Local Government Energy Audit:
Energy Audit Report

Street Lighting

Various Locations

Long Hill, New Jersey 07933

Long Hill Township

October 30, 2018

Final Report by:

TRC Energy Services

Disclaimer

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

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

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

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

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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 Long Hill Township's Street Lighting.

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

Long Hill Township's Street Lighting consists of approximately 697 street lighting fixtures owned and operated by Jersey Central Power & Light.

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

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated one measure which represents an opportunity for Long Hill Township to reduce annual street lighting energy costs by approximately $8,478 and annual greenhouse gas emissions by 232,789 lbs CO_2e. If the measure is implemented as recommended, the project will pay for itself immediately. 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 annual street lighting energy use by 60%, with an operating cost reduction of11%.

Figure 1 – Previous 12 Month Utility Costs

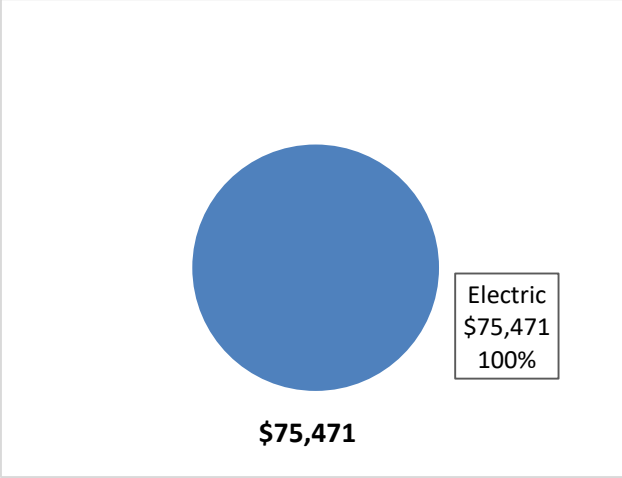
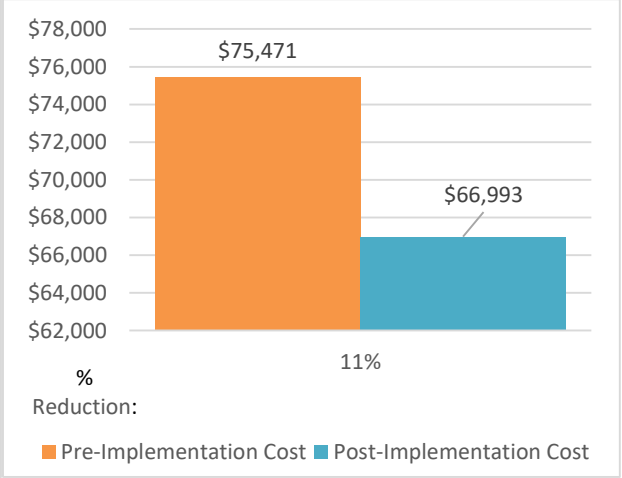


Figure 2 – Potential Post-Implementation Costs



A detailed description of the street lighting 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 Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**231,172**	**0.0**	**$8,478.48**	**$0.00**	**$0.00**	**$0.00**	**0.0**	**232,789**
ECM 1	Install LED Fixtures	Yes	231,172	0.0	$8,478.48	$0.00	$0.00	$0.00	0.0	232,789
TOTALS			**231,172**	**0.0**	**$8,478.48**	**$0.00**	**$0.00**	**$0.00**	**0.0**	**232,789**

* - 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).

Note: the Annual Energy Cost Savings ($) are the savings realized by the Town as reflected in the monthly bills, the difference in cost between the current case (under existing tariffs), and the projected case (under new rate tariffs associated with the replacement lamps). This cost reduction is computed by two main factors which differ between the base case and the proposed case:, the monthly fixture charge and the monthly kWh charge. Please see further description of savings in Section 4.2, ECM 1.

Energy Efficient Practices

TRC also identified a low cost (or no cost) energy efficient practice. Energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on systems. These practices can extend equipment lifetime, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified include:

- Ensure Lighting Controls Are Operating Properly

For details on this energy efficient practice, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation. Based on the configuration of the site and loads there is a no potential for installing any PV or 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 ECM 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 light fixtures separately, groups of fixtures, or a comprehensive approach where all fixtures are implemented together.

The ECM outlined in this report may qualify under the following program:

- Direct Install

Jersey Central Power & Light (JCP&L) provides a direct install streetlight conversion program, outlined in the document. "Municipal Lighting Handbook." The February 2018 edition is provided as Attachment B to this report. The program provides for the installation of replacement street lighting, including fixtures using high efficiency LED sources.

