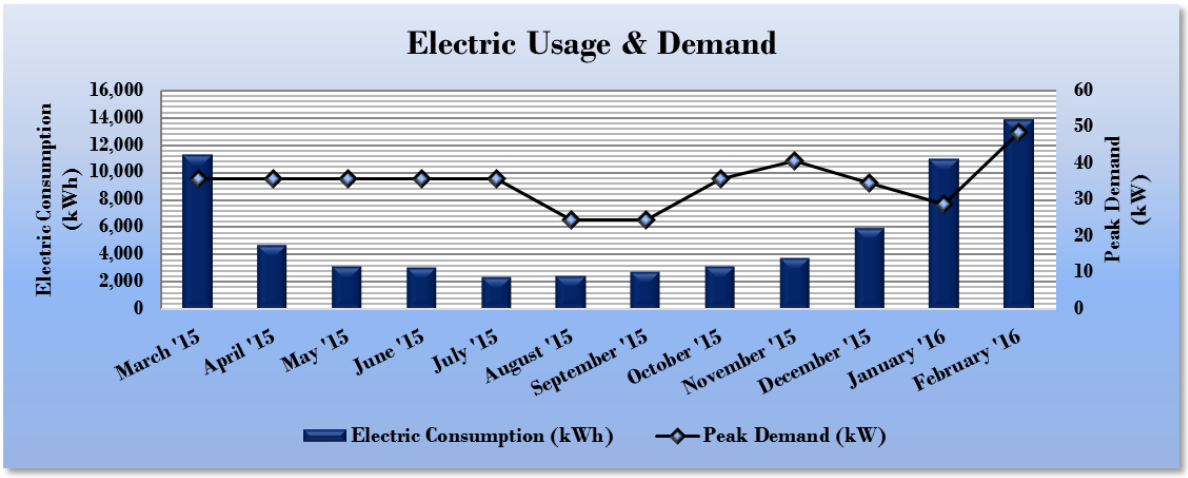


Figure 12 – Clover Hill Pump Station - Monthly Electric Usage & Demand

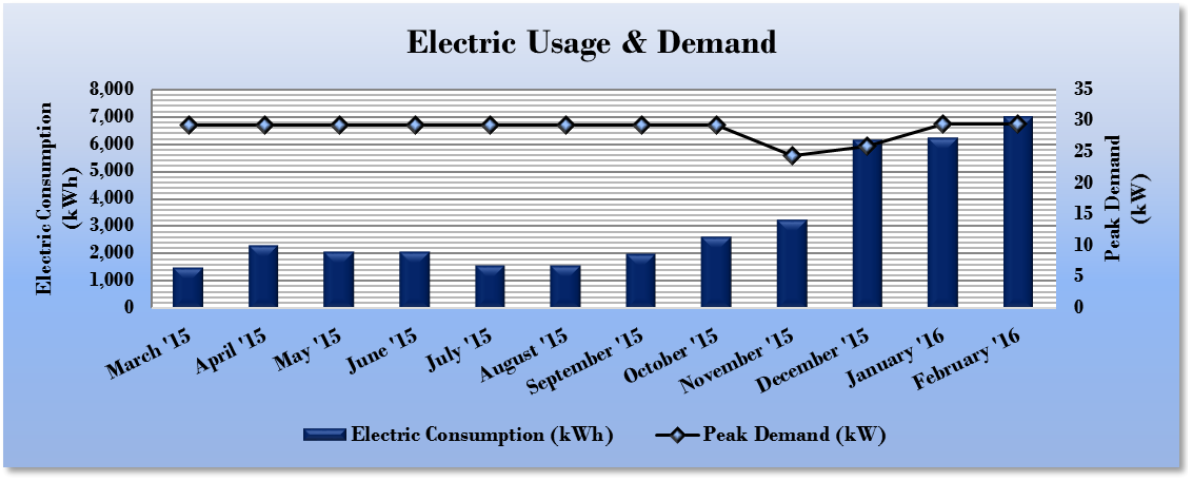


