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A Best Practices Guide for Multi-Municipal Aggregation Programs

Lessons Learned from DVRPC's

REGIONAL STREETLIGHT PROCUREMENT PROGRAM

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

The Delaware Valley Regional Planning Commission is the federally designated Metropolitan Planning Organization for a diverse nine-county region in two states: Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer in New Jersey.

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

DVRPC's vision for the Greater Philadelphia Region is a prosperous, innovative, equitable, resilient, and sustainable region that increases mobility choices by investing in a safe and modern transportation system; that protects and preserves our natural resources while creating healthy communities; and that fosters greater opportunities for all.

DVRPC's mission is to achieve this vision by convening the widest array of partners to inform and facilitate data-driven decision-making. We are engaged across the region, and strive to be leaders and innovators, exploring new ideas and creating best practices.

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CHAPTER 1:

Introduction

Purpose of this Guide

Multi-municipal aggregation programs can be incredibly valuable to assist local governments with implementation of projects. Aggregation programs, as described in this guide, will remove several key technical, procurement, and decision-making challenges that local governments face. This guide includes the best practices and lessons learned from DVRPC's Regional Streetlight Procurement Program (RSLPP), a multi-municipal aggregation program designed to enable conversion of LED streetlighting systems. This guide provides step-by-step information that will assist regional and multi-government groups with developing and implementing a multi-local government / aggregation procurement and implementation program, specifically for LED streetlight conversions. The lessons learned can also be applied to other applications of aggregated procurement and implementation for local governments. DVRPC is in the process of using the best practices included in this guide to develop additional implementation programs for local governments in southeastern Pennsylvania.

This guide also attempts to evaluate the pros and cons of the two distinct procurement methods that DVRPC used when implementing the two rounds of this program— energy performance contracting and design-bid-build. These two contracting methods are commonly used by local governments for construction projects, and this guide is intended to help municipalities and program administrators navigate which mechanism may work best for their projects when done at a regional or multi-municipal scale. The intended audience are those who might seek to implement a similar program, such as regional planning commissions, council of governments, or counties. This guide may also be useful for municipalities and other local governments to understand the value and process of working together. It may be used to educate internal stakeholders, and to clearly define a plan for structuring a similar program.

Outline of this Guide

Understanding an Aggregation Program

- About the Regional Streetlight Procurement Program (RSLPP)
- Key elements of an Aggregation Program
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CHAPTER 2:

Understanding an Aggregation Program

Regional Streetlight Procurement Program (RSLPP)

The Regional Streetlight Procurement Program (RSLPP) was first launched by DVRPC in 2015. DVRPC is the Metropolitan Planning Organization and Regional Planning Commission for the Greater Philadelphia Metropolitan Area. DVRPC provides planning services to our counties and municipalities throughout the nine-county region of southeastern Pennsylvania and southern New Jersey.

The RSLPP leverages the purchasing and decision-making power of multiple municipalities in the region to procure, develop, and implement LED streetlight conversion projects for each participating municipality. The RSLPP was developed by DVRPC in 2015 to provide small and medium-sized municipalities in southeastern Pennsylvania with a turnkey approach to implementing an LED streetlight conversion project. Municipalities seek to convert streetlighting systems to LED to reduce energy and maintenance cost, improve lighting quality in their community, and lower their carbon footprint. DVRPC's turnkey aggregation approach addresses many of the barriers that small and medium-size municipalities face when implementing planning projects, such as securing funds for a project with high upfront cost, navigating the procurement and contracting processes, engaging effectively with the utility, and confidence in decision-making on a technical project.

There are 238 municipalities in the four suburban counties of southeastern PA, with an average population size of under 10,000. The majority of municipalities lack the staffing capacity, in-house technical expertise and in some cases the funding to confidently implement an LED streetlight conversion project. By working cooperatively through the RSLPP, these municipalities can aggregate their purchasing and decision-making power to realize lower costs, leverage shared technical expertise, and overcome procurement costs and barriers to confidently navigate these projects.

DVRPC has offered two rounds of the RSLPP to municipalities in the suburban counties of southeastern Pennsylvania since 2015. Two different program models were used in each round: In Round 1 (2015–2018), Energy Performance Contracting was the contractual mechanism that was used for project development and construction. In Round 2 (2018–2020), DVRPC managed a Design-Bid-Build process on behalf of participants to enable project development and construction. See the next section of this report for a comparison of these two contracting mechanisms. Each round of RSLPP has included turnkey services for municipalities who wish to implement a new LED streetlight system including auditing and design services, procurement, standardized contracts, financing, project management of construction support, utility engagement, and financing. Each round of the RSLPP was organized into four phases including 1) Feasibility, 2) Project Development, 3) Construction, and 4) Post-Construction Operations and Maintenance (O&M). All municipalities participating in the RSLPP follow a common timeline of steps through the four phases of the program, and these phases are accompanied by significant technical, procurement, legal and contractual support from DVRPC and its hired consultants.

Key Elements of the RSLPP

- **Turnkey**: The program provides all aspects of an LED conversion process and the ability to leverage a pool of financing.
- **Solicitations**: All solicitations are issued by DVRPC on behalf of municipalities.
- **Common timeline**: Parallel project steps ensures municipalities can confidently proceed through the LED conversion process.
- **Pooled buying power**: Economies of scale results in lower pricing on products, labor, and services provided through the program.
- **Expert vetting**: Products and services are vetted by experts, so the program achieves the highest quality at lowest possible price.
- **Full transparency**: on all products, labor, pricing, and design strategies can boost municipal decision-making confidence.

Structuring an Aggregation Program

There are two contracting mechanisms that can be used when structuring an aggregation program — **Energy Performance Contracting** and **Design-Bid-Build**. These two procurement methods are commonly used by local governments for construction projects and they are described below. Regional Organizations will need to decide which contracting mechanism to utilize when launching an aggregation program.

Energy Performance Contracting (EPC)

Energy Performance Contracting (EPC) is a contract between a facility owner (in this case the municipality) and an Energy Services Company (ESCO) that allows the owner to pay for a project that is developed and managed by the ESCO using the project's future energy savings. Since operational savings are used to pay off the project cost, they are not considered capital projects and thus result in more flexible financing options for municipalities. Through an Energy Performance Contract, the municipality contracts with a single ESCO, and the ESCO subcontracts. This type of contracting is supported by the Pennsylvania Guaranteed Energy Savings Act (GESA).

The Pennsylvania Sustainable Energy Finance Program (PennSEF) supports municipal use of EPCs. DVRPC partnered with PennSEF to administer the RSLPP.

Key Consultant that is Hired: Energy Services Company (ESCO)

Key Elements of a Program Centered Around Energy Performance Contracting:

- The regional entity (in this case DVRPC or other metropolitan planning organizations, regional commissions, or groups of municipalities) does not have to develop and manage a subcontracting process, so this model may be more suitable for entities with less technical capacity and staffing time.
- There is no upfront cost to municipalities or the regional entity. The ESCO provides a feasibility study for free to participants, and all project development services (e.g., auditing, design) are rolled into the cost of the EPC.
- Energy Performance Contracts are typically scaled for larger projects. This model allows municipalities that would otherwise typically not have access to this contracting mechanism gain access due to the scale created by aggregating municipalities together.
- EPCs will typically result in a more expensive project for municipalities overall, compared to Design-Bid-Build, as a result of the cost of the Savings Guarantee, a lack of transparency on vendor solicitations because the regional entity does not have control over the subcontracting process (the ESCO does this), and the overhead cost of the ESCO. When compared to design-bid-build, EPCs will often lead to a more expensive project with less transparency for the regional entity and municipalities. The increase costs result from the ESCO's overhead— they control the subcontractor selection process and workflow— and the Savings Guarantee itself.

How Energy Performance Contracting Impacts the Aggregation Program:

- The regional entity issues a Request for Proposals (RFP) for technical advisors to the program, including a Legal Advisor and a Designer. The Legal Advisor assists with contracting and procurement guidance. The Designer provides unbiased support of project management of the ESCO to DVRPC and on a one-on-one basis to municipalities. In Pennsylvania, the PennSEF program will provide access to a Legal Advisor so the regional entity may not need to competitively select a Legal Advisor for their program unless they wish to do so.
- The regional entity issues an RFP for an Energy Services Company on behalf of municipalities.

- The RFP process invites a single ESCO to serve the program. As per the Guaranteed Energy Savings Act, the invited ESCO must provide no-cost preliminary audits to the municipalities listed in the RFP.
- The RFP locks in equipment specification and pricing. This was done by including a specification of equipment in the RFP, requiring respondents to provide lighting solutions and pricing for all equipment specified.
- The RFP locks in service costs for ESCO service work during project design and construction phases, provided by the ESCO in their proposal, represented as a percentage of the overall contract amount.
- The RFP locks in installation pricing provided by the ESCO in their proposal, based on prevailing wage.

Design-Bid-Build

Specific to this model of the RSLPP, the Design-Bid-Build contracting approach results in a construction contract between a facility owner (in this case the municipality) and the program-selected installation partner. The program lead (in this case the Regional Entity on behalf of the municipality), must competitively solicit for all aspects of a streetlight project, including project development services and the vendors required for construction, so that municipalities can piggyback off of these contracts.

