Local Government Energy Audit:
Energy Audit Report

Trenton Water Facilities

(Pump Stations)

Various Locations throughout the City

City of Trenton, New Jersey

December 31, 2018

Final Report by:

TRC Energy Services

Disclaimer

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

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

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Trenton Water Facilities (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 energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

The Trenton Water Facilities (Pump Stations) total approximately 3,440 square feet in size. The following pumping stations included within this report are as follows:

- Water Facility (Quakerbridge) located in Lawrence Township
- Water Facility (Denow) located in Hopewell Township
- Water Facility (Scotch) located in Ewing Township

These facilities are comprised of mechanical space dedicated to water pumping. The facilities were built in the 1940's and are in fair condition. They are in operation 24 hours a day, seven days a week, however they are only occupied as-needed for maintenance and for emergency service calls. The facility equipment maintains the water level and pressure within the township water towers which support the distribution of potable water to surrounding customers and serve as a reservoir to help with water needs during periods of peak demand. The mechanical spaces are lit by either linear fluorescent T8 or T12 lamp fixtures. The exterior of the above ground buildings is lit by high pressure sodium lamp fixtures. These facilities house large water pumps and motors as well as fractional horsepower exhaust fans and motors. The buildings are heated by electric unit heaters controlled by manual dial thermostats. There is no domestic hot water heating equipment or plug loads.

A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated six measures and recommends five measures which together represent an opportunity for the Trenton Water Facilities (Pump Stations) to reduce annual energy costs by roughly $3,203 and annual greenhouse gas emissions by 20,575 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 6.5 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce the Trenton Water Facilities (Pump Stations)'s annual energy use by 3%.

Figure 1 – Previous 12 Month Utility Costs

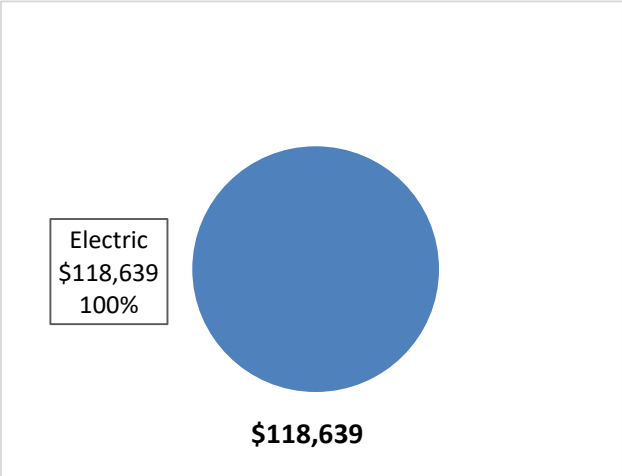


Figure 2a – Potential Post-Implementation Costs (High Priority Measures)

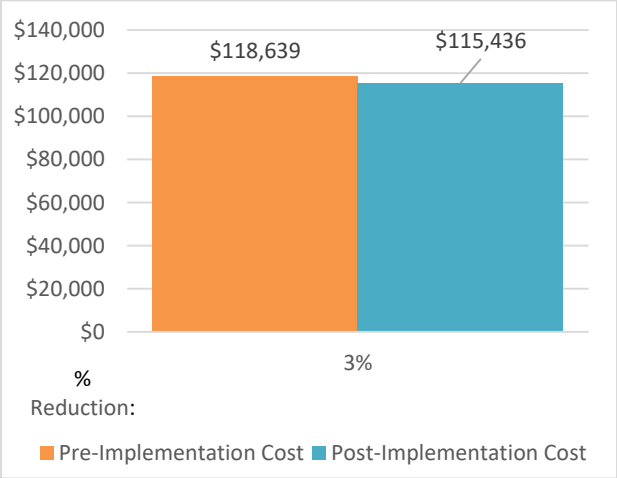
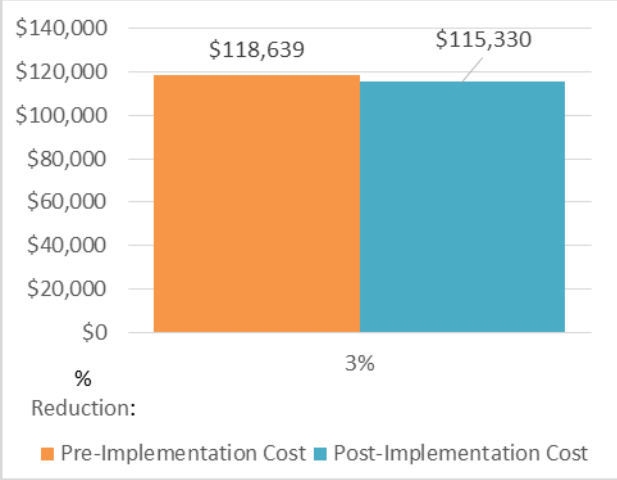


Figure 2b – Potential Post-Implementation Costs (All Evaluated Measures)



A detailed description of the Trenton Water Facilities (Pump Stations)'s existing energy use can be found in Section 3.