Figure 13 - Heritage Road Pump Station - Monthly Electric Usage & Demand

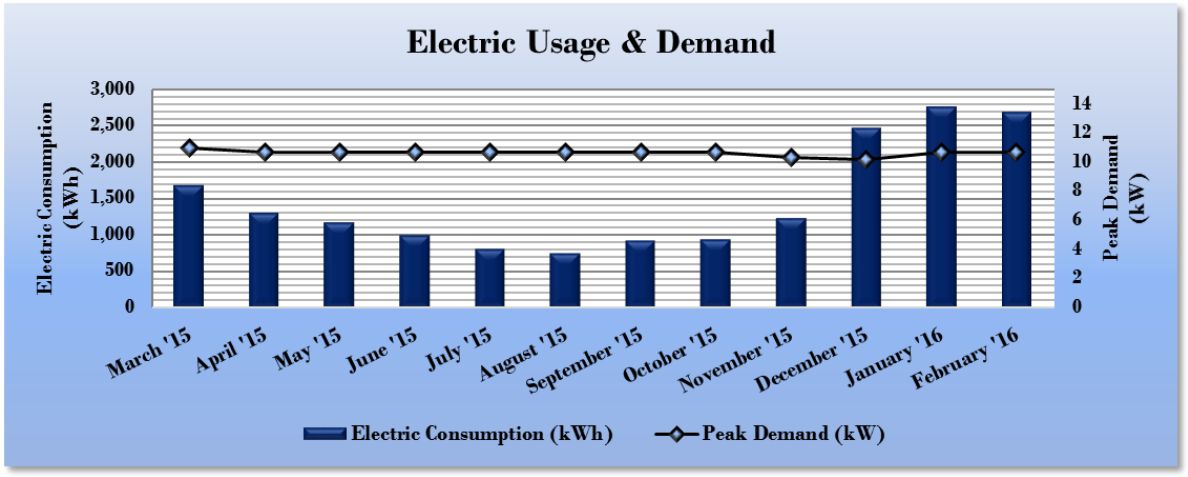


Figure 14 – Skyline Drive Pump Station - Monthly Electric Usage & Demand