Please refer to Section 8.1 for a more complete description of JCP&L's streetlight replacement offering.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Nancy Malool	Township Administrator	Administrator@longhillnj.gov	908-578-7010
Guy Piserchia	Township Committee	guyp@longhillnj.gov	908-578-7010
Tom Sweeney	Director of Public Works	roads@longhillnj.gov	908-647-8000 Ext. 219
TRC Energy Services			
Tom Page	Auditor	TPage@TRCsolutions.com	732-855-0033

2.2 General Site Information

On June 15, 2017, TRC performed an energy audit for street lighting located in Long Hill, New Jersey. TRC's team met with the facility operations team to help focus our investigation on specific energy-using systems.

Long Hill Township's street lighting consists of approximately 697 fixtures owned and operated by Jersey Central Power & Light. TRC obtained site drawings indicating the type and quantity of Long Hill Township's street light fixtures.

2.3 Building Occupancy

Fixtures operate approximately from dusk to dawn providing street and walkway illumination throughout the township.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Street Lighting	Weekday	6:00 PM - 6:00 AM
Street Lighting	Weekend	6:00 PM - 6:00 AM

2.4 Energy-Using Systems

Lighting System

The town's street lighting system is comprised of fixtures owned and operated by the electrical utility, Jersey Central Power & Light. The Town's cost for this service is embedded in three rate tariffs:

1. Service Classification SVL, "Sodium Vapor Street Lighting Service."
2. Service Classification MVL, "Mercury Vapor Street Lighting Service."
3. Service Classification ISL, "Incandescent Street Lighting Service."

Each tariff provides information about fixtures and operations. Nominal fixture wattage is provided based on lamp size and type. Mercury vapor fixtures range from 100-Watt to 175-Watt, while high pressure sodium fixtures range from 50-Watt through 400-Watt, depending on the application. Incandescent street lighting sources are listed as 105-Watt or 205-Watt in the tariff. All fixtures are assumed to operate 4,200 hours per year.

Monthly billings are comprised of a combination of monthly "per fixture" charges by fixture type, and of kWh use based on wattages and prorated operating hours listed in the tariff, at established rates.

TRC evaluated 697 fixtures for replacement through JCP&L's street lighting replacement program.

3 SITE ENERGY USE AND COSTS

Utility data for electricity was analyzed to identify opportunities for savings.

3.1 Total Cost of Energy

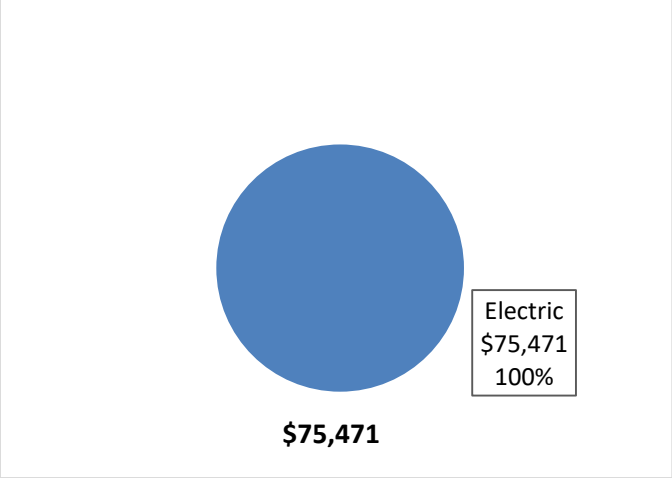
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each street lighting account. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Street Lighting		
Fuel	**Usage**	**Cost**
Electricity	388,382 kWh	$75,471
Total		**$75,471**

The current annual energy cost for this facility is $75,471 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 $0.194/kWh, which is the blended rate that includes per fixture charges and distribution charges. A total annualized cost comparison approach is used to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