Design Services Professional (DSP) is hired to contract with each municipality for project development and management services, including auditing and designing municipal streetlighting systems, developing streetlight conversion projects, and managing construction contracts on behalf of municipalities. The DSP also works with the regional entity to develop solicitations for all required vendors for this project, including Manufacturers for all equipment, a Distribution Partner to order, track receive and ship equipment to the project site, and an Installation contractor who is responsible for installing the equipment. The regional entity contracts with vendors in each category, and then "assigns" the manufacturer and distributor contracts to the construction contract with the selected installer contract, allowing municipalities to piggyback off of a "fully-assigned" construction contract with the installer that includes all of the products, services, pricing, and terms and conditions that DVRPC locked in to their contracts with each vendor. The DSP is responsible for developing a project proposal for each municipality that serves as the basis of their construction contract with the installer, and references the equipment and pricing that was selected during the vendor solicitation process. Each municipality's construction contract with the installer is managed by the Design Services Professional on behalf of the municipality.

Key Consultant that is Hired: Design Services Professional

Key Elements of a Program Centered Around Design-Bid-Build:

- There is upfront cost for this method for municipalities, including the cost of the feasibility study and the cost for project development services (e.g., auditing, design). DVRPC paid upfront for the feasibility studies for municipalities but needed to find a funding source to provide this.
- The regional entity must be capable of running solicitations and contracting for all products and services for this work with the support of the DSP. Therefore, it may require more procurement, legal, and technical capacity to manage the DSP model than the EPC model. As a result, however, the regional entity likely will experience greater control, pricing, and transparency of project through solicitation processes.
- This contracting model is typically well suited for smaller and less complex projects like street lighting.
- Project costs are typically less expensive for municipalities overall due to the control over the solicitation process.

Aggregation Model:

- The regional entity issues an RFP to identify a Legal Advisor to provide contracting and procurement guidance to the program.
- The regional entity issues an RFP to hire a Design Services Professional (DSP) on behalf of the participating municipalities to serve the program. A DSP is responsible for project development (vendor selection, design, and auditing) and project management of the construction contract but is not responsible for any aspect of construction. This RFP resulted in a contract between DVRPC and the DSP that:
    - Required the DSP to provide free feasibility studies to all participating municipalities (under contract to DVRPC).
    - Provides the legal procurement basis for municipalities to contract with DSP for all project development (auditing, design, and procurement), project management of construction, and post-construction operation and maintenance services. Municipalities seeking these services will piggyback off of DVRPC's contract to directly contract with the DSP for the services in these phases.
    - Locked in pricing for all DSP auditing and design services to develop an Investment Grade Audit for each municipality's proposed project.
    - Contracted with DVRPC to partner closely on program development and delivery, and in Phase 2 to develop and issue the required vendor solicitations for distributor, manufacturer, and installation contractors.
- The regional entity works with the DSP to issue solicitations for all required vendors for the program, including manufacturers, distributor, and installer.
- Each municipality contracts with the DSP for project development services (auditing, design, and procurement), resulting in a final project proposal that serves as the basis of the construction contract with the installer.
- Each municipality contracts with the program-selected installer for construction, and this contract is managed by the DSP using the final project proposal as the basis of the scope of work in the construction contract.

Comparing RSLPP Round 1 and Round 2

Energy Performance Contracting

Consultant Hired: Energy Services Company (ESCO)
Solicitations Run: Two (RFP for ESCO, e-mail bid for program technical advisor)
Financing: Available through Univest Bank and PA Treasury, arranged by PennSEF
Number of Participants:

- 45 municipalities entered program
- 35 municipalities proceeded with a contract to convert their streetlights

Total Installed: 25,000 streetlights (Cobrahead, decorative), >1,000 area fixtures, >5,700 traffic signals, manual and wireless controls
Individual Project Size: Ranged from 60–3,500 fixtures (average 765)
Individual Project Cost: Ranged from $24K– $2.2M (average $373K)
Total Program Cost: $14 Million
Source of Funds: 24 municipalities used program-arranged financing, 11 used internal funds
Payback: 3–20 years, 10.4 yr. average $16 million net energy and operational cost savings over 20 years

RSLPP Round 1 Pricing Per Light

Cobrahead (35W)	$124.59
Installation	$97.50
ESCO Service Costs	$63.07
Photocell	$9.54
M&V	$10.61
Total Cost	**$305.31**

Design-Bid-Build

Consultant Hired: Design Services Professional (DSP)
Solicitations Run: Five (RFPs for DSP, Legal Advisor, Installer, Distributor, Manufacturers)
Financing: Available through the Delaware Valley Regional Finance Authority with support from counties
Number of Participants:

- 26 municipalities entered program
- 26 municipalities proceeded to Phase 2. As of March 2021, all municipalities have entered construction or intend to

Total to be Installed: 15,000 streetlights (Cobrahead, decorative), 300 area fixtures, 6,500 traffic signals, manual and wireless controls
Individual Project Size (Streetlights Only): Ranged from 21–3,710 fixtures (average 539)
Individual Project Cost: Ranged from $34K– $1.3M (average $263K)
Total Program Cost: $6.8 Million
Source of Funds: 9 municipalities used or intend to use program-arranged financing, 17 used internal funds
Payback: 3–20 yrs, 8.3 yr. average
$10.6 million net energy and operational cost savings over 20 years

RSLPP Round 2 Pricing Per Light

Cobrahead (35W)	$92.00
Installation	$104.70
DSP Services Cost	$34.00
Photocell	$9.32
Distribution	$8.11
Total Cost	**$248.13**

RSLPP - How it Works: The Four Phases

All participants in the RSLPP followed a common timeline of steps organized in the following four phases of a LED conversion process. Each phase is described in greater detail starting on page 18 (Step 5: Execute your Program) of this report.

CHAPTER 3:

Step-by-Step: How to Set Up an Aggregation Program

Step 1: Identify Your Overall Program Structure

Step 1A
Determine the Appropriate Model: EPC or Design-Bid-Build

Energy Performance Contracting

- Fewer solicitations and project management—may be more suitable for entities with less technical capacity and staffing time.
- There is no upfront cost to municipalities. The Regional entity may still need to hire a legal and technical advisor.
- Typically scaled for larger projects.
- More expensive project for municipalities overall than Design-Bid-Build.

VS

Design-Bid-Build

- May require more technical capacity to manage multiple solicitations, but will likely result in greater control, pricing and transparency of project through solicitation processes.
- Upfront cost to the Regional entity and/or municipalities.
- May be more suitable for smaller/less complex projects like street lighting.
- Less expensive projects for municipalities overall.

Learn more about these two models on page 4 of this report, under *"Structuring an Aggregation Program."*

Step 1B
Evaluate Whether to Include a Program Fee

Program Fees

The regional organization will likely accrue upfront fees associated with hiring a technical advisor and a legal advisor to run solicitations and help guide program development. Your regional entity may wish to consider a program fee to recoup its upfront costs from municipalities as a percentage of each municipality's contract signed through the program. DVRPC did this at 5 percent on the contracts with the Design Services Professional, and up to 3 percent on each municipality's construction contract. These program fees were established at the beginning of the project, and municipalities were required to agree to them to participate. DVRPC intends to use recouped upfront fees in order to pay for upfront costs associated with its next local government aggregation program.

Step 1C
Identify the Team Members and Their Roles:
Team members will be consistent for both models, though their roles may vary.

Project Team

Below is a listing of project team members that the regional entity should be expected to partner with for a multi-municipal streetlight program. The team members will be consistent for both models, though their roles may vary. Some of the team members listed below will be brought on before the program is launched, and some will be brought on after the program is launched. It is important to become familiar with the project team roles before you launch your program to ensure you have the staffing capacity and procurement capability to manage the team.

The Regional Entity: The regional entity is the lead that designs and manages the program on behalf of participating municipalities. As the lead, this entity should be prepared to convene and facilitate the program as well. The regional entity will be responsible for program outreach, development of all solicitations, gathering data from program participants, managing the work of the legal advisor and the ESCO or Design Services Professional, managing overall program timeline and communication of next steps to municipalities, tracking program status, and addressing road blocks or barriers as they arise.

Municipal Steering Committee (MSC): A municipal steering committee serves several functions: 1) participating in the selection committee for all solicitations, 2) vetting key program decision points, 3) serving as a pre-assembled team of advocates for other program municipalities in cases when the program needs to negotiate a solution with the ESCO or other external partner (such as the utility), and 4) having another line of communication to better understand what concerns and successes municipalities are experiencing with the program day-to-day. Municipal steering committee member commitments typically involve participating in conference calls one to two times a month to evaluate program decisions, and if applicable, review solicitations (especially for the Program Advisor/Owners agent or ESCO).

To establish a municipal steering committee, DVRPC made an open call for volunteers during each RSLPP round and sought to have at least one representative from each county serve on the MSC. When not enough individuals volunteered, DVRPC self-selected municipal representatives and inquired if they were interested—in almost all cases, these individuals were willing to serve this role. You should seek a single staff person from a handful of municipalities participating in the program to serve on the MSC. MSC members do not have to be lighting experts themselves. Rather, it is helpful to have a member who is aware of the timing, administrative and communication needs of municipalities in your region, and are willing to speak openly about program concerns. Typically, steering committee members are municipal managers or other administrative staff that support the municipality's elected bodies through day-to-day decisions. Public works, finance staff, or even elected officials themselves may be appropriate steering committee members as well.