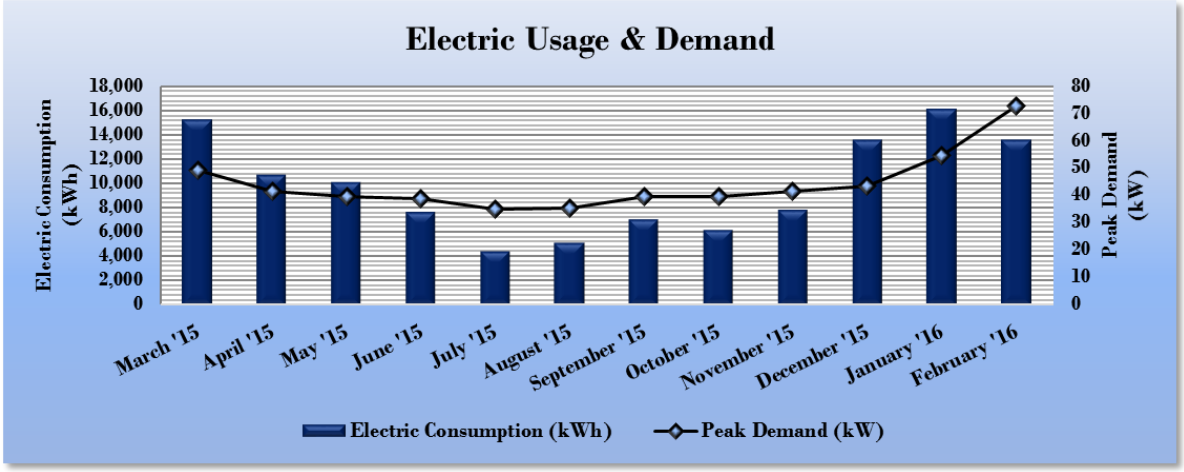


Figure 15 – Warren / Union Pump Station - Monthly Electric Usage & Demand

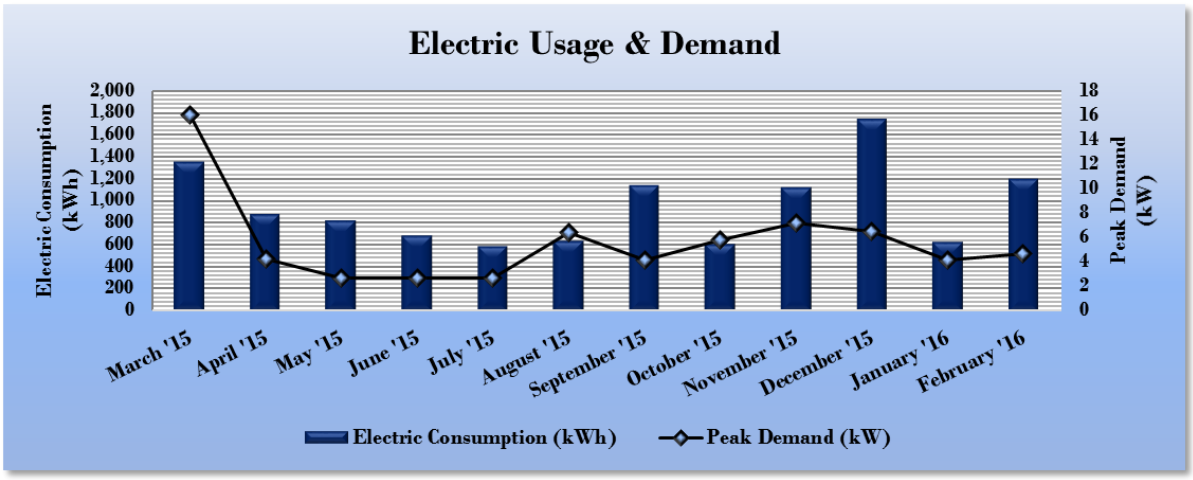
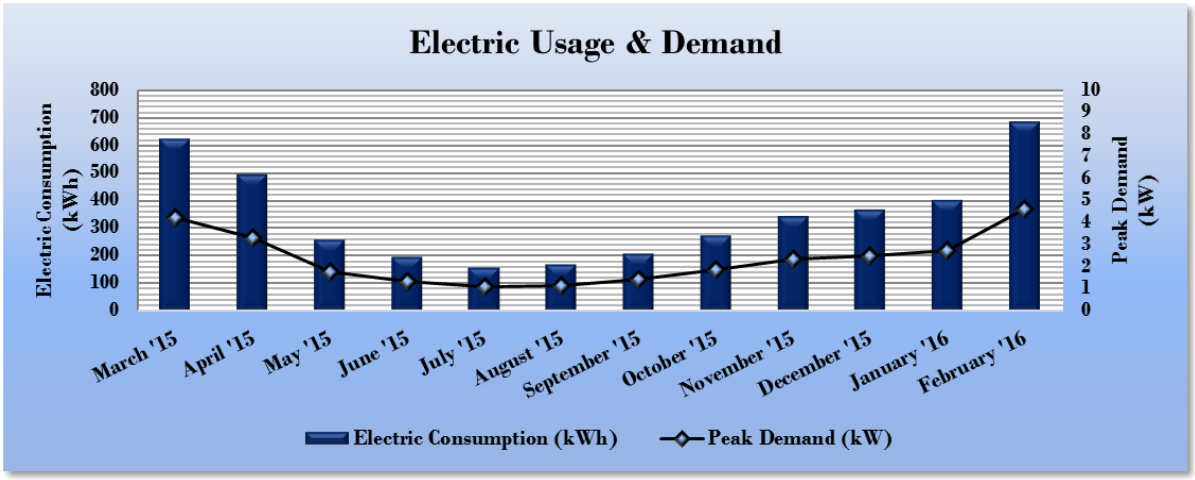