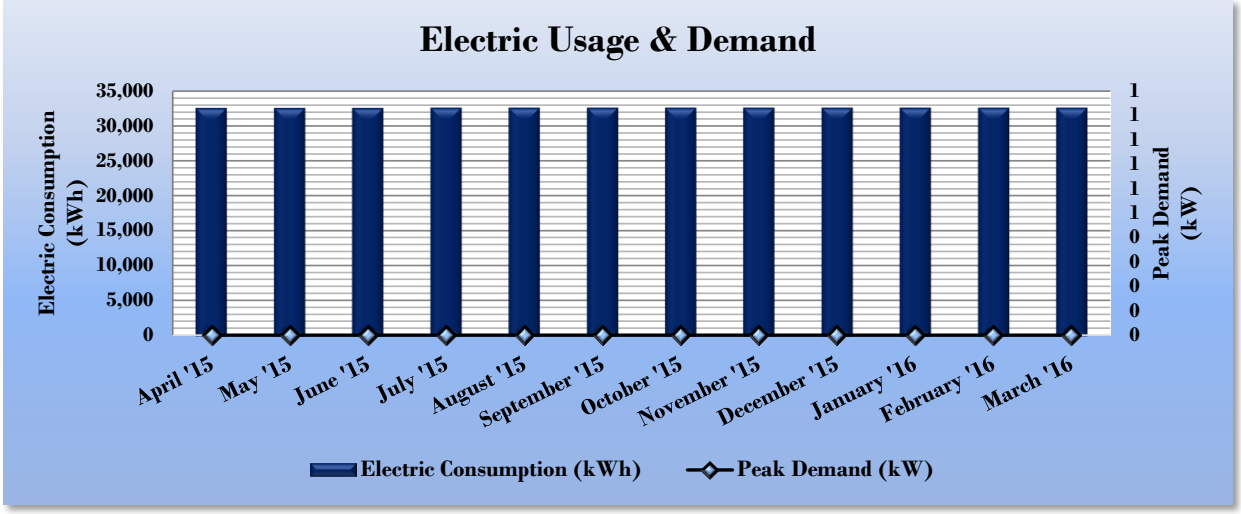


Figure 9 - Electric Usage & Demand

Electric Billing Data for Street Lighting					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Fixture Charges	Total Electric Cost
4/21/15	31	32,511	0.0	$2,738	$6,354
5/20/15	29	32,511	0.0	$2,635	$6,218
6/19/15	30	32,511	0.0	$2,635	$6,218
7/21/15	32	32,553	0.0	$2,641	$6,339
8/20/15	30	32,553	0.0	$2,641	$6,339
9/21/15	32	32,553	0.0	$2,641	$6,339
10/22/15	31	32,553	0.0	$2,641	$5,729
11/20/15	29	32,553	0.0	$2,641	$5,731
12/22/15	32	32,553	0.0	$2,641	$7,578
1/21/16	30	32,553	0.0	$2,641	$6,347
2/19/16	29	32,553	0.0	$2,641	$6,347
3/22/16	32	32,553	0.0	$2,641	$6,347
Totals	**367**	**390,510**	**0.0**	**$31,775**	**$75,885**
Annual	**365**	**388,382**	**0.0**	**$31,602**	**$75,471**

3.3 Benchmarking

The street lighting system was not benchmarked as street lighting systems are not covered in the ENERGY STAR® program. Facilities are typically 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 a 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.

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 a 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. The street lighting system is not in a category that is eligible to receive a score.

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.

4 ENERGY CONSERVATION MEASURES

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Township 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.

The following section describes the evaluated measure.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 10 – Summary of Recommended ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**231,172**	**0.0**	**$8,478.48**	**$0.00**	**$0.00**	**$0.00**	**0.0**	**232,789**
ECM 1	Install LED Fixtures	Yes	231,172	0.0	$8,478.48	$0.00	$0.00	$0.00	0.0	232,789
TOTALS			**231,172**	**0.0**	**$8,478.48**	**$0.00**	**$0.00**	**$0.00**	**0.0**	**232,789**

* - 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).

4.2 ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	231,172	0.0	0.0	$8,478.48	$0.00	$0.00	$0.00	0.0	232,789

Measure Description

We recommend replacing existing fixtures containing incandescent, high pressure sodium, or mercury vapor lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output. Please note that the kWh savings shown above are representative of the impact of the LED upgrade and will be seen at the utility grid and not at the facility meter.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of mercury vapor or high pressure sodium lamps, and more than 10 times longer than many incandescent lamps.

JCP&L's program can provide and install new LED light fixtures on overhead wood fixture poles at no cost. In most cases the work includes the removal cost of existing light fixtures and standard sized brackets. Fees may apply as applicable, such as for highway permits, traffic control costs, and certain preparation fees. LED conversions are available for installation of 12 or more LED fixtures per request.

New fixtures will be billed under the tariff "Service Classification LED." While in some cases the monthly "fixture charge" assigned to the new fixtures under the tariff will be higher than the fixtures being replaced, the "kWh charge" for the new fixtures are typically much lower than for existing fixtures, reflective of lower energy use. Overall, for fixtures that provide approximately equal light output, the tariff associated with LED street lighting systems provides for reduced charges as compared to the tariff's which govern existing case mercury vapor, high pressure sodium, or incandescent fixtures.