Utility: Your utility partner is an essential component to your program team, and bringing this partner on board as early as possible is recommended. With your utility, you can communicate openly about tariff rates, streetlight buybacks (if applicable), billing, or rebates (if applicable). DVRPC's RSLPP intentionally aligned with the geographic service territory of PECO, the investor-owned utility of southeastern PA. It was important that DVRPC and PECO had an open line of communication to work through billing processes, given that streetlight service in PECO territory is un-metered and a large quantity of bill updates would be required for municipalities to achieve their project savings. DVRPC, the ESCO or DSP, and PECO proactively worked to develop a bill update process in anticipation of each Round of the Program to ensure that the utility could handle the volume of bill updates that were occurring as part of the program.

Step 1C
Identify the Team Members and Their Roles:
Team members will be consistent for both models, though their roles may vary.

Program Technical Advisor and Owners Agent: A Program Technical Advisor will be necessary for both models, unless significant streetlighting expertise exists in-house. The Program Technical Advisor plays a critical role to the success of your program, so it is important to identify a trusted advisor. The ideal qualifications and the roles are:

Program Advisor and Owners Agent for the ESCO model: If internal expertise on streetlighting does not exist, a third party advisor should be brought on to assist with the development of the ESCO RFP, the program-level management of the ESCO, and to serve (on a contractual basis) as an "owners agent" to municipalities who seek that assistance to help manage their contract with the ESCO. The Program Advisor can also support with additional negotiation or engagement activities that may occur throughout the program, such as working with the utility, and oversight of the ESCOs procurement.

Program Advisor for the Disaggregated model ("Design Services Professional"): In the disaggregated model, the project consultant served the role of the program advisor and thus becomes more direct and integral to the function of the program.

Program Advisor/Owners Agent Qualifications (both models): For either model, the regional entity should seek to hire a program advisor that has as many of the following qualifications as possible:

- Lighting certified
- Experience managing complex lighting projects— from solicitation through construction
- Excellent oral and written communicator
- Experience working with municipal clients is ideal
- Collaborative and patient approach to the work (you do not want someone to come in and tell you how it is done, you want someone who will collaborate with you on the unique aspects of your region's municipalities and program goals)

Project Consultant: The Regional Organization will need to solicit for an Energy Services Company or a Design Services Professional depending on which contracting model is used in the aggregation program. The ESCO or DSP will be responsible for project development services including development of a feasibility study, a field audit, system design, the development of a final project proposal, and the project management for each municipality's project. In the Design-Bid-Build model, the DSP will also be responsible for assisting the regional organization with developing and evaluating all vendor solicitations—for manufacturers, installer, and distribution partners.

- Resources:
  - RSLPP RFP for ESCO (RSLPP Round 1)
  - RSLPP RFP for Design Services Professional (RSLPP Round 2)

Step 1C
Identify the Team members and Their Roles:
Team members will be consistent for both models, though their roles may vary.

Legal Advisor: If your organization does not have in-house legal counsel, a legal advisor will be required for both models as there are significant procurement, contracting, and finance questions that will arise for your organization. In Round 1, DVRPC's Partnership with PennSEF provided this capacity, and legal costs were applied to each municipality's construction contract. This model proved challenging for the PennSEF team, as not all municipalities proceeded to construction, and legal services were therefore provided at-risk until the construction period. In Round 2, DVRPC hired a legal advisor up front and paid for its services using a portion of a grant DVRPC received from the Pennsylvania Department of Environmental Protection, and DVRPC later plans to recoup these upfront legal costs through program fees for municipal participants. Your organization should seek to find a legal advisor that has experience with development of construction contracts, knowledge of cooperative procurement law, and (if using the ESCO model) state performance contracting statute. Experience with municipal financing and procurement is also essential.

- Resource: RSLPP RFP for Legal/Contracts Advisor

Financial Partner: For each round, DVRPC sought to arrange financing available to all municipalities in the program, regardless of an individual municipality's project size, payback period, or past-borrowing credentials. By arranging financing for the program, the lender is able to see this group of municipalities as a portfolio (with potentially many new clients), while the lead regional entity helps lower the administrative burden to the lender by assisting with communicating and gathering all required information from municipalities, and facilitating communication between team members.

However, financing can be one of the more challenging aspects to arrange for the program, but also the most critical to implementation of municipal projects. Ideally, you should find a financial partner who is willing to provide as many of the financial objectives listed in Appendix B under Financial Partner Qualifications as possible. The timing of bringing a financial partner on board may be challenging, as municipalities in the program will likely not be able to decide on financing until they bring the decision to enter into a construction contract before their elected bodies. This means that your program must identify a financial partner before it can guarantee municipal participation. Identifying a financial partner after municipal decisions are made would cause significant delay between signage of construction contracts and construction start, and would require a municipality to make a decision based on significant unknowns relative to the cost of financing.

- Resource: See Appendix B for a list of financial partner qualifications.

Step 1C
Identify the Team Members and Their Roles:
Team members will be consistent for both models, though their roles may vary.

Vendors: There are three essential vendors required for any street lighting project: Distributors, Manufacturers, and Installers. With the ESCO model, the ESCO will be responsible for subcontracting with these vendors, and sometimes these vendor services (such as installation) are included as part of an Energy Services Company's team in addition to their auditors, designers, and construction project managers. In the Design-Bid-Build disaggregated model, it will be the responsibility of the regional entity to procure and contract with these vendors on behalf of participants (municipalities then piggy-back off these contracts). For both rounds of the RSLPP, DVRPC sought to identify vendors that provided the highest quality product or service at the lowest possible price, which included evaluating manufacturer products on a lifecycle basis. In Round 1, while the ESCO was responsible for subcontracting to these vendors, DVRPC and its program advisor were able to evaluate the products selected by including a specification upfront in the RFP for the ESCO. In Round 2, Requests for Proposals were the best way to achieve these qualifications with price as a consideration for all vendors. Below are general guidelines on soliciting for each vendor to ensure the highest quality of services and products.

Distributor: Streetlighting projects are field-based and require several SKUs (stock-keeping units), or types of lighting products, for each municipal project. In your RFP, include the ability to evaluate distributor partners based on experience with distribution on a large complex project, experience with streetlighting projects specifically due to their complex nature, proof of a clean and organized warehouse, and a web-based user portal to track purchase orders, delivery dates, and change orders. You also should evaluate distributors based on pricing (material markup percent) and their net payment requirements for purchases. During the evaluation, be sure to visit the distributor's warehouse and test their online communication portal. If you hire an ESCO to manage this process, you may not be able to participate in the evaluation of the distributor, and therefore will lose the ability to understand the distributor markup and evaluate their performance. Typically, a single distributor selected for the program will be easiest to manage for all parties and will be easiest from a contracting perspective. A single distribution partner was used for each round of the RSLPP.

- Resource: RSLPP RFP for Distribution Partner Services

Manufacturers: Evaluation of streetlighting products will be a technical endeavor that should be managed by a third-party entity (not affiliated with any manufacturer or distributor), such as your hired Program Advisor/Design Services Professional. If you hire an ESCO to manage manufacturer solicitations, be sure to include required minimum equipment specifications in your RFP for the ESCO to allow you to evaluate on cost of manufacturer products that the ESCO will use (you will likely need your Program Advisor to assist with the development of these minimum specifications). Additionally, build into your RFP for the ESCO that you will have your Program Advisor evaluate selected products. The disaggregated Design-Bid-Build model will give your program more flexibility to design a comprehensive RFP from which to evaluate manufacturers directly, and again this RFP would be developed by the Design Services Professional. Several manufacturer products will need to be evaluated and therefor several manufacturers will need to be selected to partner in the program.

Step 1C
Identify the team members and their roles:
Team members will be consistent for both models, though their roles may vary

Manufacturer streetlighting products needed include cobraheads, a variety of decorative lighting and their retrofit kits, photocontrols, and network controls (if desired). DVRPC also evaluated for area lighting (e.g., wall-packs, shoe-box fixtures), traffic signals and pedestrian signs due to the desire for this equipment to be included in municipal projects. No matter the method, when evaluating manufacturer products, a lifecycle cost should be used to evaluate cost if possible that takes into the energy use and maintenance cost of each fixture over the life of the system (RSLPP used 20 years across manufacturers in its evaluation). A non-exhaustive list of additional evaluation measures includes lighting performance (e.g., photometric performance, availability of a range of color temperatures), warranty duration, product lead times, presence on market (take extra care to evaluate products that do not have a multi-year performance track record), appropriate certifications (such as Design Lights Consortium or UL-listed). For greater detail on how manufacturers were evaluated, please see DVRPC's RFPs.