Figure 16 – Centennial Village Pump Station - Monthly Electric Usage & Demand



3.3 Benchmarking

Pump stations are not one of the facility types that are eligible to receive an ENERGY STAR® score. Nevertheless, energy usage data for each pump stations has been entered into Portfolio Manager® as part of our billing analysis.

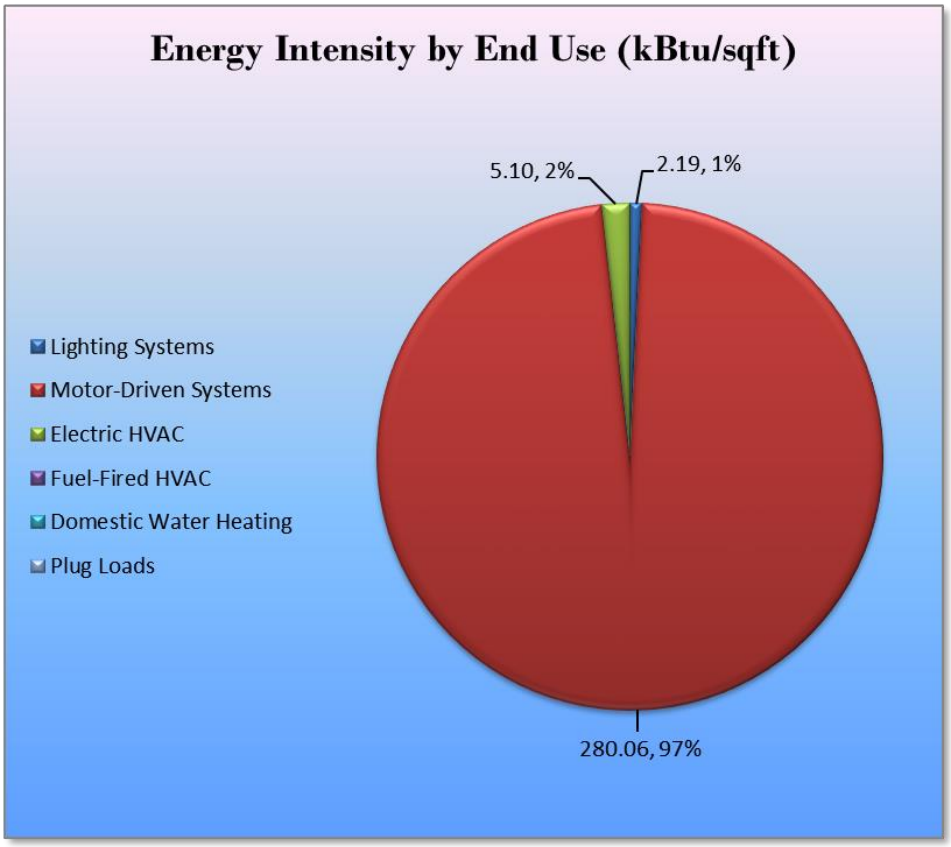
A Portfolio Manager® account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training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

About 97% of energy used at the pump station sites is for water pumping. The remaining three percent is lighting when occupied and space heating in winter.

