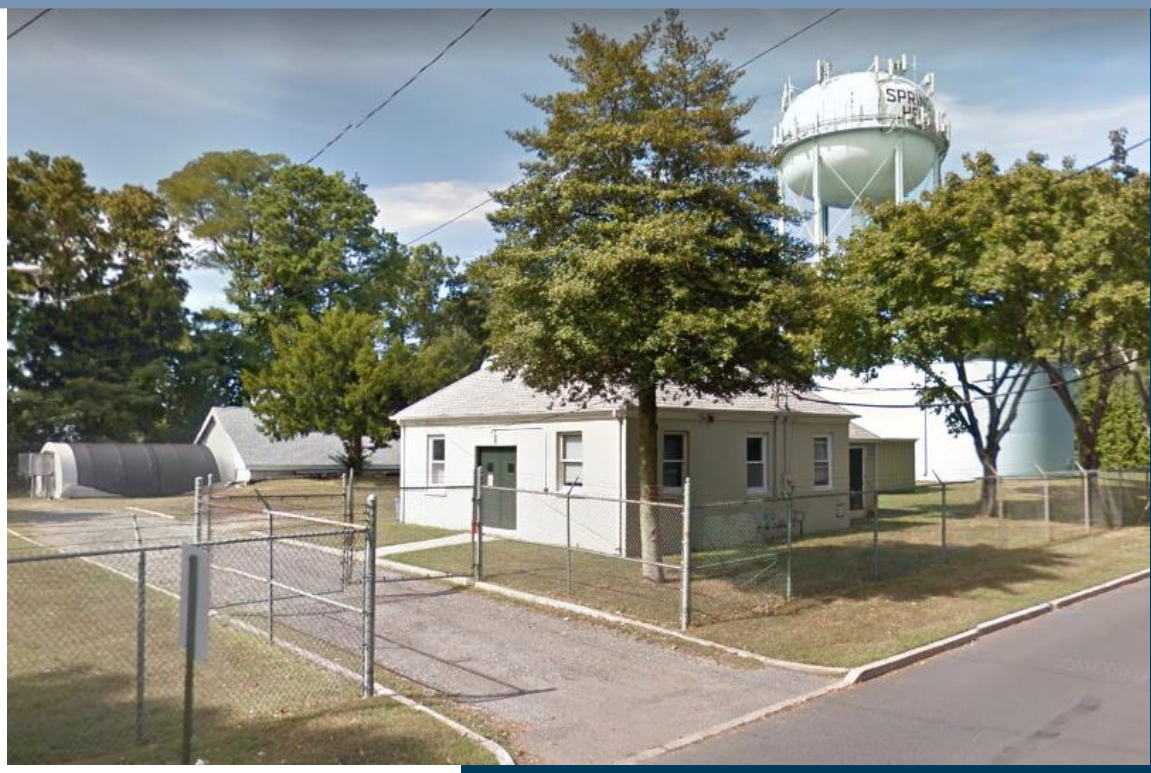
# Local Government Energy Audit:
## Energy Audit Report



## Water Treatment Plant

Old Mill Road

Spring Lake Heights, NJ 07762

Spring Lake Heights

October 17, 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 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 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 Water Treatment Plant.

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

## 1.1 Facility Summary

The Water Treatment Plant is a 1,150 square-foot facility comprised of various space types including pump rooms, an office, a greenhouse, and a well house. The well house is associated with the water treatment plant, but located approximately 400 yards south of the facility on Old Mill Road.

Lighting consists of aging and inefficient fluorescent and incandescent lighting. Heating is supplied by gas-fired unit heaters and electric space heaters. There is no cooling at the facility. A small electric water heater located in the main building supplies domestic hot water. A thorough description of the facility and our observations are in Section 2.

## 1.2 Your Cost Reduction Opportunities

### Energy Conservation Measures

TRC Energy Services evaluated 5 measures, and recommends 4, which together represent an opportunity to reduce annual energy costs by $1,124 and annual greenhouse gas emissions by 8,870 lbs. $CO_2e$. We estimate that if all measures were implemented as recommended, the project would pay for itself in 12.8 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Water Treatment Plant's annual energy use by 7%.

*Figure 1 – Previous 12 Month Utility Costs*

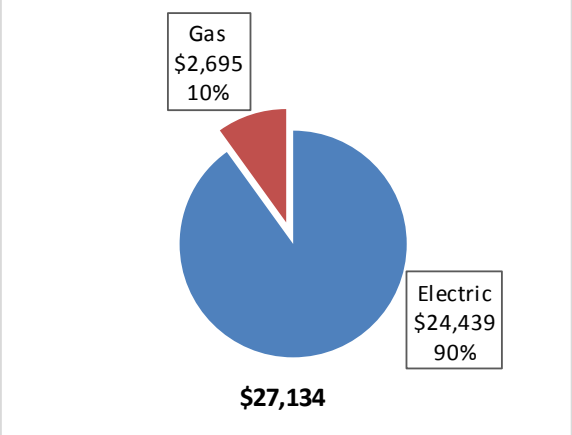
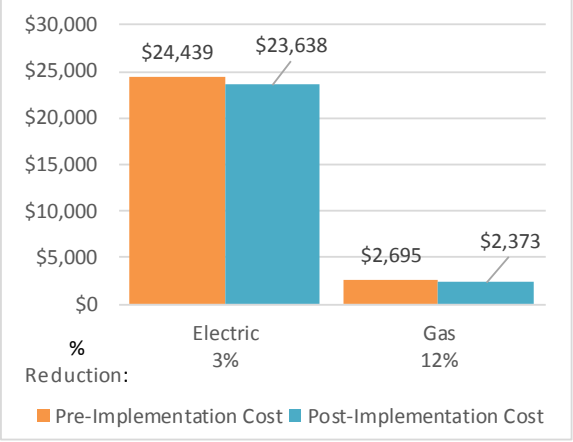



*Figure 2 – Potential Post-Implementation Costs*



A detailed description of Water Treatment Plant's existing energy use is in Section 3 "Site Energy Use and Costs."