- Resources:
  - US DOE Municipal Solid State Lighting Consortium Model Specification
  - RSLPP RFP for Manufacturer Product Solutions

Installers: Installers will be responsible for much of the day-to-day implementation and communication of each municipal project, and therefore are critical front-facing members of the team. The RSLPP evaluated installers for project management capabilities (such as change order management, field status reporting), pricing and efficiency (per unit pricing on typical service items and the rate at which those service items could be installed (#/day)), and general contractor capabilities (such as relevant experience on projects similar to this volume and geography). In the DVRPC region, many municipalities have existing relationships with local installers, so municipal opinion weighed heavily in the evaluation and recommendation of this vendor in particular.

- Resource: RSLPP RFP for Installation Partner

Step 2: Recruit Participants

Step 2A
Initial Recruitment

Once the regional entity has developed its conceptual model for the program, the first step is to vet this model through candidate municipalities and then modify as needed. DVRPC used a two-page concept memo to describe the program and its timeline, and vetted this through a handful of interested municipalities, and revised as needed.

Step 2B
Formal Recruitment

The next step is to formally recruit participants. This can take from 1–3 months, and it should include clear deadlines for municipal participation.

Host an in-person workshop

to present the program to all interested municipalities at a centrally-located site in the region. Invite all municipalities by group email, and follow-up by phone to the municipalities who you expect are interested. During workshop, highlight participation requirements, program timeline, and expected outcomes. Clearly communicate any next steps and deadlines so that municipalities leave the workshop with an expectation to engage with your organization on the program.

Draft a letter of intent

A letter of commitment/intent should be provided for each municipality to participate in the program, that should do the following:

1. Authorize the regional entity to issue cooperative procurement solicitations on behalf of each municipality,
2. Clearly identify the program fees required and state that by signing municipality agrees to pay,
3. Outline upfront data requests (such as utility bills or surveys) that municipalities will be expected to fulfill prior to solicitations.

This letter should be provided at the in-person workshop, with a clear due date.

Gather Data

Gather the upfront data from each municipality. For the RSLPP, this data included a copy of the municipality's most recent streetlight and traffic signal bill from the utility company, a list of key contacts for each municipality (including the key point of contact who would be responsible for day-to-day direct communications about the program), and a completed "needs assessment survey" that DVRPC distributed via Survey Monkey. This data is then compiled ahead of your RFP for either an ESCO or a Design Services Professional, to provide a sense of overall scope or potential of procurement volume for future vendor solicitations.

Step 3: Get Ready to Launch

Step 3A
Hire Initial Project Team

At the outset, the regional entity will need to contract with a legal advisor, a technical advisor, and a Project Consultant. These partners provide initial services to the Regional Entity in developing and launching the program. See Step 1 for more information on roles and qualifications for these solicitations.

- Resource: DVRPC RFPs for
  - Project Consultant (ESCO or Design Services Professional)
  - Legal and Contracts Advisor

Step 3B
Engage Your Utility Company

Convene a meeting with your utility partner early in the program. Once the Project Consultant is on board, a meeting between the consultant and the utility facilitated by the regional entity will be necessary as well. The Utility Company will be responsible for updating municipal bills after— and sometimes during— construction/installation. It is important that each entity— the Regional entity the Project Consultant, and the Utility Company clearly understand tariff rates, streetlight buyback processes (if applicable), billing, and rebates (if applicable).

Step 3C
Identify Additional Sources of Funding

Streetlight projects carry a strong and reliable payback. DVRPC therefore did not encourage municipalities to pursue grants that instead could be used for other projects that do not carry a payback. However, in addition to arranging financing for municipalities that do not have upfront capital, DVRPC evaluated supplemental funding sources. These sources include utility and ISO (International Organization for Standardization) rebates, along with state-level transportation funding allocations available to each municipality. In the DVRPC region, this included PECO Smart Ideas rebates, PJM Capacity Market Rebates, and municipal Liquid Fuel Fund Allocations from PennDOT.

Step 4: Kickoff Program with Consultants

Step 4A
Establish a Clear Communication Protocol

Establish a clear communication protocol between the Program Consultant and the Regional Entity and between the Program Consultant and municipalities. For example, DVRPC hosted weekly project check-ins with its consultant team. DVRPC established that it would reach out to municipalities on all whole-program deadlines and next steps. DVRPC would also be responsible for setting up most one-on-one meetings between the ESCO or DSP and each municipality, while the ESCO or DSP would be responsible for one-on-one engagement on all project development-related communication specific to each individual municipality (and most often this correspondence would be copied to DVRPC).

Step 4B
Refine Program Goals and Expectations

While you may have clearly explained all of your program goals and expectations in your RFP for the Program Consultant (ESCO or DSP), and while the Program Consultant may have written an excellent proposal for the work, it is still important to meet in person to go through each step of the program to ensure that you are on the same page regarding goals, outcomes, and specific deliverables. It is important to do this initially at kickoff, but be prepared to continue to revisit this step throughout the program, and be sure to prepare your organization and your Program Consultant to be flexible to any needed changes when they arise.

Step 4C
Define Overall Program Timeline

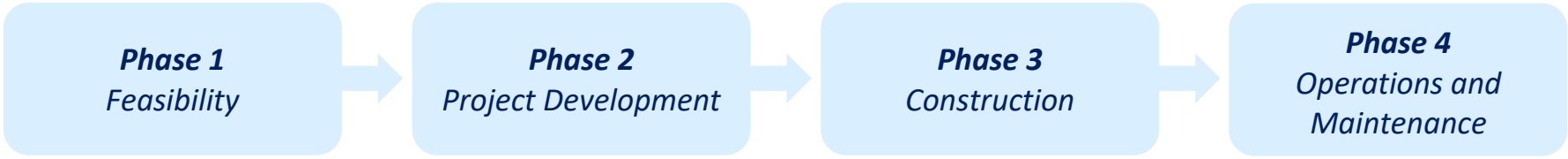
Revisit the timeline defined in the RFP or the Program Consultant proposal and refine as needed now and along the way. Delays can occur with consultant deliverables, municipal decision-making, navigating bureaucracies, and even within the supply chain. These delays may require that the whole program timeline be adjusted. Anticipate delays throughout and include buffers and check-in points to revisit the timeline. While delays may be frustrating to the regional entity, municipalities typically are understanding of these timeline shifts if they are clearly and transparently communicated.

Step 4D
Transfer Data

Share all data that you have received from municipalities with the selected ESCO or DSP so that they can begin preparing to meet one-on-one with each municipality. For the RSLPP, this included copies of streetlight and traffic signal utility bills as well as the responses from the needs assessment survey, and the full contact list for each municipality (clearly identifying the main point of contact and the list of all municipal contacts who should be included on any email coming from the ESCO or DSP).

Step 5: Execute Your Program

This section provides a detailed overview of the four phases of the RSLPP.



Phase 1
Feasibility

The Feasibility Phase provides an introduction for each participating municipality to the overall process as well as a one-on-one review of the costs and savings of a streetlight conversion project in their community. Municipalities can then prepare internal staff and elected officials to decide to proceed with the project. The phase consists of the following:

Host an in-person kickoff meeting: Work with your consultant to prepare an in-person kickoff meeting for all municipalities that clearly explains the four phases of the program, the expected timing for each phase, and what will be expected from each municipality during each phase. This face-to-face meeting is the opportunity to introduce your new ESCO or DSP to the municipalities and reinforces that this is a regional program with many participants working towards a common goal. Make sure that they walk away from the meeting aware of their immediate next steps and how to contact you if any questions arise after the meeting. If possible, also invite other key team members to this meeting, such as the utility, to keep them included in the process and allow them to show their support.

Arrange one-on-one needs assessment meetings with each municipality and the DSP or ESCO: This step provides an opportunity for the DSP or ESCO to meet face-to-face with all relevant municipal staff in each participating municipality. Prior to this, the ESCO or DSP should have reviewed all municipal data and information that was provided by the regional organization, and they should be prepared with additional questions for each municipality on project goals and objectives. For the RSLPP, DVRPC scheduled these meetings for the DSP or ESCO by arranging centralized municipal “host sites” around the region where municipalities could come and meet with a stationary ESCO or DSP at a selected time arranged by DVRPC.

Deliver feasibility studies (also known as Preliminary Audits): The Feasibility Study is an important decision-making tool for municipalities to consider whether or not to pursue an LED conversion project, and it is the key deliverable of this phase. An important consideration is whether municipalities will be charged an upfront cost for this study (See page 9 under “evaluate whether to include a program fee” for an overview of how to make this decision). The Feasibility Study should be a clear and concise report that provides a baseline of current costs for the municipality’s streetlighting system, an inventory of existing equipment, as well as a detailed analysis of the costs and savings associated with an LED conversion. See Appendix C for a sample Feasibility Study. The regional entity managing the program should be prepared to assist with the feasibility study in two ways:

1. Provide feedback on the study format to ensure it is transparent, concise, and easy to understand.

2. Assist in gathering and evaluating data sources. See Appendix A for a list of data sources for streetlight projects, including how the Regional Entity can assist with gathering this data.

Decide to proceed to Phase 2: At the conclusion of Phase 1, municipalities must decide whether or not to proceed to Phase 2, project development. Up until this time, municipalities have not committed financial resources to the program. A decision to proceed to Phase 2 is a commitment to sign a contract with the selected vendor (ESCO or DSP) for all project development-related services such as field auditing, system design, and procurement. The pricing for these services should have been locked in through the RFP that the regional entity developed to select the ESCO or DSP. The role for the regional entity includes:

1. **Develop template resolution** for municipalities to pass that authorizes the municipality to sign a contract with the DSP or ESCO for project development services. This resolution will need to reference the procurement method used by the regional entity that the municipalities are leveraging.