The costs savings are computed based on a comparison of the tariffs for base case and replacement light fixtures. TRC's recommendations are based on selecting replacement LED fixtures based on providing similar illumination levels as the existing fixture types and wattage. Longhill Township should seek assistance when finalizing the design to ensure that the proposed system will meet illumination, safety and related requirements. Further study to determine whether a system of advanced lighting controls should be considered as a means of adjusting lighting levels with potential additional savings.

Please see Appendix A: Equipment Inventory & Recommendations for a detailed list of the locations and recommended upgrades for each lighting measure, and Appendix B: JCP&L Municipal Lighting Handbook for the utility program guidance, with a summary provided in Section 8.1.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, energy performance can also be improved through application of low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on systems, equipment lifetime can be extended; 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 plan that is customized to your systems. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Ensure Lighting Controls Are Operating Properly

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

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 system. 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.

Onsite generation is not applicable to the Long Hill Township's street lighting system.

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. 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.

Although the on-peak utility billing period may extend into evening hours and during periods of streetlight operation, it is not currently expected that a demand curtailment event would occur during this window.

We do not believe that this system is a good candidate for implementation of DR.

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 note that the direct install program listed in this section is sponsored by the utility company JCP&L.

Please refer to Figure 11 for a list of the eligible programs identified for each recommended ECM.

Figure 11 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings
ECM 1	Install LED Fixtures			x	

8.1 Direct Install

Jersey Central Power & Light (JCP&L) provides a direct install streetlight conversion program, outlined in the document "Municipal Lighting Handbook." The February 2018 edition is provided as Attachment B to this report. The program provides for the installation of replacement street lighting, including fixtures using high efficiency LED sources.

The purpose of the handbook is to provide guidance on the application process for new or upgraded street lighting installations along public roadways; to catalog the Street Lighting Options that are available from JCP&L; and to provide information on the installation costs and monthly rates for each of these Lighting Options. The monthly rates provided in the handbook are subject to change.

JCP&L does not make lighting recommendations and does not provide street lighting design service. It is up to the Municipality to specify the desired level of illumination for a given location with the corresponding bracket size. However, JCP&L will provide a street lighting layout once the municipality has decided on the appropriate spacing for the type of street lighting fixtures selected. As a convenience, photometric data needed to develop a street lighting design can be obtained from various lighting manufacturers' web sites.

JCP&L's tariff structure provides for three basic types of lighting service: Light Emitting Diode Street Lighting (LED), Sodium Vapor Street Lighting (SVL) and Outdoor Lighting. The typical street lighting installation is overhead construction comprised of a cobra head fixture on a wood distribution pole, known as a "fixture" pole. JCP&L also offers decorative colonial type luminaires that can be installed on fixture poles. There are also several street lights offered for installation in underground residential service areas, including the standard colonial post top, as well as more decorative street lighting options.

JCP&L will not install street lights for the illumination of municipal parking lots, driveways, walkways, or park & ride facilities. JCP&L will only install street lights along public rights-of-way for the illumination of roadways. Also, JCP&L will not install decorative lighting for "streetscape" projects where a municipality constructs a "downtown" area revitalization project. Private electrical contractors are available for

streetscape installations, and JCP&L will coordinate service requirements for the new lighting fixtures, either metered or unmetered service.

TERM OF CONTRACT – Ten years for each Company Fixture installation and thereafter on a monthly basis. Where special circumstances apply or special or unusual facilities are supplied, contracts of more than ten years may be required. Service that is terminated before the end of the contract term shall be billed the total of 1) each light's monthly Fixture Charge plus 2), the per KWH Distribution Charge applicable to each light's Billing Month KWH, times the remaining months of the contract term. (Removal costs are discussed on page 7). Restoration of Service to lamps before the end of the contract term shall be made at the expense of the customer. (Tariff Part III Sheet No. 33)

There is no installation cost to install a new LED Light Fixture on an overhead Wood Fixture pole. The monthly rate provides for the removal Labor cost of the existing Light Fixture, Standard Bracket (8 Foot Aluminum) and Luminaire. Labor fees do NOT apply for conversion of MVL, ISL, SVL to LED Light Fixtures. Brackets longer than the Standard 8 foot Bracket are subject to additional charges. Also, additional charges may apply under Term of Contract conditions for both SVL and LED lighting. Other fees may also apply such as: Highway Permits, Excess traffic control cost, certain preparation fees, etc. Service Classification LED (light-emitting diode) is available for installation of twelve (12) or more LED fixtures per request. LED street lights are a solid state light that uses a semi-conductor to convert electricity into light. KWH Charges are based on a standard illumination schedule of 4200 hours per year.