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

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**3,430**	**0.7**	**0.0**	**$537.67**	**$4,144.75**	**$430.00**	**$3,714.75**	**6.9**	**3,454**
	Install LED Fixtures	No	670	0.1	0.0	$105.06	$2,897.90	$300.00	$2,597.90	24.7	675
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,507	0.3	0.0	$236.22	$772.16	$0.00	$772.16	3.3	1,517
ECM 2	Retrofit Fixtures with LED Lamps	Yes	1,253	0.3	0.0	$196.39	$474.70	$130.00	$344.70	1.8	1,261
Lighting Control Measures			**658**	**0.1**	**0.0**	**$103.14**	**$810.00**	**$105.00**	**$705.00**	**6.8**	**662**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	658	0.1	0.0	$103.14	$810.00	$105.00	$705.00	6.8	662
Motor Upgrades			**14,659**	**3.7**	**0.0**	**$2,298.26**	**$17,994.20**	**$0.00**	**$17,994.20**	**7.8**	**14,762**
ECM 4	Premium Efficiency Motors	Yes	14,659	3.7	0.0	$2,298.26	$17,994.20	$0.00	$17,994.20	7.8	14,762
HVAC System Improvements			**2,355**	**0.0**	**0.0**	**$369.28**	**$1,431.24**	**$450.00**	**$981.24**	**2.7**	**2,372**
ECM 5	Install Occupancy-Controlled Thermostats	Yes	2,355	0.0	0.0	$369.28	$1,431.24	$450.00	$981.24	2.7	2,372
TOTALS FOR HIGH PRIORITY MEASURES			**20,432**	**4.4**	**0.0**	**$3,203.29**	**$21,482.29**	**$685.00**	**$20,797.29**	**6.5**	**20,575**
TOTALS FOR ALL EVALUATED MEASURES			**21,102**	**4.5**	**0.0**	**$3,308.36**	**$24,380.19**	**$985.00**	**$23,395.19**	**7.1**	**21,250**

* - 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®). Motor 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.

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

Energy Efficient Practices

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

- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule

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

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Trenton Water Facilities (Pump Stations). 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
- Direct Install
- Energy Savings Improvement Program (ESIP)
- Demand Response Energy Aggregator

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

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 that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated Direct Install contractor and, in most cases, they will perform the installation work.

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

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

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

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Hoggarth Stephen	Principal Engineer	hstephen@trentonnj.org	609-989-3615
Sean Semple	Assistant Director of Public Works	ssemple@trentonnj.org	609-989-3823
Bill Mitchell	Plant Superintendent	wmitchell@trentonnj.org	609-989-3640
Designated Representative			
John Martin	Head of Facilities		609-273-8194
TRC Energy Services			
Aimee Lalonde	Auditor	alalonde@trcsolutions.com	732-855-0033

2.2 General Site Information

On February 08, 2018, TRC performed an energy audit at the Trenton Water Facilities (Pump Stations) located in Trenton, New Jersey. TRC's team met with John Martin to review the facility operations and help focus our investigation on specific energy-using systems.

The Trenton Water Facilities (Pump Stations) total approximately 3,440 square feet. The following pumping stations included within this report are as follows:

- Water Facility (Quakerbridge) located in Lawrence Township
- Water Facility (Denow) located in Hopewell Township
- Water Facility (Scotch) located in Ewing Township

These facilities are comprised of mechanical space dedicated to water pumping. The facilities were built in the 1940's and are in fair condition. The facility equipment maintains the water level and pressure within the township water towers which support the distribution of potable water to surrounding customers and serve as a reservoir to help with water needs during periods of peak demand. The mechanical spaces are lit by either linear fluorescent T8 or T12 lamp fixtures. The exterior of the above ground buildings is lit by high pressure sodium lamp fixtures. These facilities house large water pumps and motors as well as fractional horsepower exhaust fans and motors. The buildings are heated by electric unit heaters controlled by manual dial thermostats. There is no domestic hot water heating equipment or plug loads.