2. **Develop template contract with the DSP or ESCO for municipalities to proceed to Phase 2**. This is a program-wide contract that all municipalities must use to proceed to Phase 2. Consistency in the contract across the program saves time for the ESCO or DSP so they do not have to undergo an arduous contracting process with each individual municipality. It ensures that terms and conditions that protect the municipality are provided for in the contract and makes the contract process easier for the municipality because their solicitors and decision-makers can have trust in a program-developed contract.

Phase 2
Project Development

Phase 2 is the beginning of the financial commitment for municipal participants. During this Phase, municipalities who have passed a resolution to proceed to Phase 2 sign a contract with the selected vendor (ESCO or DSP) to "develop" a project proposal that will serve as the basis of the construction contract.

Develop and issue all required solicitations for vendor equipment and services: Any streetlight project will need to secure equipment manufacturers, a distribution partner or partners, and installers. For RSLPP Round 1, DVRPC ran only the initial solicitations for the ESCO and the program technical advisor, and all "sub" solicitations for vendors (material, distributor, labor) were run by the ESCO as part of the Energy Performance Contract. In RSLPP Round 2, DVRPC ran these solicitations directly with considerable technical support from the Design Services Professional and legal support from our Legal Advisor. See page 10–14 of this report for an overview of the qualifications that should be included in the solicitations for your project team, including vendors and service providers.

Deliver field audit data and final project proposal: The ESCO or DSP will conduct a field audit of all streetlighting and outdoor lighting equipment that are candidates for retrofit, and review (scrub) the data with each municipality. Raw and scrubbed data gathered during field auditing is then delivered via web map and Excel. The scope of the field audit and the format through which it is shared with municipalities should be outlined in the RFP process. The ESCO or DSP uses field audit data to conduct a preliminary design and then, with municipal input, final design of the proposed LED streetlighting conversion. The ESCO or DSP compiles a Project Proposal (known as an Investment Grade Audit in Round 1 and the Final Project Specification and Proposal in Round 2) that serves as the basis of the construction contract. The format of this report should be similar to the Feasibility Study so that municipalities are familiar with it. The Regional Organization should provide feedback on the format of the report to ensure that the information is provided in a transparent, concise, and easy to understand manner. See Appendix D for a sample Project Proposal. from RSLPP Round 2.

Provide educational webinars to municipal staff: Throughout Phase 2, provide educational webinars to municipal participants. DVRPC hosted several webinars for municipalities in partnership with the program consultant, including webinars on lighting control technologies, the streetlight design process and design considerations (e.g., color temperature choices, managing glare, and understanding lighting distribution types), impacts of "blue light," and an overview of the utility bill update process.

Arrange financing: DVRPC arranged financing available to all municipalities in the program, regardless of an individual municipality's project size, payback period, or past-borrowing credentials. During this phase, it is important to identify a financial partner that is willing to provide financing to interested municipalities in the program. See Appendix B for a list of financial partner qualifications.

Coordinate with the utility company on rebates and bill updates: The bill update process and the majority of the rebate application process will take place during construction phase, but it is important to facilitate a discussion between your organization, your contractor, and the utility company to develop a process for bill updates so that they can occur in a timely fashion.

Provide resources for Phase 3 decision making: DVRPC worked with its Contractor and Legal Advisor to also develop the template vendor and construction contracts for each round of the program. In RSLPP Round 1, vendor contracts were not needed because Energy Performance Contracting was used, so DVRPC worked with the legal advisor (PennSEF) to develop a template construction contract, known as a Guaranteed Savings Agreement, that would be signed between the ESCO and each municipality that proceeded to Phase 3. In RSLPP Round 2, DVRPC contracted directly with each vendor that was selected (distributor and manufacturers) and "assigned" all off the manufacturer contracts and the distributor contract to the Installation Contractor who will hold the construction contract with each municipality. Municipalities then piggybacked off DVRPC's fully-assigned construction contract. To make this possible, DVRPC worked with its legal advisor to develop one set of vendor and construction contracts to be signed between DVRPC and the vendors. The RSLPP then developed a short "agreement" that served as the mechanism through which municipalities piggybacked off of the fully-assigned construction contract between DVRPC and the installer.

Phase 3
Construction

Phase 3 is the actual installation of the streetlighting system. During this phase, the Project Proposal serves as the basis of the construction contract. The installer or ESCO purchases the equipment on behalf of the municipalities according to the supply chain under contract to the program, and according to the product schedule and installation schedule developed in the Project Proposal. The DSP or ESCO manages the construction contract for each municipality.

Evaluate Project Schedule: A whole-program construction schedule is important to develop with your consultant to ensure that 1) the project team knows what to anticipate, and 2) you can clearly communicate to municipalities when their projects may begin. With multiple municipalities participating in the program, not all will be able to start at one time, so it is important to be transparent about this. DVRPC prioritized municipalities that accessed financing since these municipalities typically would all "close" on financing at the start of construction phase, and the project savings would be needed to make payments on the financing.

Update utility bill and rebates: Utility bill updates and final rebate applications occur during this phase. The regional organization should be responsible for hosting regular bill update calls between the utility and the consultant, as well as verifying that the consultant has submitted all required documentation for utility rebates, if available. The utility staff will do the actual bill updates.

Collect data: As projects are completed, it is important to gather data from your consultant so that you can track project outcomes—particularly the details on the equipment installed, its cost, and associated savings.

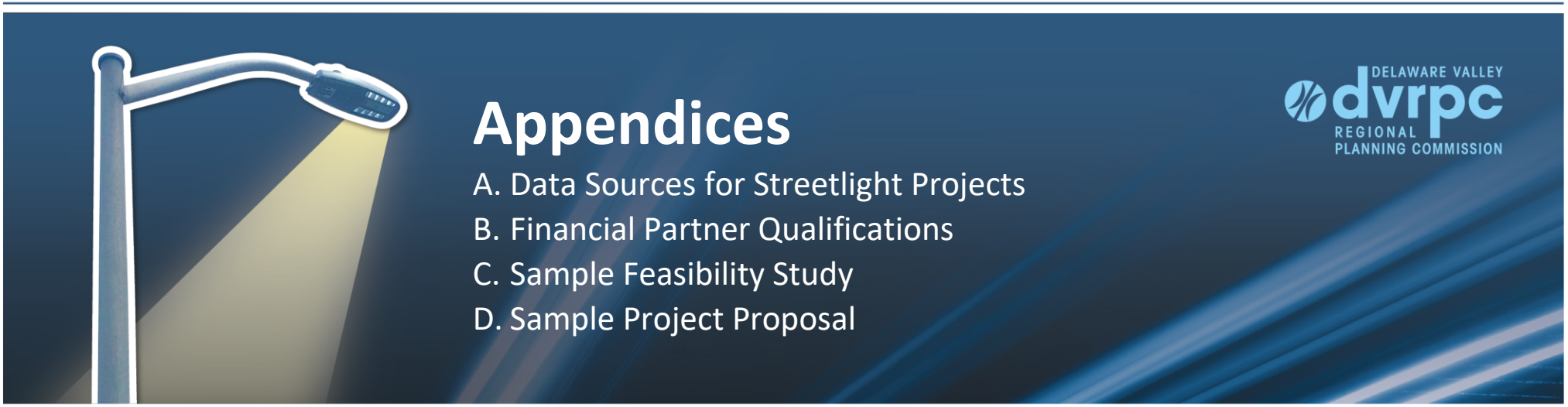
Phase 4
Post-Construction Operations and Maintenance

Phase 4 provides post-construction operation and maintenance services that include independent verification of project savings and guidance for on-going maintenance of the streetlighting system.

Deliver Measurement and Verification (M&V) of project savings: Any project that is projected to save energy should be followed up with a report that verifies that projected savings have been met and that the equipment installed is operating properly. If your organization uses the EPC model, a Measurement and Verification process is required for your project as per the Pennsylvania Guaranteed Energy Savings Act. DVRPC instituted a 3-year M&V period and the ESCO was required to produce an M&V report annually for the first three years after installation. For RSLPP Round 2, the DSP offered M&V plans as an optional scope of work item for Phase 4, and all municipalities included these services in their contract.

Prepare Operations and Maintenance (O&M) guidance: Operations and Maintenance guidance should ensure that municipalities understand how to identify equipment that has failed or is damaged, as well as how to order replacement parts of equipment. For example, a light that persists in the on setting during the day is known as a “day burner” and likely indicates that the photocell has failed and needs to be replaced, whereas a flickering lighting may need to be evaluated to identify if the entire fixture needs to be replaced or if it is an issue with the driver. Municipalities should clearly understand who to call for maintenance repairs as well as what replacements— parts and labor— are covered under their warranty, and how to order replacement equipment. To order replacement equipment, municipalities will need to know who to contact that will honor the warranty— whether through their maintenance provider, their installation contractor or the distribution partner, and what part numbers specifically to order. To do this, municipalities will need a detailed list of equipment that lists the part number of all equipment installed at each location in their community.