Scheduling LED Conversions: LED conversions of sodium vapor, mercury vapor or incandescent street lights shall be scheduled at the Company's reasonable discretion.

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.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

Location	Existing Conditions: Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours
JCP&L Street Lighting Acct #: 100 005 846 348	0	0	0	0	0
Mercury Vapor Street Lighting	1	Mercury Vapor: (1) 175W Lamp	None	211	4,200
Mercury Vapor Street Lighting	266	Mercury Vapor: (1) 100W Lamp	None	121	4,200
JCP&L Street Lighting Acct #: 100 005 846 405	0	0	0	0	0
Sodium Vapor Street Lighting	1	High-Pressure Sodium: (1) 150W Lamp	None	176	4,200
Sodium Vapor Street Lighting	1	High-Pressure Sodium: (1) 70W Lamp	None	85	4,200
Sodium Vapor Street Lighting	5	High-Pressure Sodium: (1) 400W Lamp	None	498	4,200
Sodium Vapor Street Lighting	9	High-Pressure Sodium: (1) 50W Lamp	None	60	4,200
Sodium Vapor Street Lighting	18	High-Pressure Sodium: (1) 250W Lamp	None	293	4,200
Sodium Vapor Street Lighting	29	High-Pressure Sodium: (1) 70W Lamp	None	85	4,200
Sodium Vapor Street Lighting	45	High-Pressure Sodium: (1) 50W Lamp	None	60	4,200
Sodium Vapor Street Lighting	94	High-Pressure Sodium: (1) 100W Lamp	None	121	4,200
JCP&L Street Lighting Acct #: 100 005 846 462	0	0	0	0	0
Incandescent Street Lighting	112	Incandescent: 105 W Incandescent Lamps	None	105	4,200
Incandescent Street Lighting	116	Incandescent: 205 W Incandescent Lamps	None	205	4,200

Location	Proposed Conditions: Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Change in Cost per Fixture	Cost per Control
JCP&L Street Lighting Acct #: 100 005 846 348	None	No	0	0	0	0	0	$0.00	$0.00
Mercury Vapor Street Lighting	Fixture Replacement	No	1	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	90	4,200	$31.56	$0.00
Mercury Vapor Street Lighting	Fixture Replacement	No	266	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	50	4,200	$10.80	$0.00
JCP&L Street Lighting Acct #: 100 005 846 405	None	No	0	0	0	0	0	$0.00	$0.00
Sodium Vapor Street Lighting	Fixture Replacement	No	1	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	130	4,200	-$5.04	$0.00
Sodium Vapor Street Lighting	Fixture Replacement	No	1	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	50	4,200	$14.40	$0.00
Sodium Vapor Street Lighting	Fixture Replacement	No	5	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	260	4,200	$86.52	$0.00
Sodium Vapor Street Lighting	None	No	9	High-Pressure Sodium: (1) 50W Lamp	None	60	4,200	$0.00	$0.00
Sodium Vapor Street Lighting	Fixture Replacement	No	18	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	130	4,200	$75.84	$0.00
Sodium Vapor Street Lighting	Fixture Replacement	No	29	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	50	4,200	$14.40	$0.00
Sodium Vapor Street Lighting	None	No	45	High-Pressure Sodium: (1) 50W Lamp	None	60	4,200	$0.00	$0.00
Sodium Vapor Street Lighting	Fixture Replacement	No	94	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	50	4,200	$33.84	$0.00
JCP&L Street Lighting Acct #: 100 005 846 462	None	No	0	0	0	0	0	$0.00	$0.00
Incandescent Street Lighting	Fixture Replacement	No	112	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	50	4,200	-$28.20	$0.00
Incandescent Street Lighting	Fixture Replacement	No	116	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	50	4,200	$28.68	$0.00