2.3 Building Occupancy

The facilities are in operation 24 hours a day, seven days a week, however they are only occupied as-needed for maintenance and for emergency service calls. The typical schedule is presented in the table below.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Water Facility Operation	Weekday	24/7
Water Facility Operation	Weekend	24/7
Occupancy	Weekday	Emergency Only
Occupancy	Weekend	Emergency Only

2.4 Building Envelope

These facilities are pumping stations, two of three are above ground and one underground. The building envelopes are in fair condition. The water facilities located on Denow Road and Scotch Road have walls made of concrete masonry units. There are no windows and the doors are metal with metal frames. There is little opportunity for outside air infiltration.

Image 1: Entrance to the Water Facility (Quakerbridge) located in Lawrence Township – Underground

2.5 On-Site Generation

The Trenton Water Facilities (Pump Stations) do not have any on-site electric generation capacity.

2.6 Energy-Using Systems

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

Lighting System

Lighting at these mechanical facilities is provided mostly by linear fluorescent fixtures with T8 lamps with electronic ballasts or with T12 lamps and magnetic ballasts. These are either industrial fixtures, wrap fixtures or explosion proof fixtures. They are manually controlled via wall switches.

Image 2: Interior Lighting Fixtures

The exterior lighting is minimal and consists of high pressure sodium (HPS) lamp wall pack fixtures that are controlled by photocells. Exterior lighting is only present at the Pump Station located on Denow Road as shown in the photo below.

Image 3: Exterior Lighting Fixtures

Motors

The Trenton Water Facilities (Pump Stations) are comprised of mechanical space which house large water pumps and motors. This equipment maintains the water level and pressure within the township water towers which support the distribution of potable water to surrounding customers. The towers serve as reservoirs to help with water needs during periods of peak demand. At Quakerbridge Road and Denow Road, the process motors range between 10 HP and 75 HP, are high efficiency, and are driven by variable frequency drives (VFDs). Quakerbridge Road water facility also contains exhaust fans driven by fractional horsepower motors. At Scotch Road, the process motors are 50 HP and 75 HP, standard efficiency and driven by VFDs.

Image 4: Scotch Road (Ewing Township) Water Pumps and Motors

Image 5: Denow Road (Hopewell Township) Water Pumps and Motors

Image 6: Quakerbridge Road (Lawrence Township) Water Pumps and Motors

Electric HVAC Equipment and Systems

These Trenton Water Facilities (Pump Stations) are heated by electric unit heaters controlled by manual dial thermostats. They are set to heat the mechanical space to about 70°F. Since these facilities are not occupied on a regular basis, it is assumed that this electric heating equipment is used for freeze protection and that the thermostats are present to provide the occasional occupant with the ability to manually increase the temperature as needed when they are on site.

Image 7: Electric Unit Heaters and Thermostats

2.7 Water-Using Systems

There are no restrooms at these facilities. There is no domestic hot water heating 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

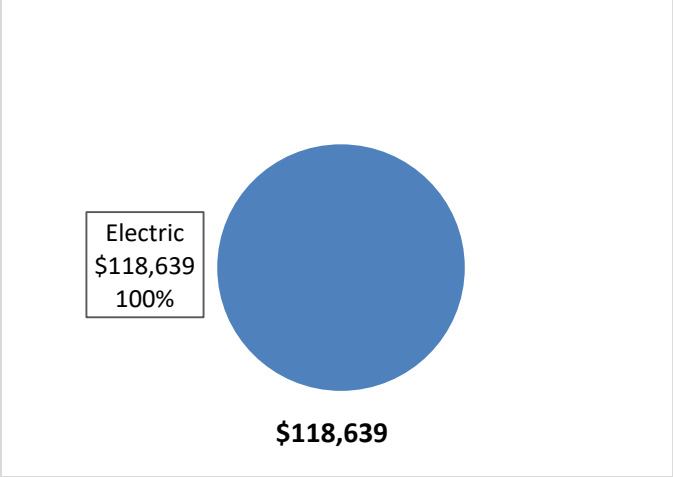
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Trenton Water Facilities (Pump Stations)		
Fuel	**Usage**	**Cost**
Electricity	756,737 kWh	$118,639
Total		**$118,639**

The current annual energy cost for this facility is $118,639 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was $0.157/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 facility does pay electrical demand charges, however insufficient information was provided in order for this data to be included. The total monthly electricity consumption is shown in the chart below, which includes data from all three water facilities (pump stations).