Consider outdoor lighting ordinances: A lighting ordinance is an optional follow-up step for municipalities to consider as part of their lighting projects, and these ordinances can typically be developed by the Consultant in either model (ESCO or DSP). A lighting ordinance will ensure that all future lighting installations in the municipality will align with the specification of the converted streetlight and outdoor lighting system.



Appendices

A. Data Sources for Streetlight Projects
B. Financial Partner Qualifications
C. Sample Feasibility Study
D. Sample Project Proposal

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

Appendix A: Data Sources for Streetlight Projects

Data Source	Description of Data	DVRPC Role
Utility Bills	In the DVRPC region, a municipality's streetlight bill provides an inventory of the streetlight equipment that is installed. This includes the style of lamp (e.g., HPS) and lamp wattage. Using this information, plus the utility billing algorithm of 4100 burn hours per year X kWh used by each lamp, a baseline of energy costs can be generated. Further, the equipment inventory provided by the utility bills helps create the basis for the LED conversion scenario during the feasibility study.	DVRPC gathered utility bills from all participants in RSLPP Round 1 and Round 2 and shared with the consultant (ESCO or DSP) the data in raw (utility bills) and spreadsheet form.
Maintenance Cost Estimates	The feasibility study should include both the cost of maintaining the existing incumbent system as well as the expected cost of maintaining the desired LED system.	DVRPC gathered information on whether a municipality's maintenance service was in-house or contracted. The ESCO or DSP was responsible for developing a methodology for estimating maintenance cost savings, communicating this methodology to municipalities, and gathering the data sources needed to make costs and savings estimates.
Labor Pricing	Labor pricing estimates were developed using county-level prevailing wage determinations provided by the Pennsylvania Department of Labor and Industry for labor pricing for construction projects.	Prevailing Wage determinations are provided by the PA Department of Labor and Industry by county. The consultants— ESCO or DSP—were responsible for pulling this information and developing labor cost estimates for the feasibility studies.
Streetlight Products and Distributor Pricing	Any streetlight conversion project will include several pieces of equipment depending on the number and style of fixtures being replaced. Pricing for streetlights should evaluate base products plus any add-on components— those that are required and any that are optional as well. A distribution partner will mark up material pricing to fund their material handling services.	For RSLPP Round 1, DVRPC included a requirement for ESCOs to provide a pricing proposal for a list of specified streetlighting equipment that was developed by the RSLPP technical advisor. The RFP allowed DVRPC to "lock in" the pricing for the equipment specified through the RFP, and this pricing was used for all projects and included in feasibility studies. For Round 2, DVRPC hired a Design Services Professional to run the solicitations for streetlighting equipment, but these solicitations could not be run until after the feasibility phase. As such, Round 2 of the RSLPP leveraged RSLPP Round 1 pricing as an estimate of vendor equipment pricing.
Project Development Pricing	During Phase 2 of a project, project development-related services include: field auditing, system design, and procurement. The feasibility study should include a price for project development services, typically provided on a per-fixture basis.	Pricing for all Project Development services should be locked in as part of the RFP for the ESCO or DSP that is issued by the regional entity, and this pricing should be used in studies or project proposals by the program's ESCO or DSP.

Appendix B: Financial Partner Qualifications

The following list of requirements were developed for each round of the RSLPP, with the goal of allowing each municipality to have access to these benefits.

- Ability to provide subject to appropriation debt: Subject to appropriation debt means that municipalities commit to appropriating the funds to pay debt service annually, and therefore this debt is not counted against a municipality's debt limit. The benefits to municipalities are that they are able to access these funds even if they are at or close to their debt limit, and it allows the municipality to avoid the costly and time-intensive filing process of applying for approval to take out general obligation debt. As a result, subject to appropriation debt helps to keep the program moving quickly and will typically lower the cost of borrowing for each participant relative to the complexities of general obligation debt.
- Flexible and extended financing terms: This allows municipalities to choose the terms of their loan so that energy and maintenance cost savings meet or exceed the finance payments each year and no out of pocket\ costs are required if none are available. Due to the payback, long term debt (>7 years), particularly debt that is "subject to appropriation," may be difficult to find as some lenders will be unwilling or unable to issue debt for longer than this period. Unique partnerships, or binding together more than one financial partner, may be required to meet this objective.
- Low and fixed interest rates: As with all borrowers, the lower the interest rate the better. Finding a lender willing to provide fixed-rate loans is equally as important, as most municipalities will be unwilling to enter into a variable interest rate financing, nor will they be willing to "re-finance" the project at an unknown rate 7–10 years into the future.
- No risk for another community's default: Be sure that the financial partner understands upfront that you are seeking to arrange standard financing across a portfolio, but that the risk of borrowing falls on each borrower, with no cross collateralization of debt permitted. This protects each municipality and all other program partners against the risk if one municipality defaults.
- Reimbursement of upfront consulting, design, and auditing costs associated with the project: In many cases, municipalities will need to pay for some upfront cost associated with their projects. It is helpful to have a way for municipalities to be able to reimburse themselves for these upfront costs at closing if possible.

Appendix C: Sample Feasibility Study

Roadway, Street & Area Lighting Upgrade Feasibility Study

Tredyffrin Township

2/15/2019

Prepared by:

Keystone Lighting Solutions
Michael Fuller, President

In Partnership with:

Delaware Valley Regional Planning Commission's
Regional Streetlight Procurement Program

Report Version 2.15.19.A

Table of Contents

Executive Summary

RSLPP Overview

The Delaware Valley Regional Planning Commission's Regional Streetlight Procurement Program (RSLPP) allows regional municipalities to improve the performance of municipal street lighting, and specifically to design, procure, install, and finance the transition to light-emitting-diode (LED) lighting technology, and to maintain those improvements. The RSLPP is organized in four Phases: Phase 1: Feasibility; Phase 2: Project Development; Phase 3: Construction; and Phase 4: Post-Construction Operations and Maintenance. These Phases are described in greater detail in Appendix A.

Keystone Lighting Solutions (KLS) was competitively selected by the RSLPP to serve as the Design Services Professional for all four Phases of the program. In Phase 1, KLS is contracted with DVRPC to provide Feasibility Studies for all participating municipalities. By using existing available information and with financial support from DVRPC and the PA Department of Environmental Protection, the RSLPP is able to offer this study at no-cost to the municipality.

Feasibility Study Overview & Approach

This report has been prepared by KLS. The purpose of this Feasibility Study is to provide an assessment of the opportunity associated with the upgrade of a municipalities existing roadway, street and area lighting systems to LED, which may also include traffic signals. This study will act as a decision-making tool for your municipality to decide whether to proceed to Phase 2 of the RSLPP, Project Development. Project Development Phase will include comprehensive audits, design and analysis resulting in a final project design proposal.

Phase 1, Feasibility, is a "data-driven" effort that uses existing available information to assess the opportunity associated with an upgrade to your existing lighting system. No field work has been conducted for the development of this Feasibility Study. General design principals have been used by KLS to identify LED upgrade opportunities, described in the Design Approach and Photometric Analysis section. Project costs from Round 1 of the RSLPP (2015-2018) have been used to develop this financial assessment of the municipalities upgrade opportunity.

Project Goals and Special Applications

The following list of project goals and special applications was developed during discussions between municipality staff/management and KLS as preparation for this initial study.

- **Project Goals**
  - Reduce Energy Costs
  - Reduce Maintenance Costs
  - Meet or Exceed Existing Lighting System Performance

- **Special Applications**
  - Consider adding a few fixtures by the high school and middle school @ intersection
  - Commercial area feedback is that it is overlit
  - Above issues to be more fully explored in Phase 2 Project Development

Project Scope of Work

The following is a list of all possible energy conservation measures (ECMs) presented for the lighting upgrade project. The "In Scope" column indicates which ECMs the municipality has chosen to include in the scope of work for this Feasibility Study:

Upgrade Category	In Scope
PECO Buyback	No
Cobrahead Lighting	Yes
Decorative Lighting	No
Area Lighting	No
Traffic Signals	Yes

Executive Financial Summary

Below is an Executive Financial Summary. This summary table provides Total Annual Operating Cost Savings (includes energy and maintenance cost savings), Total Project Costs, and Payback for each Energy Conservation Measure (ECM).

Energy Conservation Measure (ECM)	Total Annual Operating Savings	Total Project Costs	Payback w/ Financing (Years)	Payback w/o Financing (Years)	GHG Reduction (MT/Year)
PECO Inventory Adjust	($331)	$0	0.0	0.0	66
Area Lighting	$0	$0			
Cobrahead	$85,657	$710,864	8.3	6.9	339
Decorative	$0	$0			
Traffic Signals	$38,625	$259,297	6.7	5.7	0
Totals	**$123,951**	**$970,161**	**7.8**	**6.5**	**405**

Existing Lighting System

Unmetered Streetlight Baseline

The table below represents the current lighting inventory for Unmetered Streetlights. This baseline represented in the table below was developed using information from the municipality's unmetered PECO streetlight bill(s). It is assumed, for the purpose of this study, that all baseline streetlight fixture types are a cobrahead style as PECO does not maintain fixture style detail. Though the quantities, types, and wattages of fixtures reflected on the PECO bill(s) may vary from what is actually installed in the municipality, this project's energy baseline for unmetered service will be tied to the inventory of equipment on your unmetered PECO streetlight bill. Any energy cost savings realized from upgrades to the unmetered fixtures installed in your community will be realized through changes to this PECO bill(s). If known by the municipality, this table may indicate whether a baseline fixture is style other than a cobrahead, though this classification has no impact on baseline energy use or cost.