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

*Figure 3 – Summary of Energy Reduction Opportunities*

| Energy Conservation Measure | | Recommend? | Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($)* | Estimated Net Cost ($) | Simple Payback Period (yrs)** | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lighting Upgrades** | | | **1,211** | **0.5** | **0.0** | **$230.35** | **$942.67** | **$45.00** | **$897.67** | **3.9** | **1,220** |
| ECM 1 | Retrofit Fluorescent Fixtures with LED Lamps and Drivers | Yes | 788 | 0.3 | 0.0 | $149.95 | $404.00 | $0.00 | $404.00 | 2.7 | 794 |
| ECM 2 | Retrofit Fixtures with LED Lamps | Yes | 423 | 0.3 | 0.0 | $80.40 | $538.67 | $45.00 | $493.67 | 6.1 | 426 |
| **Lighting Control Measures** | | | **176** | **0.1** | **0.0** | **$33.43** | **$888.00** | **$90.00** | **$798.00** | **23.9** | **177** |
| | Install Occupancy Sensor Lighting Controls | No | 176 | 0.1 | 0.0 | $33.43 | $888.00 | $90.00 | $798.00 | 23.9 | 177 |
| **Motor Upgrades** | | | **3,003** | **2.5** | **0.0** | **$571.16** | **$10,316.10** | **$0.00** | **$10,316.10** | **18.1** | **3,024** |
| ECM 3 | Premium Efficiency Motors | Yes | 3,003 | 2.5 | 0.0 | $571.16 | $10,316.10 | $0.00 | $10,316.10 | 18.1 | 3,024 |
| **Gas Heating (HVAC/Process) Replacement** | | | **0** | **0.0** | **39.5** | **$322.06** | **$3,120.81** | **$0.00** | **$3,120.81** | **9.7** | **4,627** |
| ECM 4 | Install High Efficiency Unit Heaters | Yes | 0 | 0.0 | 39.5 | $322.06 | $3,120.81 | $0.00 | $3,120.81 | 9.7 | 4,627 |
| **TOTALS FOR HIGH PRIORITY MEASURES** | | | **4,214** | **3.0** | **39.5** | **$1,123.56** | **$14,379.57** | **$45.00** | **$14,334.57** | **12.8** | **8,870** |
| **TOTALS FOR ALL EVALUATED MEASURES** | | | **4,390** | **3.1** | **39.5** | **$1,156.98** | **$15,267.57** | **$135.00** | **$15,132.57** | **13.1** | **9,047** |

* - 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.

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

## Energy Efficient Practices

TRC Energy Services also identified 9 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 Water Treatment Plant include:

- Reduce Air Leakage
- Perform Lighting Maintenance

- Perform Routine Motor Maintenance
- Use Thermostat Schedules and Temperature Resets
- Perform Furnace Maintenance
- Perform Water Heater Maintenance
- 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 Energy Services evaluated the potential for installing on-Site generation for Water Treatment Plant. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures. For details on our evaluation and on-site generation potential, please refer to Section 6.

## 1.3 Implementation Planning

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

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

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

- SmartStart (SS)
- Direct Install (DI)
- Energy Savings Improvement Program (ESIP)

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

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

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services as well as

attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.3 for additional information on the ESIP Program.

Additional information on relevant incentive programs is 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 May | Engineer | jmay@springlakehts.com | 732-449-3500 |
| **TRC Energy Services** | | | |
| Alexander Klieverik | Auditor | aklieverik@trcsolutions.com | (732) 855-0033 |

## 2.2 General Site Information

On April 03, 2018, TRC performed an energy audit at Water Treatment Plant located in Spring Lake Heights, NJ. TRC's team met with Joe May to review the facility operations and help focus our investigation on specific energy-using systems.

The Water Treatment Plant is a 1,150 square-foot facility comprised of several buildings. The main building has a pump room and office, a greenhouse, a booster pump building, and two well houses. One well house is located at the facility, while the other is located approximately 400 yards south of the facility on Old Mill Rd. Although this facility is called a 'Treatment Plant' there is no water treatment occurring. This facility only handles water storage and distribution for Spring Lake Heights.

The facility and well house were originally constructed in 1950. In the years since its construction, equipment has been gradually added to the facility to meet demand. The last year of major equipment installation was in 1980.

## 2.3 Building Occupancy

The facility is open Monday through Friday and is occupied between 7:00 AM and 3:30 PM. The well house is not occupied by staff. The typical schedule is presented in the table below. The entire facility and well house operate year-round. During a typical day, the facility is usually occupied by 2 staff people.

*Figure 5 - Building Schedule*

| Building Name | Weekday/Weekend | Operating Schedule |
|---|---|---|
| Water Treatment Plant | Weekday | 7:00 AM to 3:30 PM |
| Water Treatment Plant | Weekend | 7:00 AM to 3:30 PM |
| Well #3 | Weekday | Not occupied |
| Well #3 | Weekend | Not occupied |

## 2.4 Building Envelope

The main building is constructed of concrete block, and structural steel with a stucco exterior finish and pitched asphalt roof. Both well houses are wood frame structures with pitched roofs. The booster building is constructed of structural steel and corrugated metal sheeting, with no windows and a flat roof. The greenhouse is a one-story building constructed of wood beams with exterior wood panel finish and tarp covering the greenhouse section. The main building and well houses have double pane windows which are in good condition and show little sign of excessive infiltration. The exterior doors at the main

building and well houses are constructed of aluminum, and the door on the booster building is a hollow core composite. All doors at the facility are in good condition.