Figure 8 - Electric Usage & Demand

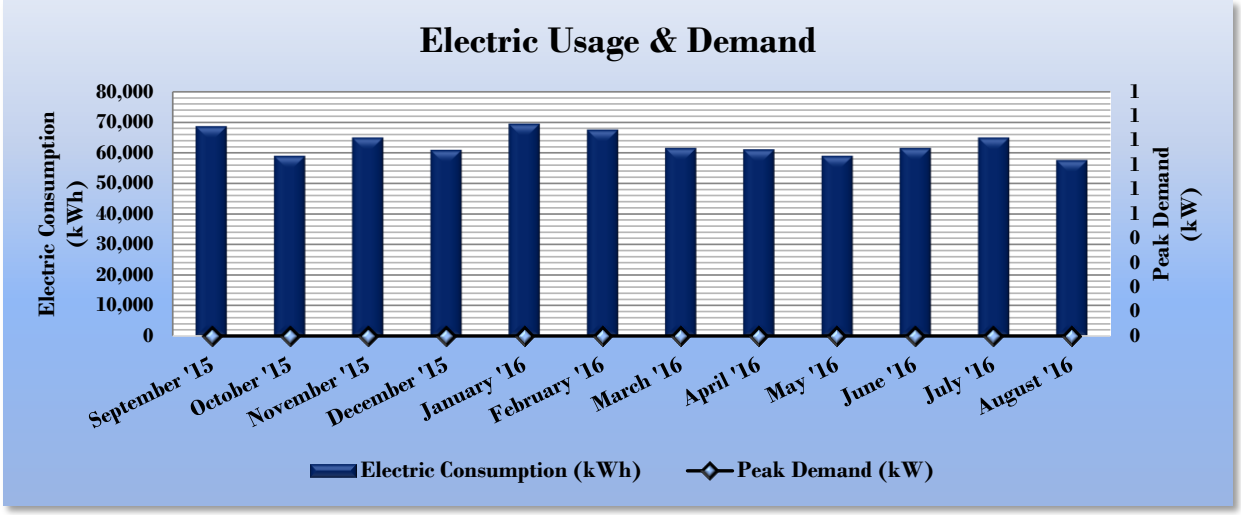


Figure 9 - Electric Usage & Demand

Electric Billing Data for Trenton Water Facilities (Pump Stations)						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
9/21/15	32	68,706			$11,901	Yes
10/20/15	29	58,970			$9,326	Yes
11/18/15	29	65,028			$9,818	Yes
12/21/15	33	60,926			$9,690	Yes
1/21/16	31	69,483			$10,085	Yes
2/22/16	32	67,616			$9,950	Yes
3/22/16	29	61,563			$9,351	Yes
4/21/16	30	61,112			$8,522	No
5/20/16	29	59,050			$8,127	No
6/21/16	32	61,577			$10,408	No
7/21/16	30	65,036			$11,537	No
8/19/16	29	57,671			$9,923	No
Totals	**365**	**756,737**	**0**	**$0**	**$118,639**	
Annual	**365**	**756,737**	**0**	**$0**	**$118,639**	

3.3 Benchmarking

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

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

Figure 10 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Trenton Water Facilities (Pump Stations)	National Median Building Type: Water/Wastewater Treatment/Pumping
Source Energy Use Intensity (kBtu/ft^2)	2356.8	123.1
Site Energy Use Intensity (kBtu/ft^2)	750.6	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 11 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