PECO Unmetered Streetlight Baseline
(Consolidated Summary of all PECO Streetlight Bills)

Fixture Type Code	Fixture Type Description	Location Count	Fixture Quantity	Fixture Watts	Total kW	Annual Operating Hours	Total kWh/ Year	Total Annual Electric Costs
Cobrahead								
02500L	Cobrahead, 202W INC		2	202	0.4	4,092	1,653	$117
04000M	Cobrahead, 100W MV		773	115	88.9	4,092	363,758	$25,783
05800S	Cobrahead, 70W HPS		1	94	0.1	4,092	385	$27
08000M	Cobrahead, 175W MV		573	191	109.4	4,092	447,841	$31,742
09500S	Cobrahead, 100W HPS		2	131	0.3	4,092	1,072	$76
12000M	Cobrahead, 250W MV		121	275	33.3	4,092	136,161	$9,651
13000H	Cobrahead, 175W MH		4	192	0.8	4,092	3,143	$223
20000M	Cobrahead, 400W MV		277	429	118.8	4,092	486,265	$34,466
20500H	Cobrahead, 250W MH		14	294	4.1	4,092	16,843	$1,194
25000S	Cobrahead, 250W HPS		6	294	1.8	4,092	7,218	$512
42000M	Cobrahead, 750W MV		48	768	36.9	4,092	150,847	$10,692
Cobrahead Totals			**1,821**		**394.7**		**1,615,186**	**$114,482**
Energy Usage Sub-Total			**1,821**		**394.7**		**1,615,186**	**$114,482**
Locations	Service Locations	1,760						$141,504
Total Electric Bill Costs		**1,760**						**$255,986**

*Service Location Distribution Charge, also known as the "Tap Fee" is based on $6.70 per location, per month. This is a fixed charge on your bill, and it is not impacted by the wattage of the fixture at each location. The costs associated with SLDC are expected to stay the same unless the quantity of service locations changes as a result of your RSLPP project. Estimates for any expected changes in SLDC as a result of the project will be modeled if the municipality proceeds to Phase 2, Project Development.

Unmetered Streetlight Adjustments

Based on information provided by the municipality, it is understood that the table below reflects the current existing inventory which should be reflected on the PECO unmetered streetlight bills. In addition to showing a more accurate depiction of the unmetered streetlight inventory, we show the costs or savings associated with possible adjustments to the PECO streetlight inventory. The identified existing inventory is used for the remainder of this study as the basis for upgrade recommendations. We also carry forward the inventory adjustment costs or savings as they would be addressed during any upgrade project and final reporting to PECO.

Municipality Identified Existing Fixture Types								
Fixture Type Code	Fixture Type Description	Location Count	Fixture Quantity	Fixture Watts	Total kW	Annual Operating Hours	Total kWh/ Year	Total Annual Electric Costs
Cobrahead								
02500L	Cobrahead, 202W INC		2	202	0.4	4,092	1,653	$117
04000M	Cobrahead, 100W MV		773	115	88.9	4,092	363,758	$25,783
05800S	Cobrahead, 70W HPS		1	94	0.1	4,092	385	$27
08000M	Cobrahead, 175W MV		573	191	109.4	4,092	447,841	$31,742
09500S	Cobrahead, 100W HPS		2	131	0.3	4,092	1,072	$76
12000M	Cobrahead, 250W MV		61	275	16.8	4,092	68,643	$4,865
13000H	Cobrahead, 175W MH		4	192	0.8	4,092	3,143	$223
20000M	Cobrahead, 400W MV		277	429	118.8	4,092	486,265	$34,466
20500H	Cobrahead, 250W MH		14	294	4.1	4,092	16,843	$1,194
25000S	Cobrahead, 250W HPS		6	294	1.8	4,092	7,218	$512
42000M	Cobrahead, 750W MV		48	768	36.9	4,092	150,847	$10,692
Cobrahead Totals			**1,761**		**377.8**		**1,547,668**	**$109,696**
Decorative								
OPTIMA-250W-MH	Lumec Optima Deco, 250W HPS		60	294	17.6	4,092	72,183	$5,116
Decorative Totals			**60**	**294**	**17.6**		**72,183**	**$5,116**
Energy Usage Sub-Total			**1,821**		**395.5**		**1,619,851**	**$114,812**
Locations	Service Locations	1,760						$141,504
Total Electric Bill Costs		**1,760**						**$256,316**
kWh Adjustment Savings/Costs					(1.1)	4,092	(4,665)	($331)
Location Adjustment Savings/Costs								
Total kWh and Location Adjustment Savings/Costs								**($331)**

Traffic Signals Baseline

The table below represents the current lighting inventory for Unmetered Traffic Signals. This baseline represented in the table below was developed using information gathered from the municipality's PECO traffic signal bill(s). Though the quantities, types, and wattages of fixtures reflected on your PECO bill may vary from what is actually installed in your municipality, this project's energy baseline for unmetered traffic signal service will be tied to the inventory of equipment on your PECO traffic signal bill. Any energy cost savings realized from upgrades to the unmetered fixtures installed in your community will be realized through changes to this PECO bill.

PECO Unmetered Traffic Signal Baseline
(Consolidated Summary of all PECO Traffic Signal Bills)

Fixture Type Code	Fixture Type Description	Location Count	Fixture Quantity	Fixture Watts	Total kW	Annual Operating Hours	Total kWh/ Year	Total Annual Electric Costs
00LOOP	Loops		146	5	0.7	8,640	6,307	$443
0MINLT	Flashing Lights		106	0	0.0	0	0	$0
EMPESD	Preemption Devices		41	2	0.1	8,640	708	$50
G 000 TA - 12	12" Incandescent Traffic Arrow Green		22	150	3.3	691	2,281	$160
G 000 TL - 12	12" Incandescent Green		80	150	12.0	3,715	44,582	$3,128
G 000 TL - 8	8" Incandescent Green		10	69	0.7	3,715	2,563	$180
G LED TA - 12	12" LED Traffic Arrow Green		6	13	0.1	691	54	$4
G LED TA - 8	8" LED Traffic Arrow Green		54	9	0.5	691	336	$24
G LED TL - 12	12" LED Green		349	12	4.2	3,715	15,559	$1,092
G LED TL - 8	8" LED Green		71	14	1.0	3,715	3,693	$259
HNDSGN - 12	12" Incandescent Hand/Man		68	138	9.4	8,640	81,078	$5,689
R 000 TL - 12	12" Incandescent Red		26	150	3.9	4,752	18,533	$1,300
R 000 TL - 8	8" Incandescent Red		5	69	0.3	4,752	1,639	$115
R LED TL - 12	12" LED Red		448	11	4.9	4,752	23,418	$1,643
TRCONT	Motor Controller		85	15	1.3	8,640	11,016	$773
WALKSGN - 9	9" Incandesent Walk/Don't Walk		8	69	0.6	8,640	4,769	$335
Y 000 TA - 12	12" Incandescent Traffic Arrow Yellow		54	150	8.1	691	5,599	$393
Y 000 TA - 8	8" Incandescent Traffic Arrow Yellow		2	69	0.1	691	95	$7
Y 000 TL - 12	12" Incandescent Yellow		393	150	59.0	173	10,187	$715
Y 000 TL - 8	8" Incandescent Yellow		78	69	5.4	173	930	$65
Energy Usage Sub-Total			**2,052**		**115.5**		**233,348**	**$16,374**
Locations	Service Locations	49						$2,158
Total Electric Bill Costs		**49**						**$18,532**

*Service Location Distribution Charge, also known as the "Tap Fee" is based on $3.67 per intersection, per month. This is a fixed charge on your bill, and it is not impacted by the wattage of the fixtures at each intersection. The costs associated with SLDC are expected to stay the same unless the quantify of service locations changes as a result of your RSLPP project. Estimates for any expected changes in SLDC as a result of the project will be modeled if the municipality proceeds to Phase 2, Project Development.

Design Approach and Standardized Upgrade Plan

Design Approach

The following section explains the design approach for standardized upgrade recommendations.

KLS has conducted a photometric analysis for 5 typical lighting applications in order to compare the lighting performance of a "traditional" fixture type and technology (e.g. high-pressure sodium, metal halide, mercury vapor, incandescent) with that of a new fixture using LED technology. When keeping all application details the same (e.g. road width, pole spacing, fixture mounting height, etc.) this analysis identifies LED fixtures that perform equal or better than existing older technology fixtures. An example of this photometric analysis comparison can be seen in Appendix D.

For each typical application analysis KLS evaluates illumination levels and uniformity ratios against IES RP-8 standards. Actual municipality applications will likely not match typical applications (i.e. pole spacing, fixture mounting height) and therefore will not meet IES RP-8 standards. The design goal and strategy for the RSLPP is to "meet or exceed" existing lighting performance. Performance is not solely based on illumination levels (quantity of light) but is heavily impacted by light distribution, uniformity, glare, cut-off, source-brightness and color temperature. Many of these factors impact a human's perceived visibility of a lit environment.