Location	Energy Impact & Financial Analysis: Peak kW Savings (Fixtures)	Peak kW Savings (Controls)	Total Peak kW Savings	Annual kWh Savings (Fixtures)	Annual kWh Savings (Controls)	Total Annual kWh Savings	Annual MMBtu Savings (Fixtures)	Annual MMBtu Savings (Controls)	Total Annual MMBtu Savings
JCP&L Street Lighting Acct #: 100 005 846 348	0.00	0.00	0.00	0	0	0	0.0	0.0	0.0
Mercury Vapor Street Lighting	0.10	0.00	0.10	574	0	574	0.0	0.0	0.0
Mercury Vapor Street Lighting	15.37	0.00	15.37	89,633	0	89,633	0.0	0.0	0.0
JCP&L Street Lighting Acct #: 100 005 846 405	0.00	0.00	0.00	0	0	0	0.0	0.0	0.0
Sodium Vapor Street Lighting	0.04	0.00	0.04	218	0	218	0.0	0.0	0.0
Sodium Vapor Street Lighting	0.03	0.00	0.03	166	0	166	0.0	0.0	0.0
Sodium Vapor Street Lighting	0.97	0.00	0.97	5,648	0	5,648	0.0	0.0	0.0
Sodium Vapor Street Lighting	0.00	0.00	0.00	0	0	0	0.0	0.0	0.0
Sodium Vapor Street Lighting	2.39	0.00	2.39	13,925	0	13,925	0.0	0.0	0.0
Sodium Vapor Street Lighting	0.83	0.00	0.83	4,817	0	4,817	0.0	0.0	0.0
Sodium Vapor Street Lighting	0.00	0.00	0.00	0	0	0	0.0	0.0	0.0
Sodium Vapor Street Lighting	5.43	0.00	5.43	31,675	0	31,675	0.0	0.0	0.0
JCP&L Street Lighting Acct #: 100 005 846 462	0.00	0.00	0.00	0	0	0	0.0	0.0	0.0
Incandescent Street Lighting	5.01	0.00	5.01	29,235	0	29,235	0.0	0.0	0.0
Incandescent Street Lighting	14.63	0.00	14.63	85,333	0	85,333	0.0	0.0	0.0

Location	Annual Energy Cost Savings (Fixtures)	Annual Energy Cost Savings (Controls)	Total Annual Energy Cost Savings	Installation Cost (Fixtures)	Installation Cost (Controls)	Total Installation Cost	NJCEP Incentives (Fixtures)	NJCEP Incentives (Controls)	Total Incentives
JCP&L Street Lighting Acct #: 100 005 846 348	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Mercury Vapor Street Lighting	$111.59	$0.00	$80.03	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Mercury Vapor Street Lighting	$17,417.62	$0.00	$14,544.82	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
						$0.00			
JCP&L Street Lighting Acct #: 100 005 846 405	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Sodium Vapor Street Lighting	$42.42	$0.00	$47.46	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Sodium Vapor Street Lighting	$32.28	$0.00	$17.88	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Sodium Vapor Street Lighting	$1,097.48	$0.00	$664.88	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Sodium Vapor Street Lighting	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Sodium Vapor Street Lighting	$2,705.88	$0.00	$1,340.76	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Sodium Vapor Street Lighting	$936.08	$0.00	$518.48	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Sodium Vapor Street Lighting	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Sodium Vapor Street Lighting	$6,155.10	$0.00	$2,974.14	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
						$0.00			
JCP&L Street Lighting Acct #: 100 005 846 462	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Incandescent Street Lighting	$5,681.06	$0.00	$8,839.46	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Incandescent Street Lighting	$16,582.06	$0.00	$13,255.18	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Location	Net Cost (Fixtures)	Net Cost (Controls	Total Net Cost	Payback w/o Incentives in Years (Fixtures)	Payback w/o Incentives in Years (Controls)	Combined Payback w/o Incentives in Years	Payback w/ Incentives in Years (Fixtures)	Payback w/ Incentives in Years (Controls)	Simple Payback w/ Incentives in Years
JCP&L Street Lighting Acct #: 100 005 846 348	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mercury Vapor Street Lighting	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mercury Vapor Street Lighting	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
JCP&L Street Lighting Acct #: 100 005 846 405	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium Vapor Street Lighting	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium Vapor Street Lighting	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium Vapor Street Lighting	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium Vapor Street Lighting	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium Vapor Street Lighting	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium Vapor Street Lighting	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium Vapor Street Lighting	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium Vapor Street Lighting	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
JCP&L Street Lighting Acct #: 100 005 846 462	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incandescent Street Lighting	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00
Incandescent Street Lighting	$0.00	$0.00	$0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX B: JCP&L MUNICIPAL LIGHTING HANDBOOK

Please refer to the link below.

https://www.firstenergycorp.com/content/dam/customer/OpCoHome/files/municipal-lighting-handbook.pdf