Figure 17 - Energy Balance (kBtu/ft² and %)



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 eight pump stations 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 18 – Summary of Recommended ECMs

Energy Conservation Measure		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		**1,748**	**1.3**	**$242.30**	**$2,577.42**	**$130.00**	**$2,447.42**	**10.1**	**1,761**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	524	0.8	$72.55	$1,926.67	$0.00	$1,926.67	26.6	527
ECM 2	Retrofit Fixtures with LED Lamps	1,225	0.5	$169.75	$650.75	$130.00	$520.75	3.1	1,233
Motor Upgrades		**1,737**	**0.6**	**$240.70**	**$8,999.84**	**$0.00**	**$8,999.84**	**37.4**	**1,749**
ECM 3	Premium Efficiency Motors	1,737	0.6	$240.70	$8,999.84	$0.00	$8,999.84	37.4	1,749
Variable Frequency Drive (VFD) Measures		**172,070**	**39.1**	**$23,845.83**	**$89,763.97**	**$14,400.00**	**$75,363.97**	**3.2**	**173,273**
ECM 4	Install VFDs on Pump Motors	172,070	39.1	$23,845.83	$89,763.97	$14,400.00	$75,363.97	3.2	173,273
TOTALS		**175,555**	**41.0**	**$24,328.84**	**$101,341.23**	**$14,530.00**	**$86,811.23**	**3.6**	**176,782**

* 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 19 below.

Figure 19– Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	*Annual Natural Gas Savings (MMBtu)*	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		**1,748**	**1.3**	**0.0**	**0.0**	**$242.30**	**$2,577.42**	**$130.00**	**$2,447.42**	**10.1**	**1,761**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	524	0.8	0.0	0.0	$72.55	$1,926.67	$0.00	$1,926.67	26.6	527
ECM 2	Retrofit Fixtures with LED Lamps	1,225	0.5	0.0	0.0	$169.75	$650.75	$130.00	$520.75	3.1	1,233

Because the pump stations have near zero daily occupancy, lighting controls were not considered for any of the pump stations. The Simple Payback Period (SPP) estimated for lighting measures is higher than is typical for most commercial building lighting upgrades due to the relative low usage of lighting in each building.

Please Note: Our estimates of installation costs for the lighting upgrades (and for other ECMs) assume standard labor rates for tube and fixture replacement. The payback period would likely be greatly improved if the proposed lighting upgrades (and other ECMs) were to be installed in-house by qualified DPW staff.

ECM 1: 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	524	0.8	0.0	$72.55	$1,926.67	$0.00	$1,926.67	26.6	527
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing T12 fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers, which are designed to be used in retrofitted T12 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.

For T8 fluorescent fixtures (and many other type of light fixtures), it is often most cost-effective to simply replace current tubes (or bulbs) with LED light bars that are designed to fit in existing fixtures and use existing ballasts. Though for older lighting technologies like T12 fixtures, we recommend replacing the ballasts as well, when the fixtures are upgraded. T12 fixtures often contain older magnetic ballasts, which may contain PCBs. These ballasts should be removed and properly disposed of and replaced with new electronic LED drivers.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice as long as most fluorescent tubes and more than 10 times longer than most 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	306	0.3	0.0	$42.39	$535.00	$105.00	$430.00	10.1	308
Exterior	919	0.2	0.0	$127.36	$115.75	$25.00	$90.75	0.7	925

Measure Description

We recommend retrofitting existing all existing incandescent, halogen, HID, T8 fluorescent and 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 often more than twice as long as fluorescent tubes and more than 10 times longer than most incandescent lamps.

4.1.2 Motor Upgrades

Our recommendations for motor upgrades are summarized in Figure 20 below.

Figure 20-Summary of Motor 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)
Motor Upgrades		**1,737**	**0.6**	**0.0**	**$240.70**	**$8,999.84**	**$0.00**	**$8,999.84**	**37.4**	**1,749**
ECM 3	Premium Efficiency Motors	1,737	0.6	0.0	$240.70	$8,999.84	$0.00	$8,999.84	37.4	1,749

ECM 3: 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)
1,737	0.6	0.0	$240.70	$8,999.84	$0.00	$8,999.84	37.4	1,749

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.

The payback for this measure is fairly long. Though, we have recommended adding new variable frequency drives to many pump motors to minimize power consumption (See ECM-4 below). For motors that are over 15 years of age, we recommended upgrading the motor to the most efficient current model when VFD measures are implemented.