## 2.5 On-Site Generation

The Water Treatment Plant has a 135kW natural gas backup generator installed on site.

## 2.6 Energy-Using Systems

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

### Lighting System

Lighting is provided by linear 32-Watt fluorescent T8 lamps with electronic ballasts as well as some incandescent and LED lamps. Most of the fixtures are 2-lamp or 1-lamp, 4-foot long ceiling mounted fixtures.



The greenhouse contains two fluorescent T12 fixtures with 8' lamps and magnetic ballasts.

Lighting control in most spaces is provided by wall switches.

The building's exterior lighting is minimal and consists of compact fluorescent and LED screw-in lamps that are controlled by photocells.

### Heating System

The facility is heated by gas-fired unit heaters and electric resistance heaters. The main building contains a Reznor XL60-3 with an output capacity of 46.8 kBtuh serving the main building area, and a Modine unit heater with an output capacity of 30 kBtuh serving the office area of the building. The only other building with a gas-fired heater is the greenhouse, which contains a Reznor unit with an output capacity of 30kBtuh.

The side room of the main building, as well as the booster building, contain electric resistance heaters to prevent freezing of equipment. The well house located off-site and down the road from the plant also contains an electric resistance heater to prevent freezing of equipment. The heater is set to 55F.


## Domestic Hot Water Heating System

The domestic hot water heating system consists of an Rheem electric water heater with an input rating of 2 kW. The water heater has a 10-gallon capacity, and supplies hot water to the wash sink located in the main building.


## Building Plug Load

There is one computer work station with a desktop computer, LCD monitor, desk printer, and CRT television.

In the back of the facility near water the storage tanks, there is communications equipment used by the Spring Lake Heights police department.

## Plant Operation

The water treatment plant consists of one line of distribution equipment with a maximum design flow rate of 1.152 million gallons per day (MGD). The average flow for the plant is approximately 0.25 MGD. According to staff, the highest flow rate occurs on July 4th weekend when the plant reaches its highest flow rate at 0.5 MDG. There are three storage tanks - one elevated and two ground tanks. The elevated tank has a capacity of 300,000 gallons. The two underground storage tanks have capacities of 250,000 and 300,000 gallons.



The water pumping equipment consists of two well pumps, one 25 HP and one 60 HP. The 60 HP pump is located at the well house located down the road on Old Mill Rd. There are also 3 booster pumps with 30 HP motors. Each booster pump has a design flow rate of 500 gpm.

## 2.7 Water-Using Systems

There is one restroom. The faucet is rated for 2.2 gpm, the toilet is rated at 2.5 gallons per flush.

# 3 SITE ENERGY USE AND COSTS

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

## 3.1 Total Cost of Energy

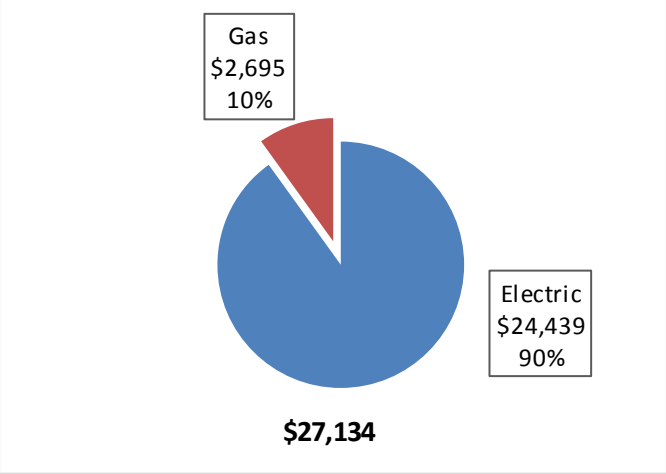
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

*Figure 6 - Utility Summary*

| Utility Summary for Water Treatment Plant | | |
|---|---|---|
| **Fuel** | **Usage** | **Cost** |
| Electricity | 128,496 kWh | $24,439 |
| Natural Gas | 3,306 Therms | $2,695 |
| **Total** | | **$27,134** |

The current annual energy cost for this facility is $27,134 as shown in the chart below.

*Figure 7 - Energy Cost Breakdown*



## 3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.190/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 increase in consumption in March is most likely due to snowmelt at the end of the winter season. The monthly electricity consumption and peak demand are shown in the chart below.