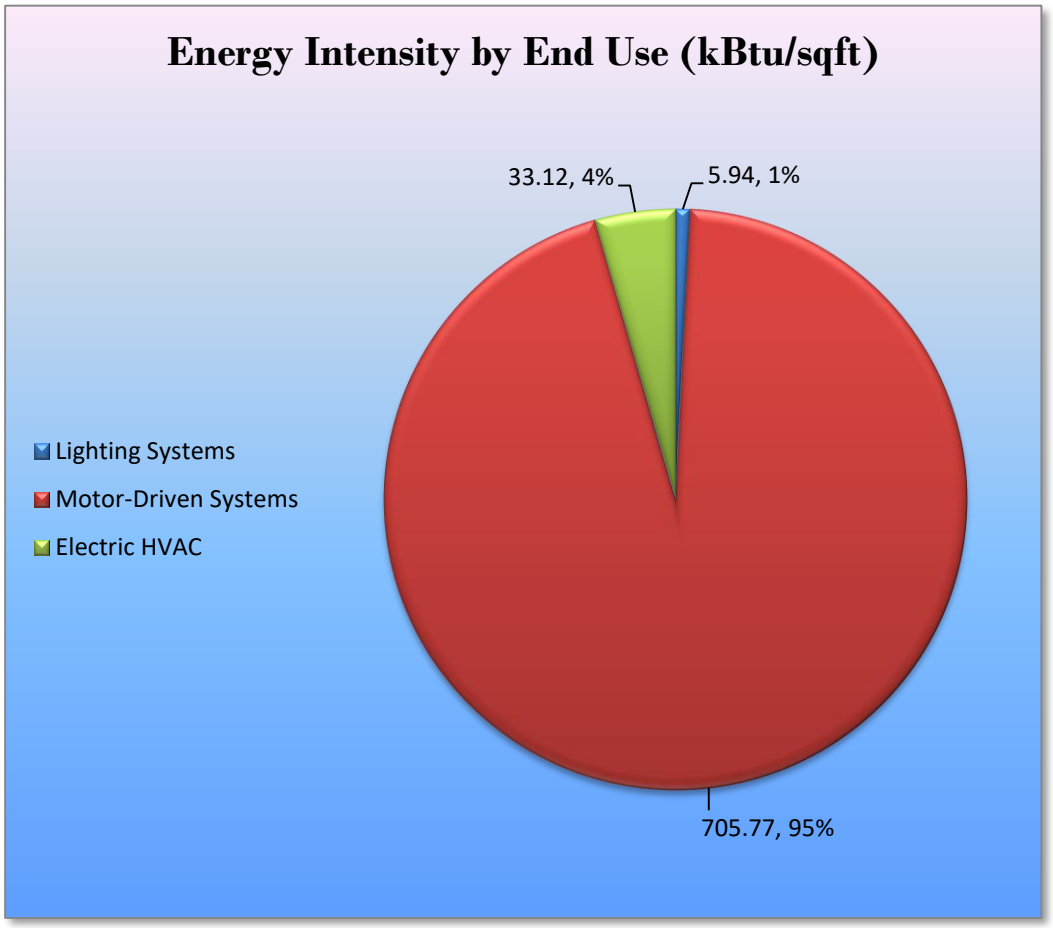
Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Trenton Water Facilities (Pump Stations)	National Median Building Type: Water/Wastewater Treatment/Pumping
Source Energy Use Intensity (kBtu/ft^2)	2293.2	123.1
Site Energy Use Intensity (kBtu/ft^2)	730.3	78.8

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

3.4 Energy End-Use Breakdown

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

Figure 12 - 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 Trenton Water Facilities (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 13 – 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		**2,759**	**0.6**	**0.0**	**$432.61**	**$1,246.85**	**$130.00**	**$1,116.85**	**2.6**	**2,779**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,507	0.3	0.0	$236.22	$772.16	$0.00	$772.16	3.3	1,517
ECM 2	Retrofit Fixtures with LED Lamps	1,253	0.3	0.0	$196.39	$474.70	$130.00	$344.70	1.8	1,261
Lighting Control Measures		**658**	**0.1**	**0.0**	**$103.14**	**$810.00**	**$105.00**	**$705.00**	**6.8**	**662**
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TOTALS		**20,432**	**4.4**	**0.0**	**$3,203.29**	**$21,482.29**	**$685.00**	**$20,797.29**	**6.5**	**20,575**

* - 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 14 below.

Figure 14 – 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		**2,759**	**0.6**	**0.0**	**$432.61**	**$1,246.85**	**$130.00**	**$1,116.85**	**2.6**	**2,779**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,507	0.3	0.0	$236.22	$772.16	$0.00	$772.16	3.3	1,517
ECM 2	Retrofit Fixtures with LED Lamps	1,253	0.3	0.0	$196.39	$474.70	$130.00	$344.70	1.8	1,261

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	1,507	0.3	0.0	$236.22	$772.16	$0.00	$772.16	3.3	1,517
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing fluorescent T12 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	1,253	0.3	0.0	$196.39	$474.70	$130.00	$344.70	1.8	1,261
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing linear fluorescent T8 fixtures with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent tubes.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 15 below.

Figure 15 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**658**	**0.1**	**0.0**	**$103.14**	**$810.00**	**$105.00**	**$705.00**	**6.8**	**662**
ECM 3	Install Occupancy Sensor Lighting Controls	658	0.1	0.0	$103.14	$810.00	$105.00	$705.00	6.8	662

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 3: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
658	0.1	0.0	$103.14	$810.00	$105.00	$705.00	6.8	662

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches. Although these facilities are rarely occupied, some light fixtures are left on while the space is unoccupied. 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. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Motor Upgrades

Our recommendations for motor upgrades are summarized in Figure 16 below.