We recommend upgrading one 7.5-hp pump motor at Morristown Road, one 35-hp pump motor at New Vernon, and motors for the two main pumps (18-hp & 20-hp) at Clover Hill.

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 21**Error! Reference source not found.** below.

Figure 21-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		**172,070**	**39.1**	**0.0**	**$23,845.83**	**$89,763.97**	**$14,400.00**	**$75,363.97**	**3.2**	**173,273**
ECM 4	Install VFDs on Chilled Water Pumps	172,070	39.1	0.0	$23,845.83	$89,763.97	$14,400.00	$75,363.97	3.2	173,273

ECM 4: Install VFDs on Pump 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)
172,070	39.1	0.0	$23,845.83	$89,763.97	$14,400.00	$75,363.97	3.2	173,273

Measure Description

We recommend installing variable frequency drives (VFD) to control pump motors to minimize daily power usage. A VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as chilled water valves close. The magnitude of energy savings is based on the estimated amount of time that the system operates at reduced loads.

VFDs are recommended for all large pump motors that are 2-hp or greater. All eight pump stations have constant speed motors which appear to meet the criteria for cost-effective energy savings. VFDs save energy by enabling pump motors to run at near peak efficiency even when the pump is operating under low load conditions.

We recommend adding variable frequency drives to control the speed of pumps and reduce energy consumption at: Morristown Road (3 pumps), New Vernon (2 pumps), Skyline (2 pumps), Clover Hill (2 pumps), Heritage Road (2 pumps), and Warren/Union pump station (2 pumps).

Please note: Motor age and operational characteristics were estimated from available data. Our analysis of electric billing data, motor run hours, and data gathered on site assumes that recent data represents typical operations for that site every year. The customer should verify that our data on current equipment and operations are accurate for each pump station and that pump operations are likely to continue at each site in roughly the same manner into the future. A closer inspection of current equipment and recent daily run hours throughout the year may be necessary to determine the feasibility and final cost effectiveness of each proposed upgrade.

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.

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.

Turn Off Unneeded Motors

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Reducing run hours for these motors can result in significant energy savings. Whenever possible, use automatic devices such as twist timers or occupancy sensors to ensure that motors are turned off when not needed.

Reduce Motor Short Cycling

Frequent stopping and starting of motors subjects rotors and other parts to substantial stress. This can result in component wear, reducing efficiency, and increasing maintenance costs. Adjust the load on the motor to limit the amount of unnecessary stopping and starting to improve motor performance.

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.

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.

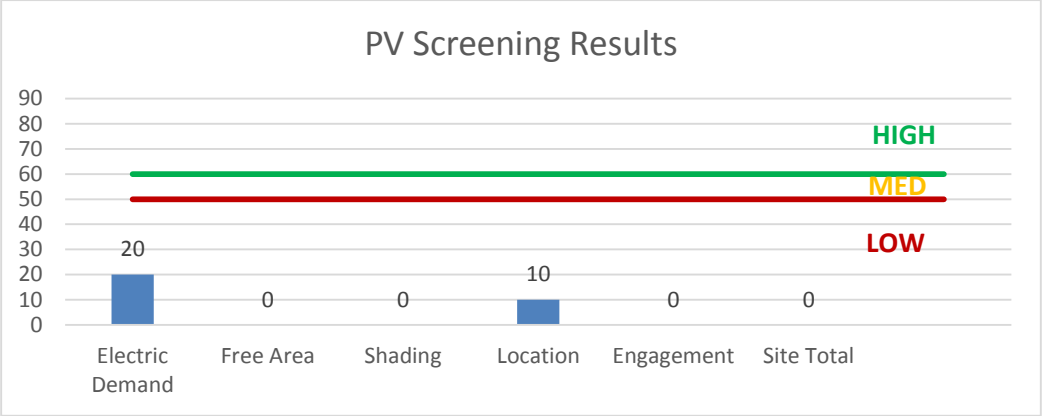
Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, 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 **Low Potential** for installing a cost-effective solar PV array.