*Figure 8 - Graph of Electric Usage & Demand*

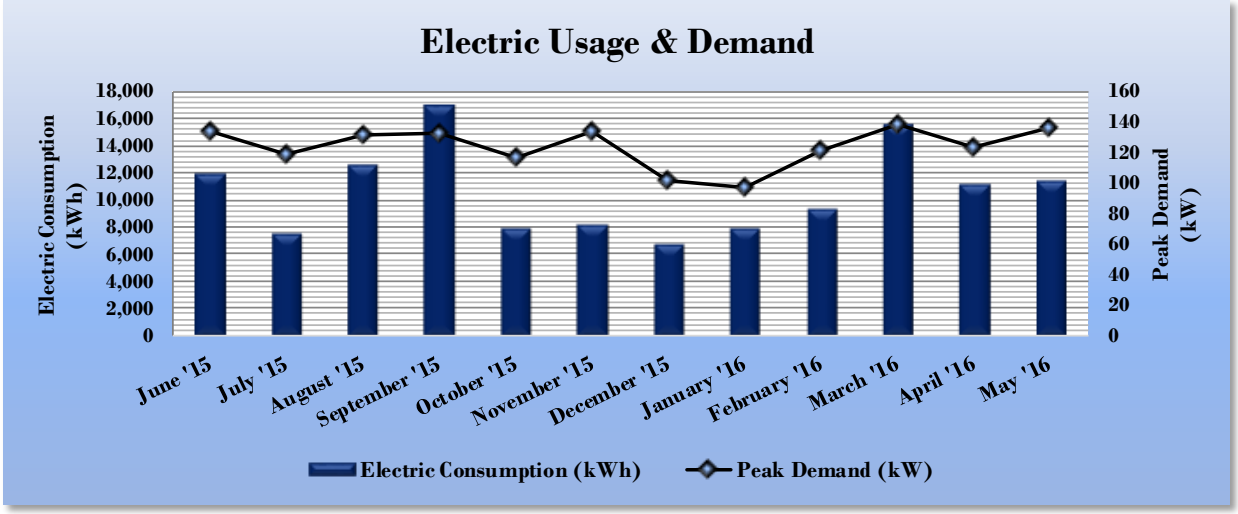



*Figure 9 - Table of Electric Usage & Demand*

| Electric Billing Data for Water Treatment Plant | | | | | |
|---|---|---|---|---|---|
| Period Ending | Days in Period | Electric Usage (kWh) | Demand (kW) | Demand Cost | Total Electric Cost |
| 6/22/15 | 31 | 11,960 | 134 | $0 | $3,121 |
| 7/22/15 | 30 | 7,520 | 119 | $0 | $1,605 |
| 8/21/15 | 30 | 12,640 | 132 | $0 | $2,287 |
| 9/22/15 | 32 | 16,960 | 132 | $0 | $2,894 |
| 10/21/15 | 29 | 7,920 | 116 | $0 | $1,542 |
| 11/19/15 | 29 | 8,160 | 134 | $0 | $1,670 |
| 12/22/15 | 33 | 6,800 | 101 | $0 | $1,334 |
| 1/22/16 | 31 | 7,880 | 97 | $0 | $1,435 |
| 2/22/16 | 31 | 9,400 | 122 | $0 | $1,744 |
| 3/23/16 | 30 | 15,600 | 138 | $0 | $2,561 |
| 4/20/16 | 28 | 11,200 | 123 | $0 | $1,976 |
| 5/18/16 | 28 | 11,400 | 136 | $0 | $2,069 |
| **Totals** | **362** | **127,440** | **138.4** | **$0** | **$24,238** |
| **Annual** | **365** | **128,496** | **138.4** | **$0** | **$24,439** |

## 3.3 Natural Gas Usage

Natural Gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $0.815/therm, which is the blended rate used throughout the analyses in this report. The natural gas energy profile (pattern of consumption) is typical for a facility with gas-fired heating equipment and an electric water heater. The monthly gas consumption is shown in the chart below.

*Figure 10 - Graph of Natural Gas Usage*

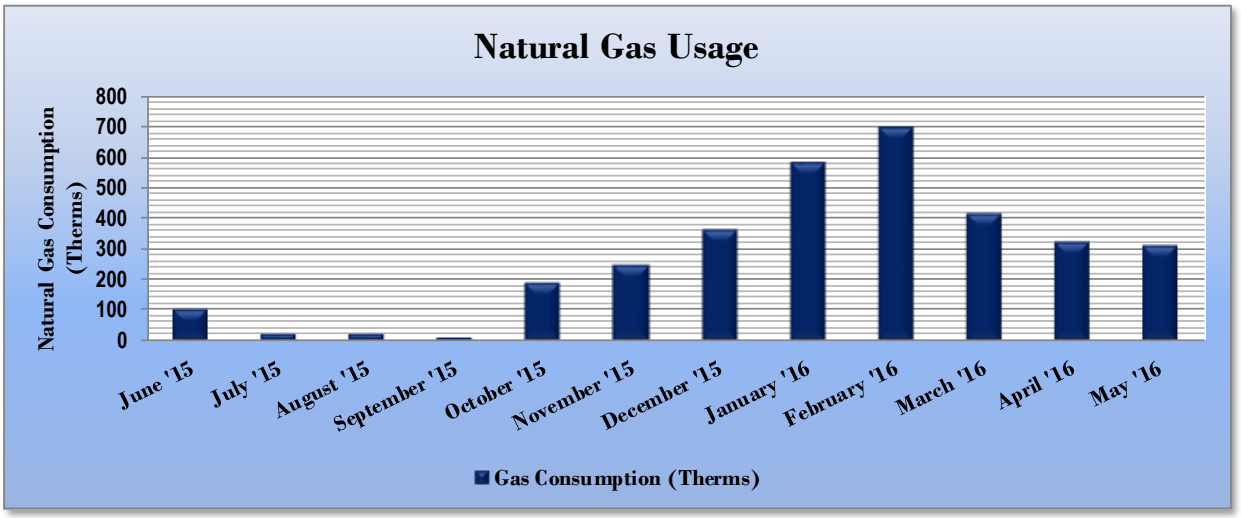



*Figure 11 - Table of Natural Gas Usage*

| Gas Billing Data for Water Treatment Plant | | | |
|---|---|---|---|
| Period Ending | Days in Period | Natural Gas Usage (Therms) | Natural Gas Cost |
| 6/22/15 | 32 | 107 | $120 |
| 7/24/15 | 32 | 26 | $48 |
| 8/21/15 | 28 | 23 | $45 |
| 9/18/15 | 28 | 14 | $37 |
| 10/20/15 | 32 | 191 | $192 |
| 11/17/15 | 28 | 248 | $202 |
| 12/18/15 | 31 | 362 | $246 |
| 1/21/16 | 34 | 585 | $381 |
| 2/23/16 | 33 | 699 | $452 |
| 3/23/16 | 29 | 416 | $367 |
| 4/21/16 | 29 | 326 | $310 |
| 5/20/16 | 29 | 310 | $295 |
| **Totals** | **365** | **3,306** | **$2,695** |
| **Annual** | **365** | **3,306** | **$2,695** |