Figure 16 - 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		**14,659**	**3.7**	**0.0**	**$2,298.26**	**$17,994.20**	**$0.00**	**$17,994.20**	**7.8**	**14,762**
ECM 4	Premium Efficiency Motors	14,659	3.7	0.0	$2,298.26	$17,994.20	$0.00	$17,994.20	7.8	14,762

ECM 4: 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)
14,659	3.7	0.0	$2,298.26	$17,994.20	$0.00	$17,994.20	7.8	14,762

Measure Description

We recommend replacing standard efficiency motors with *NEMA Premium®* efficiency motors at the Scotch Road Pumping Station. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Ensure that proposed replacement motors will be compatible with the VFD systems currently in place. 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.

4.1.4 HVAC System Upgrades

Our recommendation for HVAC system improvement are summarized in Figure 17 below.

Figure 17 - Summary of HVAC System Improvement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**2,355**	**0.0**	**0.0**	**$369.28**	**$1,431.24**	**$450.00**	**$981.24**	**2.7**	**2,372**
ECM 5	Install Occupancy-Controlled Thermostats	2,355	0.0	0.0	$369.28	$1,431.24	$450.00	$981.24	2.7	2,372

ECM 5: Install Occupancy-Controlled Thermostats

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)
2,355	0.0	0.0	$369.28	$1,431.24	$450.00	$981.24	2.7	2,372

Measure Description

We recommend replacing manual thermostats with occupancy-controlled thermostats. Many types of facilities use manually controlled thermostats set by occupants to regulate temperature within the facility, or in certain areas. An occupancy controlled-thermostat is a thermostat paired with a sensor and/or door detector to identify movement and determine if a room is occupied or unoccupied. If occupancy is sensed by the sensor, the thermostat goes into an occupied mode and enables programmed temperature setpoint. If no occupancy is sensed, the thermostat switches to unoccupied mode after a set period of time. By reducing heating temperature setpoints and increasing cooling temperature setpoints, when the space is occupied, the operation of the electric unit heaters may be reduced while still maintaining reasonable space temperatures for freeze protection. Occupancy controlled thermostats provide energy savings by reducing heating energy usage when rooms are unoccupied. There may be an opportunity to set unoccupied temperature set points to 45°F to 50°F and set occupied temperature set points to 65°F which would cost effectively save energy in comparison to the existing set point of 70°F.

4.2 ECM Evaluated But Not Recommended as High Priority

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

Figure 18 – Summary of Measure 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 Upgrades	**670**	**0.1**	**0.0**	**$105.06**	**$2,897.90**	**$300.00**	**$2,597.90**	**24.7**	**675**
Install LED Fixtures	670	0.1	0.0	$105.06	$2,897.90	$300.00	$2,597.90	24.7	675
TOTALS	**670**	**0.1**	**0.0**	**$105.06**	**$2,897.90**	**$300.00**	**$2,597.90**	**24.7**	**675**

* - 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 LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	670	0.1	0.0	$105.06	$2,897.90	$300.00	$2,597.90	24.7	675

Measure Description

We recommend considering the replacement of existing exterior high-pressure sodium lamp wall pack fixtures with new high-performance LED light fixtures when cost effective. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are much more than traditional HID technologies.

Reasons for not Recommending as a High Priority

This measure is not recommended as a high priority measure based on the economic results. The simple payback period is unattractive as it is presented here. In other words, this measure cannot be justified based on energy savings alone. It should be noted that if the City of Trenton pursues a comprehensive project under an Energy Savings Improvement Program (ESIP), this measure should be re-evaluated for inclusion based on the energy results and consistency, municipality-wide.

5 ENERGY EFFICIENT PRACTICES

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

Perform Proper Lighting Maintenance

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

Develop a Lighting Maintenance Schedule

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

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.

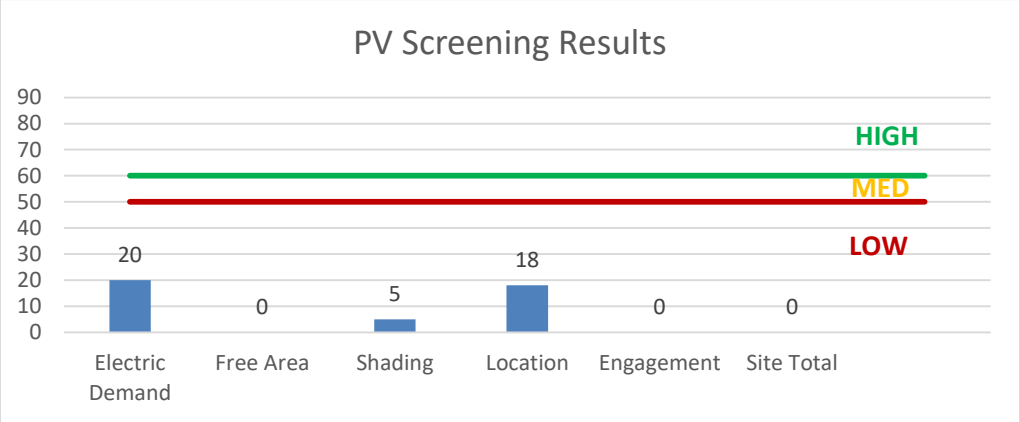
6.1 Photovoltaic

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 PV array.