Figure 22 - Photovoltaic Screening



TRC evaluated the potential for installing solar PV generation at each site. On-site solar generation, if possible, would likely reduce annual electric purchases. Based on our site inspections, none of the sites appears to be large enough for any significant commercial solar development.

For some sites (e.g. Clover Hill) there might be some potential to install small ground-based solar array, which could be connected to the grid through the pump stations electric meter. However, most of the pump station sites are either adjacent to private property or near wooded areas which might shade solar panels. So, the solar potential for the pump station sites overall appears to be poor. If the Township is interested in considering solar for any of these sites (or at another municipally-owned property), then we recommend a full assessment be conducted on site by a qualified solar technician.

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 8.2 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

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, electric customers need 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 DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

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.

Though some of the pump station sites have significant power demands, they would not likely be eligible to participation in a DR program, because their operation cannot be easily curtailed during high electric load events.

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

Figure 23 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	X			
ECM 2	Retrofit Fixtures with LED Lamps	X			
ECM 3	Premium Efficiency Motors		X		
ECM 4	Install VFDs on Water Pumps	X	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 SREC Registration Program

The SREC Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

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

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

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

8.3 Energy Savings Improvement Program

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

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

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

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

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

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

A customer's decision about whether to buy natural gas from a retail supplier 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
Morristown Road Pump Station	8	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	500	Relamp & Reballast	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.34	236	0.0	$32.71	$936.00	$0.00	28.62
New Vernon Pump Station	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.16	112	0.0	$15.50	$351.00	$60.00	18.77
New Vernon (in Pit)	1	Compact Fluorescent: 2 x 17W CFL Bulbs	Wall Switch	34	500	Relamp	No	1	LED Screw-In Lamps: 9W LED Bulbs	Wall Switch	18	500	0.01	9	0.0	$1.25	$20.50	$10.00	8.38
New Vernon (Exterior)	3	Incandescent: Standard 60W Bulbs	Wall Switch	60	4,380	Relamp	No	3	LED Screw-In Lamps: 9W LED Bulbs	Wall Switch	9	4,380	0.12	757	0.0	$104.94	$46.50	$15.00	0.30
Clover Hill Pump Station	2	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	500	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	500	0.14	97	0.0	$13.47	$404.00	$0.00	30.00
Clover Hill Pump Station	1	Incandescent: Standard 60W Bulbs	Wall Switch	60	4,380	Relamp	No	1	LED Screw-In Lamps: 9W LED Bulbs	Wall Switch	9	4,380	0.04	252	0.0	$34.98	$53.75	$5.00	1.39
Skyline Drive Pump Station	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	500	Relamp & Reballast	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	500	0.19	133	0.0	$18.48	$323.67	$0.00	17.52
Skyline Drive (Lower Level)	2	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Wall Switch	127	500	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	500	0.14	94	0.0	$13.08	$263.00	$0.00	20.11
Skyline Drive (Lower Level)	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.05	37	0.0	$5.17	$117.00	$20.00	18.77
Skyline Drive (Bottom Level)	1	Incandescent: Standard 60W Bulbs	Wall Switch	60	500	Relamp	No	1	LED Screw-In Lamps: 9W LED Bulbs	Wall Switch	9	500	0.04	29	0.0	$3.99	$15.50	$5.00	2.63
Skyline Drive (Bottom Level)	1	Compact Fluorescent: 17W CFL Bulb	Wall Switch	17	8,736	Relamp	No	1	LED Screw-In Lamps: 9W LED Bulbs	Wall Switch	9	8,736	0.01	79	0.0	$10.94	$15.50	$5.00	0.96
Skyline Drive (Exterior)	1	Incandescent: Standard 60W Bulbs	Wall Switch	60	500	Relamp	No	1	LED Screw-In Lamps: 9W LED Bulbs	Wall Switch	9	500	0.04	29	0.0	$3.99	$15.50	$5.00	2.63
Heritage Road Pump Station	2	Incandescent: 75W Bulbs	Wall Switch	75	500	Relamp	No	1	LED Screw-In Lamps: 9W LED Bulbs	Wall Switch	9	500	0.11	80	0.0	$11.04	$15.50	$5.00	0.95