## 3.4 Benchmarking

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

Energy Use Intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy". Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

*Figure 12 - Energy Use Intensity Comparison – Existing Conditions*

| Energy Use Intensity Comparison - Existing Conditions | | |
|---|---|---|
| | Water Treatment Plant | National Median Building Type: Water/Wastewater Treatment/Pumping |
| Source Energy Use Intensity (kBtu/ft$^2$) | 1499.0 | 123.1 |
| Site Energy Use Intensity (kBtu/ft$^2$) | 668.8 | 78.8 |

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

*Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures*

| Energy Use Intensity Comparison - Following Installation of Recommended Measures | | |
|---|---|---|
| | Water Treatment Plant | National Median Building Type: Water/Wastewater Treatment/Pumping |
| Source Energy Use Intensity (kBtu/ft$^2$) | 1423.6 | 123.1 |
| Site Energy Use Intensity (kBtu/ft$^2$) | 621.9 | 78.8 |

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.

For the purposes of this audit, the NJCEP LGEA program did not have access to actual influent flow meter readings and we have concerns that the information available to us does not accurately reflect the plant's actual flow rates. Therefore, there is no Statement of Energy Performance (SEP) for this property. The NJCEP LGEA program has set up a profile within Portfolio Manager, but its intent is solely to provide the Borough of Spring Lake Heights with a method to track monthly utility bills

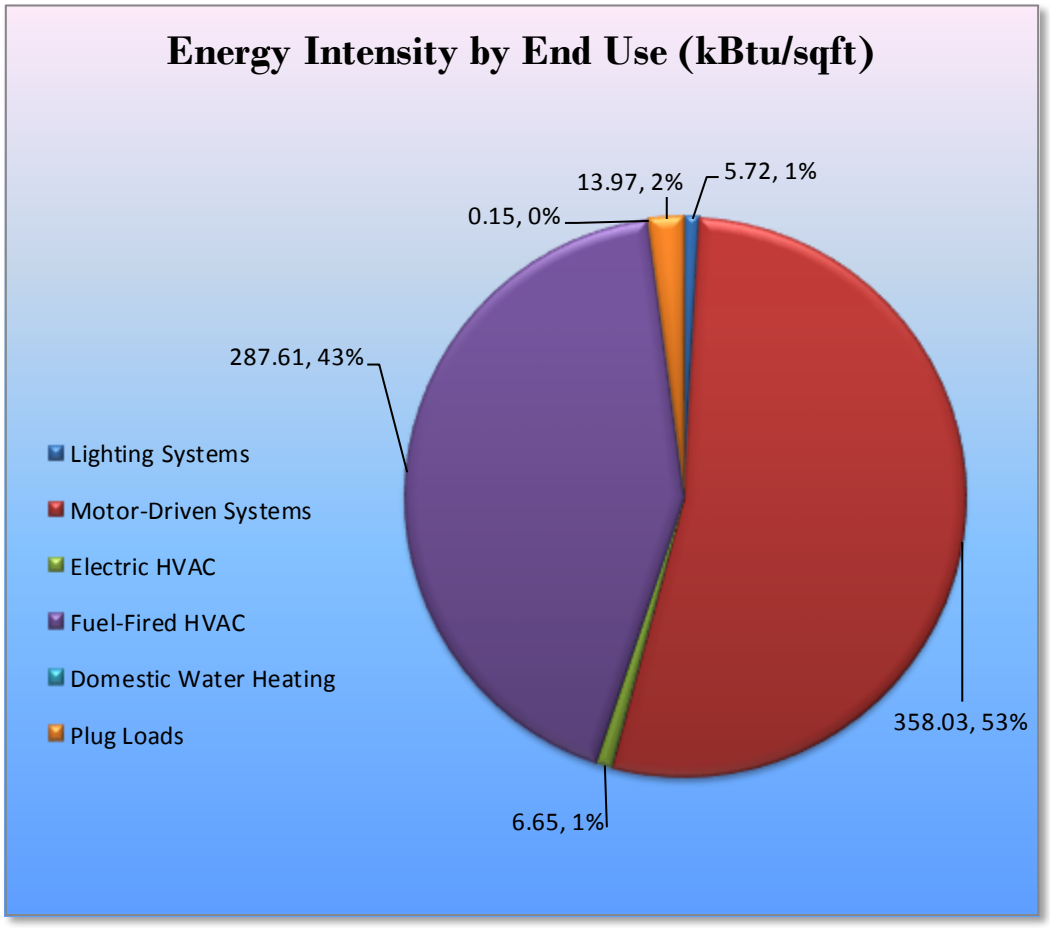
For more information on Energy Star certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use Energy Star Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training

## 3.5 Energy End-Use Breakdown

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 14 - Energy Balance (% and kBtu/SF)*



# 4 ENERGY CONSERVATION MEASURES

*Level of Analysis*

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Water Treatment Plant 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 15 – 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** | | **1,211** | **0.5** | **0.0** | **$230.35** | **$942.67** | **$45.00** | **$897.67** | **3.9** | **1,220** |
| ECM 1 | Retrofit Fluorescent Fixtures with LED Lamps and Drivers | 788 | 0.3 | 0.0 | $149.95 | $404.00 | $0.00 | $404.00 | 2.7 | 794 |
| ECM 2 | Retrofit Fixtures with LED Lamps | 423 | 0.3 | 0.0 | $80.40 | $538.67 | $45.00 | $493.67 | 6.1 | 426 |
| **Motor Upgrades** | | **3,003** | **2.5** | **0.0** | **$571.16** | **$10,316.10** | **$0.00** | **$10,316.10** | **18.1** | **3,024** |
| ECM 3 | Premium Efficiency Motors | 3,003 | 2.5 | 0.0 | $571.16 | $10,316.10 | $0.00 | $10,316.10 | 18.1 | 3,024 |
| **Gas Heating (HVAC/Process) Replacement** | | **0** | **0.0** | **39.5** | **$322.06** | **$3,120.81** | **$0.00** | **$3,120.81** | **9.7** | **4,627** |
| ECM 4 | Install High Efficiency Unit Heaters | 0 | 0.0 | 39.5 | $322.06 | $3,120.81 | $0.00 | $3,120.81 | 9.7 | 4,627 |
| **TOTALS** | | **4,214** | **3.0** | **39.5** | **$1,123.56** | **$14,379.57** | **$45.00** | **$14,334.57** | **12.8** | **8,870** |

* - 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).

Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended upgrades for each measure.

## 4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

*Figure 16 – 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** | | **1,211** | **0.5** | **0.0** | **$230.35** | **$942.67** | **$45.00** | **$897.67** | **3.9** | **1,220** |
| ECM 1 | Retrofit Fluorescent Fixtures with LED Lamps and Drivers | 788 | 0.3 | 0.0 | $149.95 | $404.00 | $0.00 | $404.00 | 2.7 | 794 |
| ECM 2 | Retrofit Fixtures with LED Lamps | 423 | 0.3 | 0.0 | $80.40 | $538.67 | $45.00 | $493.67 | 6.1 | 426 |

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: 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 | 788 | 0.3 | 0.0 | $149.95 | $404.00 | $0.00 | $404.00 | 2.7 | 794 |
| 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 fluorescent tubes.

### 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 | 389 | 0.3 | 0.0 | $73.90 | $484.91 | $45.00 | $439.91 | 6.0 | 391 |
| Exterior | 34 | 0.0 | 0.0 | $6.50 | $53.75 | $0.00 | $53.75 | 8.3 | 34 |

*Measure Description*

We recommend retrofitting existing incandescent, compact fluorescent, and linear fluorescent lighting technologies with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

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

## 4.1.2 Motor Upgrades

### 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) |
|---|---|---|---|---|---|---|---|---|
| 3,003 | 2.5 | 0.0 | $571.16 | $10,316.10 | $0.00 | $10,316.10 | 18.1 | 3,024 |

*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 (2012)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

## 4.1.3 Gas-Fired Heating System Replacements

Our recommendations for gas-fired heating system replacements are summarized in Figure 17 below.

*Figure 17 - Summary of Gas-Fired Heating Replacement 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Gas Heating (HVAC/Process) Replacement** | | **0** | **0.0** | **39.5** | **$322.06** | **$3,120.81** | **$0.00** | **$3,120.81** | **9.7** | **4,627** |
| ECM 4 | Install High Efficiency Unit Heaters | 0 | 0.0 | 39.5 | $322.06 | $3,120.81 | $0.00 | $3,120.81 | 9.7 | 4,627 |

### ECM 4: Install High Efficiency Unit Heaters

*Summary of Measure Economics*

| Annual Electric Savings (kWh) | Peak Demand Savings (kW) | Annual Fuel Savings (MMBtu) | Annual Energy Cost Savings ($) | Estimated Install Cost ($) | Estimated Incentive ($) | Estimated Net Cost ($) | Simple Payback Period (yrs) | $CO_2e$ Emissions Reduction (lbs) |
|---|---|---|---|---|---|---|---|---|
| 0 | 0.0 | 39.5 | $322.06 | $3,120.81 | $0.00 | $3,120.81 | 9.7 | 4,627 |

*Measure Description*

We recommend replacing existing standard gas-fired unit heaters with high efficiency gas-fired unit heaters. Improved combustion technology and heat exchanger design optimize the heat recovery from the combustion gases which can significantly improve unit heater efficiency. Savings result from improved system efficiency.

## 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 18 – 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) |
|---|---|---|---|---|---|---|---|---|---|
| **Lighting Control Measures** | **176** | **0.1** | **0.0** | **$33.43** | **$888.00** | **$90.00** | **$798.00** | **23.9** | **177** |
| Install Occupancy Sensor Lighting Controls | 176 | 0.1 | 0.0 | $33.43 | $888.00 | $90.00 | $798.00 | 23.9 | 177 |
| **TOTALS** | **176** | **0.1** | **0.0** | **$33.43** | **$888.00** | **$90.00** | **$798.00** | **23.9** | **177** |

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

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

### Install 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) |
|---|---|---|---|---|---|---|---|---|
| 176 | 0.1 | 0.0 | $33.43 | $888.00 | $90.00 | $798.00 | 23.9 | 177 |

*Measure Description*

We typically recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in the restroom, pump rooms, the office, and greenhouse. 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.

*Reasons for not Recommending*

Due to the limited use of some spaces at the facility, the payback period for installing occupancy controls is outside the range of our typically recommended measures.

# 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.

## Perform Regular Lighting Maintenance

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

## Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. 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 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 5-10 °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.

## Perform Regular Furnace Maintenance

Preventative furnace maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should include tasks such as checking for gas / carbon monoxide leaks; changing the air and fuel filters; checking components for cracks, corrosion, dirt, or debris build-up; ensuring the ignition system is working properly; testing and

adjusting operation and safety controls; inspecting the electrical connections; and ensuring proper lubrication for motors and bearings.