In order 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 appear not meet these minimum criteria for cost-effective PV installation.

Figure 19 - Photovoltaic Screening



6.2 Combined Heat and Power

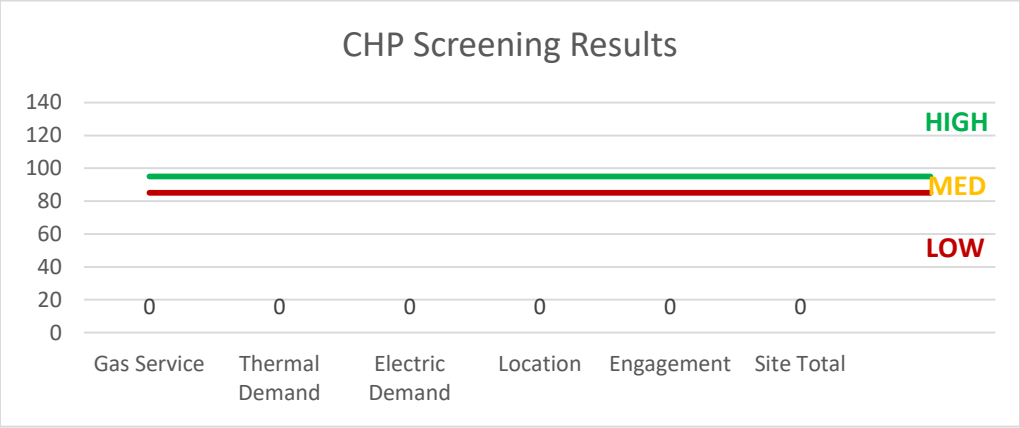
Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric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

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

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

Lack of gas service and thermal load leads to the zero potential for CHP at the site.

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

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

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

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR program information.

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

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 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	Install Occupancy Sensor Lighting Controls	x		x			
ECM 4	Premium Efficiency Motors						
ECM 5	Install Occupancy-Controlled Thermostats	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 Direct Install

Overview

Direct Install is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for 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 Direct Install program you will need to contact the participating contractor assigned to the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct Install website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

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

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

8.3 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.

8.4 Demand Response Energy Aggregator

The first step toward participation in a Demand Response (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 program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract. See Section 7 for additional information.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third-party supplier, consider shopping for a reduced rate from third-party electric suppliers. If your facility is purchasing electricity from a third-party supplier, review and compare prices at the end of the current contract or every couple years.

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

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third-party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third-party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility is purchasing natural gas from a third-party supplier, review and compare prices at the end of the current contract or every couple years.

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
16 - Quakerbridge Underground Mechanical Space	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.16	731	0.0	$114.54	$489.09	$95.00	3.44
19 - Denow Mechanical Space	6	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,920	Relamp & Reballast	Yes	6	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	2,044	0.42	1,961	0.0	$307.37	$1,042.16	$35.00	3.28
19 - Denow Exterior	3	High-Pressure Sodium: (1) 50W Lamp	None	66	4,380	Fixture Replacement	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	15	4,380	0.10	697	0.0	$109.26	$2,897.90	$300.00	23.78
28 - Scotch Mechanical Space	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.14	633	0.0	$99.27	$452.58	$85.00	3.70
28 - Scotch Generator Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,920	0.04	200	0.0	$31.42	$73.03	$20.00	1.69

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
16 - Quakerbridge	Exhaust Fans	2	Other	0.3	74.0%	No	2,745	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
16 - Quakerbridge	Water Pumps	2	Process Pump	10.0	91.0%	Yes	3,754	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
16 - Quakerbridge	Actuators	2	Exhaust Fan	0.3	74.0%	Yes	2,745	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
19 - Denow	Water Pumps	2	Process Pump	40.0	93.0%	No	3,754	No	93.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
19 - Denow	Water Pumps	1	Process Pump	75.0	95.0%	No	3,754	No	95.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
28 - Scotch	Water Pumps	1	Process Pump	75.0	91.0%	Yes	1,251	Yes	95.0%	No		1.15	1,944	0.0	$304.74	$5,447.00	$0.00	17.87
28 - Scotch	Water Pumps	3	Process Pump	50.0	90.2%	Yes	3,754	Yes	94.5%	No		2.51	12,716	0.0	$1,993.52	$12,547.20	$0.00	6.29