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
Centennial Village Pump Station	Water Treatment Pumping System	2	Process Pump	2.0	84.0%	No	1,568	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Valley Road Pump Station	Water Treatment Pumping System	2	Process Pump	4.0	87.5%	No	1,070	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Morristown Rd Pump Station	Water Treatment Pumping System	1	Process Pump	7.5	87.5%	No	3,600	Yes	91.7%	Yes	1	1.07	10,266	0.0	$1,422.76	$4,760.59	$0.00	3.35
Morristown Rd Pump Station	Water Treatment Pumping System	1	Process Pump	10.0	91.0%	No	3,600	No	91.0%	Yes	1	1.24	12,838	0.0	$1,779.09	$3,807.95	$0.00	2.14
Morristown Rd Pump Station	Water Pumping System	1	Process Pump	10.0	91.0%	No	3,600	No	91.0%	Yes	1	1.24	12,838	0.0	$1,779.09	$3,807.95	$0.00	2.14
New Vernon Pump Station	Water Pumping System	1	Process Pump	35.0	92.4%	No	1,500	No	92.4%	Yes	1	4.26	18,438	0.0	$2,555.19	$8,472.05	$2,100.00	2.49
New Vernon Pump Station	Water Pumping System	1	Process Pump	35.0	92.4%	No	1,500	Yes	93.6%	Yes	1	4.39	18,568	0.0	$2,573.27	$11,910.75	$2,100.00	3.81
Skyline Pump Station	Water Pumping System	2	Process Pump	75.0	94.5%	No	1,200	No	94.5%	Yes	2	17.85	61,811	0.0	$8,565.98	$35,900.82	$9,000.00	3.14
Skyline Pump Station	Pump House	2	Exhaust Fan	0.5	78.0%	No	500	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Skyline Pump Station	Pump House	1	Exhaust Fan	0.3	78.0%	No	500	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Clover Hill Pump Station	Water Pumping System	1	Process Pump	18.0	91.0%	No	1,693	Yes	92.4%	Yes	1	2.30	10,958	0.0	$1,518.59	$7,085.87	$0.00	4.67
Clover Hill Pump Station	Water Pumping System	1	Process Pump	20.0	91.0%	No	1,693	Yes	93.0%	Yes	1	2.59	12,218	0.0	$1,693.19	$8,850.23	$1,200.00	4.52
Heritage Rd Pump Station	Water Pumping System	2	Process Pump	5.0	87.5%	No	2,500	No	87.5%	Yes	2	1.29	9,272	0.0	$1,284.90	$6,551.70	$0.00	5.10
Heritage Rd Pump Station	Pump House	1	Exhaust Fan	0.3	78.0%	No	500	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Warren / Union Ave Pump Station	Water Pumping System	2	Process Pump	14.0	89.5%	No	650	No	89.5%	Yes	2	3.52	6,599	0.0	$914.50	$7,615.90	$0.00	8.33

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
Morristown Rd Pump Station	Pump House	1	Electric Resistance Heat		20.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
New Vernon Pump Station	Pump House	1	Electric Resistance Heat		20.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Skyline Pump Station	Pump House	1	Electric Resistance Heat		16.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Skyline Pump Station	Pump House	1	Electric Resistance Heat		16.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Clover Hill Pump Station	Pump House	1	Electric Resistance Heat		24.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Heritage Rd Pump Station	Pump House	1	Electric Resistance Heat		16.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00