## Perform Regular Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

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

## 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 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

# 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 deciding 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.

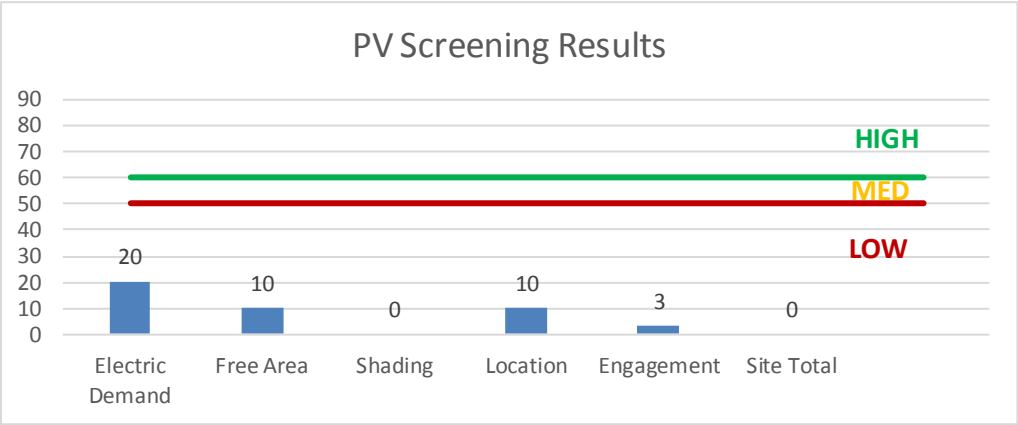
## 6.1 Photovoltaic

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 PV array.

To be cost-effective, a solar PV array needs certain minimum criteria, such as flat or south-facing rooftop or other unshaded space on which to place the PV panels. In our opinion, the facility does not appear to meet these minimum criteria for cost-effective PV installation.

*Figure 19 - Photovoltaic Screening*



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.

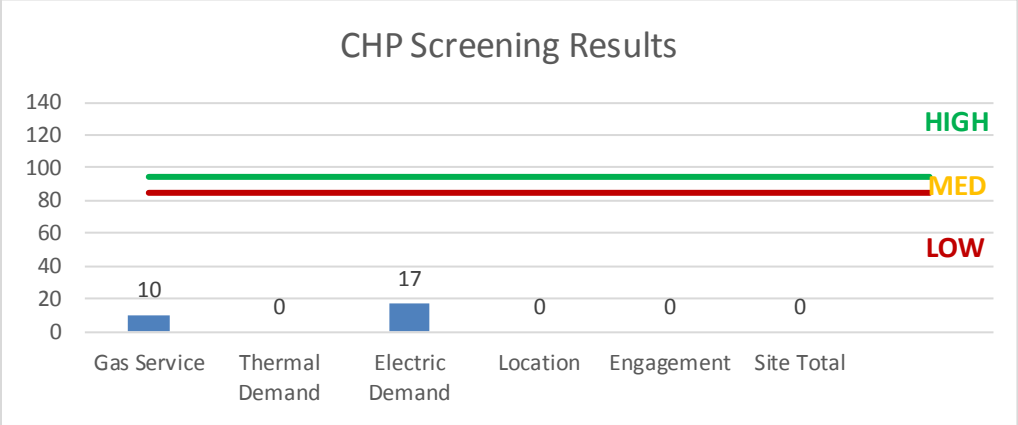
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for space cooling. The key criteria used for screening, 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/

*Figure 20 - Combined Heat and Power Screening*



# 7 DEMAND RESPONSE

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

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

Typically, an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more 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, to demonstrate compliance with DR program requirements.

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

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

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

**We do not think this building is a good candidate for Demand Response.**

# 8 PROJECT FUNDING / INCENTIVES

The NJCEP provides 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 to receive incentive payments for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 21 for a list of the eligible programs identified for each recommended ECM.

*Figure 21 - 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 | Retrofit Fluorescent Fixtures with LED Lamps and Drivers | | | X | | | |
| ECM 2 | Retrofit Fixtures with LED Lamps | X | | X | | | |
| ECM 3 | Premium Efficiency Motors | | | X | | | |
| ECM 4 | Install High Efficiency Unit Heaters | | | X | | | |

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

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

Brief descriptions of all relevant financing and incentive programs are 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**