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
16 - Quakerbridge	Mechanical Space	2	Electric Resistance Heat		13.65	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
19 - Denow	Mechanical Space	2	Electric Resistance Heat		13.65	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
28 - Scotch	Mechanical Space	4	Electric Resistance Heat		13.65	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Occupancy Controlled Thermostat Recommendations

		Recommendation Inputs						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	Thermostat Quantity	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	Cooling Setpoint Temp (deg F)	Heating Setpoint Temp (deg F)	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
16 - Quakerbridge	Electric Unit Heaters in Mechanical Space	1	0.00	27.30		90	70	0.00	589	0.0	$92.32	$238.54	$75.00	1.77
19 - Denow	Electric Unit Heaters in Mechanical Space	1	0.00	27.30		90	70	0.00	589	0.0	$92.32	$238.54	$75.00	1.77
28 - Scotch	Electric Unit Heaters in Mechanical Space	4	0.00	54.61		90	70	0.00	1,178	0.0	$184.64	$954.16	$300.00	3.54

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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N/A

ENERGY STAR® Score[1]

Water Facility (Quakerbridge Road)

Primary Property Type: Other - Utility
Gross Floor Area (ft²): 500
Built: 1970

For Year Ending: August 31, 2016
Date Generated: September 28, 2018

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Water Facility (Quakerbridge Road) Quakerbridge Road Lawrence Twp, New Jersey 08648	City of Trenton 319 East State Street Trenton, NJ 08618 (____)____-_____	Hoggarth Stephen 319 East State Street Trenton, NJ 08618 6099893615 hstephen@trentonnj.org

Property ID: 6557767

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
148.5 kBtu/ft²

Source EUI
415.8 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	74,245	(100%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	31.9
National Median Source EUI (kBtu/ft²)	89.3
% Diff from National Median Source EUI	366%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	8

Signature & Stamp of Verifying Professional

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

Signature: _____ Date: _____

Licensed Professional

____ _____
,
(____)____-_____
_____

Professional Engineer Stamp (if applicable)

ENERGY STAR® Statement of Energy Performance

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Water Facility (Denow Road)

Primary Property Type: Other - Utility
Gross Floor Area (ft²): 1,260
Built: 1970

For Year Ending: August 31, 2016
Date Generated: September 28, 2018

ENERGY STAR® Score[1]

N/A

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Water Facility (Denow Road) Denow Road Hopewell Twp, New Jersey 08525	City of Trenton 319 East State Street Trenton, NJ 08618 (____)____-_____	Hoggarth Stephen 319 East State Street Trenton, NJ 08618 6099893615 hstephen@trentonnj.org

Property ID: 6557768

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
429.5 kBtu/ft²

Source EUI
1,202.6 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	541,192 (100%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	31.9
National Median Source EUI (kBtu/ft²)	89.3
% Diff from National Median Source EUI	1247%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	55

Signature & Stamp of Verifying Professional

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

Signature: _____ Date: _____

Licensed Professional

____ _____
,
(____)____-_____
_____

Professional Engineer Stamp (if applicable)

ENERGY STAR® Statement of Energy Performance

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Water Facility (Scotch Road)

N/A

ENERGY STAR® Score[1]

Primary Property Type: Other - Utility
Gross Floor Area (ft²): 1,680
Built: 1970

For Year Ending: August 31, 2016
Date Generated: September 28, 2018

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Water Facility (Scotch Road) Scotch Road Ewing Twp, New Jersey 08628	City of Trenton 319 East State Street Trenton, NJ 08618 (____)____-_____	Hoggarth Stephen 319 East State Street Trenton, NJ 08618 6099893615 hstephen@trentonnj.org

Property ID: 6557769

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
1,034.9 kBtu/ft²

Source EUI
2,897.8 kBtu/ft²

Annual Energy by Fuel		
Electric - Grid (kBtu)	1,738,677	(100%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	31.9
National Median Source EUI (kBtu/ft²)	89.3
% Diff from National Median Source EUI	3146%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	176

Signature & Stamp of Verifying Professional

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

Signature: _____ Date: _____

Licensed Professional

____ _____

(____)____-_____

_____

Professional Engineer Stamp (if applicable)