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

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

## 8.2 Direct Install

**Overview**

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

**Incentives**

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

**How to Participate**

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

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

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

## 8.3 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 could 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 of 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 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 of 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 |
| Main Building | 3 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,190 | Relamp | Yes | 3 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,533 | 0.09 | 274 | 0.0 | $52.11 | $445.50 | $65.00 | 7.30 |
| Main Building Toilet Area | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 1L | Wall Switch | 32 | 365 | Relamp | No | 1 | LED - Linear Tubes: (1) 4' Lamp | Wall Switch | 15 | 365 | 0.01 | 7 | 0.0 | $1.37 | $35.90 | $5.00 | 22.51 |
| Main Building Office | 1 | Linear Fluorescent - T8: 4' T8 (32W) - 2L | Wall Switch | 62 | 2,190 | Relamp | Yes | 1 | LED - Linear Tubes: (2) 4' Lamps | Occupancy Sensor | 29 | 1,533 | 0.03 | 103 | 0.0 | $19.63 | $174.50 | $10.00 | 8.38 |
| Main Building Side Room | 1 | Incandescent: Screw-In: Inc. (60W) - 1L | Wall Switch | 60 | 730 | Relamp | Yes | 1 | LED Screw-In Lamps: Screw-In: LED (9W) - 1L | Occupancy Sensor | 9 | 511 | 0.04 | 44 | 0.0 | $8.43 | $169.75 | $0.00 | 20.15 |
| Well House | 1 | LED Screw-In Lamps: Screw-In: LED (9W) - 1L | Wall Switch | 9 | 365 | None | No | 1 | LED Screw-In Lamps: Screw-In: LED (9W) - 1L | Wall Switch | 9 | 365 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Booster Building | 3 | Incandescent: Screw-In: Inc. (60W) - 1L | Wall Switch | 60 | 365 | Relamp | Yes | 3 | LED Screw-In Lamps: Screw-In: LED (9W) - 1L | Occupancy Sensor | 9 | 256 | 0.13 | 66 | 0.0 | $12.64 | $277.26 | $20.00 | 20.36 |
| Booster Building | 1 | LED Screw-In Lamps: Screw-In: LED (9W) - 1L | Wall Switch | 9 | 4,380 | None | No | 1 | LED Screw-In Lamps: Screw-In: LED (9W) - 1L | Wall Switch | 9 | 4,380 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Greenhouse | 2 | Linear Fluorescent - T12HO: 8' T12HO (110W) - 2L | Wall Switch | 252 | 2,190 | Relamp & Reballast | Yes | 2 | LED - Linear Tubes: (2) 8' Lamps | Occupancy Sensor | 72 | 1,533 | 0.33 | 998 | 0.0 | $189.78 | $674.00 | $35.00 | 3.37 |
| Main Building | 1 | Compact Fluorescent: Screw-In: CFL Flood Light (26W) - 1L | Wall Switch | 26 | 4,380 | Relamp | No | 1 | LED Screw-In Lamps: Screw-In: LED (9W) - 1L | Wall Switch | 18 | 4,380 | 0.01 | 39 | 0.0 | $7.34 | $53.75 | $0.00 | 7.32 |
| Well #3 | 1 | LED Screw-In Lamps: Screw-In: LED (9W) - 1L | Wall Switch | 9 | 365 | None | No | 1 | LED Screw-In Lamps: Screw-In: LED (9W) - 1L | Wall Switch | 9 | 365 | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## 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 |
| Main Building | Well 2 | 1 | Water Supply Pump | 25.0 | 91.0% | No | 904 | No | 91.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Well #3 | Well 3 | 1 | Water Supply Pump | 60.0 | 85.0% | No | 900 | No | 85.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Booster Building | Booster Pump 1 | 1 | Water Supply Pump | 30.0 | 89.0% | No | 900 | Yes | 93.6% | No | | 0.82 | 1,001 | 0.0 | $190.39 | $3,438.70 | $0.00 | 18.06 |
| Booster Building | Booster Pump 2 | 1 | Water Supply Pump | 30.0 | 89.0% | No | 900 | Yes | 93.6% | No | | 0.82 | 1,001 | 0.0 | $190.39 | $3,438.70 | $0.00 | 18.06 |
| Booster Building | Booster Pump 3 | 1 | Water Supply Pump | 30.0 | 89.0% | No | 900 | Yes | 93.6% | No | | 0.82 | 1,001 | 0.0 | $190.39 | $3,438.70 | $0.00 | 18.06 |
| Main Building | Main Building Side Room | 1 | Exhaust Fan | 0.3 | 70.0% | No | 610 | No | 70.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Booster Building | Booster Building | 1 | Exhaust Fan | 0.3 | 70.0% | No | 610 | No | 70.0% | No | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Electric HVAC Inventory & Recommendations

| | | Existing Conditions | | | | Proposed Conditions | | | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Area(s)/System(s) Served | System Quantity | System Type | Cooling Capacity per Unit (Tons) | Heating Capacity per Unit (kBtu/hr) | Install High Efficiency System? | System Quantity | System Type | Cooling Capacity per Unit (Tons) | Heating Capacity per Unit (kBtu/hr) | Cooling Mode Efficiency (SEER/EER) | Heating Mode Efficiency (COP) | Install Dual Enthalpy Economizer? | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Main Building Side Room | Main Building Side Room | 1 | Electric Resistance Heat | | 5.10 | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |
| Booster Buiding | Booster Building | 1 | Electric Resistance Heat | | 10.20 | No | | | | | | | No | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Fuel Heating Inventory & Recommendations

| | | Existing Conditions | | | Proposed Conditions | | | | | | Energy Impact & Financial Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Area(s)/System(s) Served | System Quantity | System Type | Output Capacity per Unit (MBh) | Install High Efficiency System? | System Quantity | System Type | Output Capacity per Unit (MBh) | Heating Efficiency | Heating Efficiency Units | Total Peak kW Savings | Total Annual kWh Savings | Total Annual MMBtu Savings | Total Annual Energy Cost Savings | Total Installation Cost | Total Incentives | Simple Payback w/ Incentives in Years |
| Main Building | Main Building Area | 1 | Warm Air Unit Heater | 46.80 | Yes | 1 | Warm Air Unit Heater | 46.80 | 93.00% | Et | 0.00 | 0 | 19.0 | $154.59 | $1,367.54 | $0.00 | 8.85 |
| Main Building Office | Main Building Office | 1 | Warm Air Unit Heater | 30.00 | Yes | 1 | Warm Air Unit Heater | 30.00 | 93.00% | Et | 0.00 | 0 | 10.3 | $83.73 | $876.63 | $0.00 | 10.47 |
| Greenhouse | Greenhouse | 1 | Warm Air Unit Heater | 30.00 | Yes | 1 | Warm Air Unit Heater | 30.00 | 93.00% | Et | 0.00 | 0 | 10.3 | $83.73 | $876.63 | $0.00 | 10.47 |

## 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 |
| Main Building | Main Building Bathroom and Slop Sink | 1 | Storage Tank Water Heater (≤ 50 Gal) | No | | | | | | 0.00 | 0 | 0.0 | $0.00 | $0.00 | $0.00 | 0.00 |

## Plug Load Inventory

| | Existing Conditions | | | |
|---|---|---|---|---|
| Location | Quantity | Equipment Description | Energy Rate (W) | ENERGY STAR Qualified? |
| Main Building | 1 | Desktop Computer | 150.0 | Yes |
| Main Building | 1 | Desk Printer | 20.0 | Yes |
| Main Building | 1 | CRT TV | 120.0 | No |
| Back of site by storage tanks | 1 | Police Dept. Communications Equipment | 1,000.0 | No |