Upgrade recommendations will also be advised by a less technical, but equally relevant approach, which is to utilize the general knowledge of what upgrades have worked well on previous rounds of the RSLPP and other KLS projects. This secondary assessment is be used as a sanity check to the previous analysis driven approach discussed above.

Typical Applications include:

- **Cobrahead Roadway Applications**
  - Arterial > Roadways
  - Collector > Roadways
  - Local Residential Street
- **Decorative Street Applications**
  - Commercial District
  - Local Residential Street

Note: *The above list of Typical Applications will be expanded during Phase II, Project Development. Intersection typical designs will be considered in Phase II, when fixture location information is available. Typical designs will be provided for high and low volume Local Residential Streets in Phase II, when roadway volume information is available.*

Standardized Upgrade Plan

Based on the general design approach discussed above, the following standardized upgrade plan has been developed for this Feasibility Study.

Typical Applications and Upgrade Plan

Cobrahead Roadway & Street Applications			
Arterial Roadway			
Existing Lamp & Wattage	**Proposed LED Fixture & Wattage**	**Distribution Type**	**Color Temp**
400W High-Pressure Sodium	215W LED Cobrahead	Defined in Phase II	Defined in Phase II
400W Metal Halide	215W LED Cobrahead		
400W Mercury Vapor	215W LED Cobrahead		
250W High-Pressure Sodium	108W LED Cobrahead		
250W Metal Halide	108W LED Cobrahead		
250W Mercury Vapor	108W LED Cobrahead		
Collector Roadway			
Existing Lamp & Wattage	**Proposed LED Wattage**	**Distribution Type**	**Color Temp**
150W High-Pressure Sodium	72W LED Cobrahead	Defined in Phase II	Defined in Phase II
175W Metal Halide	72W LED Cobrahead		
175W Mercury Vapor	72W LED Cobrahead		
Local Residential Street			
Existing Lamp & Wattage	**Proposed LED Wattage**	**Distribution Type**	**Color Temp**
100W High-Pressure Sodium	54W LED Cobrahead	Defined in Phase II	Defined in Phase II
70W High-Pressure Sodium	35W LED Cobrahead		
100W Metal Halide	35W LED Cobrahead		
100W Mercury Vapor	35W LED Cobrahead		
Decorative Street Applications			
Commercial District Street (Premium Decorative)			
Existing Lamp & Wattage	**Proposed LED Wattage**	**Distribution Type**	**Color Temp**
150W or Less High-Pressure Sodium	63W LED Retrofit Kit	Defined in Phase II	Defined in Phase II
175W or Less Metal Halide Sodium	63W LED Retrofit Kit		
Local - High Volume Street (Standard Decorative)			
Existing Lamp & Wattage	**Proposed LED Wattage**	**Distribution Type**	**Color Temp**
150W High-Pressure Sodium	52W LED Decorative (i.e. 4SC)	Defined in Phase II	Defined in Phase II
100W High-Pressure Sodium	38W LED Decorative (i.e. 4SC)		
70W or Less High-Pressure Sodium	25W LED Decorative (i.e. 4SC)		
100W or Less Metal Halide Sodium	25W LED Decorative (i.e. 4SC)		
100W or Less Mercury Vapor Sodium	25W LED Decorative (i.e. 4SC)		

Control Upgrade Options

All upgrade solutions represented in the feasibility study include either basic photocell or existing timeclock control. This feasibility study does not include the costs or benefits of more advanced lighting control options. In Phase II, Project Development, we will further define what control options to include in the final project design. There are no additional design costs associated with the specification of controls, but depending on the type of controls specified, there will be additional project costs. Below is a brief description of advanced control options that could be added to your project in Phase II, Project Development.

Manual Fixture Controls

Most roadway fixture manufacturers offer a manual dimming control option. This manual control is located in the fixture housing, not visible to the public, and allows for light levels to be adjusted up or down. When this control option is requested, the next higher fixture lumen package is specified and during installation the control is "dialed-down" to the desired lumen output. This option is not typically used to save energy but rather to provide future flexibility to increase or decrease illumination levels based on application needs. In Round I of the RSLPP more than 30% of municipalities choose this option.

Local Connected Controls

A new control option to be offered in the RSLPP are local connected controls. These controls can be integrated into a photocell or as a separate module wired as an additional fixture component. These local connected controls allow for "pre-set" dimming schedules to be defined for each fixture. For example, if it is desired for a set of fixtures (e.g. parking lot) to illuminate at dusk, dim down to 30% at 2am and turn off at dawn, the local connected control can be set for this specific dimming strategy. Often these controls can be connected to a local networking technology (e.g. Bluetooth) and re-programmed on-site. This option is typically useful for area lighting fixtures were automatic dimming is desired during the fixture "on" period or where a timeclock is not available to turn lights off during the typical photocell fixture "on" period.

Network Control System

If a municipality wants complete control of a lighting system with remote networked access, then a network control system can be specified and designed. These control systems allow a municipality to manage and remotely modify master dimming schedules for all connected fixtures. A network control system also monitors the operations of all connected fixtures. Outages or under-performing fixtures can be quickly identified and, in most cases, be included in a proactive reporting to the municipality. This option can be used to save energy but is typically specified for the asset management benefits. In Round I of the RSLPP one municipality choose this option.

Upgrade Details & Savings

Annual Energy Savings

The following table shows the annual energy savings for each existing fixture type and the upgrade recommendation.

Unmetered Streetlight Energy Savings

Existing							Upgrade							Savings
Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Annual Energy Cost Savings
Unmetered Streetlight														
Cobrahead														
02500L	Cobrahead, 202W INC	202	2	0.4	1,653	$117	CHS-20W12LED-4K	Cobrahead, 19W, LED	19	2	0.0	155	$11	$106
04000M	Cobrahead, 100W MV	115	773	88.9	363,758	$25,783	CHS-35W16LED-4K	Cobrahead, 38W, LED	38	773	29.4	120,198	$8,519	$17,263
05800S	Cobrahead, 70W HPS	94	1	0.1	385	$27	CHS-35W16LED-4K	Cobrahead, 38W, LED	38	1	0.0	155	$11	$16
08000M	Cobrahead, 175W MV	191	573	109.4	447,841	$31,742	CHM-72W32LED-4K	Cobrahead, 73W, LED	73	573	41.8	171,164	$12,132	$19,610
09500S	Cobrahead, 100W HPS	131	2	0.3	1,072	$76	CHS-54W16LED-4K	Cobrahead, 53W, LED	53	2	0.1	434	$31	$45
12000M	Cobrahead, 250W MV	275	61	16.8	68,643	$4,865	CHM-108W48LED-4K	Cobrahead, 106W, LED	106	61	6.5	26,459	$1,875	$2,990
13000H	Cobrahead, 175W MH	192	4	0.8	3,143	$223	CHM-72W32LED-4K	Cobrahead, 73W, LED	73	4	0.3	1,195	$85	$138
20000M	Cobrahead, 400W MV	429	277	118.8	486,265	$34,466	CHL-215W96LED-4K	Cobrahead, 207W, LED	207	277	57.3	234,631	$16,630	$17,835
20500H	Cobrahead, 250W MH	294	14	4.1	16,843	$1,194	CHM-108W48LED-4K	Cobrahead, 106W, LED	106	14	1.5	6,073	$430	$763
25000S	Cobrahead, 250W HPS	294	6	1.8	7,218	$512	CHM-108W48LED-4K	Cobrahead, 106W, LED	106	6	0.6	2,603	$184	$327
42000M	Cobrahead, 750W MV	768	48	36.9	150,847	$10,692	CHL-241W112LED-4K	Cobrahead, 243W, LED	243	48	11.7	47,729	$3,383	$7,309
Cobrahead Total			**1,761**	**378.2**	**1,547,668**	**$109,696**				**1,761**	**149.3**	**610,796**	**$43,292**	**$66,404**
Decorative														
OPTIMA-250W-MH	Lumec Optima Deco, 250W HPS	294	60	17.6	72,183	$5,116	No Upgrade	No Upgrade	294	60	17.6	72,183	$5,116	$0
Decorative Total			**60**	**17.6**	**72,183**	**$5,116**				**60**	**17.6**	**72,183**	**$5,116**	**$0**
Unmetered Total			**1,821**	**395.9**	**1,619,851**	**$114,812**				**1,821**	**166.9**	**682,979**	**$48,408**	**$66,404**
Baseline Adjustments														
kWh Adjustment	PECO Pre-Upgrade kWh Adjustment			(1.1)	(4,665)	($331)								($331)
Locations Adjustment	PECO Pre-Upgrade Locations Adjustment													
Baseline Adjustments Total				**(1.1)**	**(4,665)**	**($331)**					**0.0**	**0**	**$0**	**($331)**

Unmetered Traffic Signal Energy Savings

Existing							Upgrade							Savings
Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Annual Energy Cost Savings
Unmetered Traffic Signal														
00LOOP	Loops	5	146	0.7	6,307	$443	00LOOP	Loops	5	146	0.7	6,307	$443	$0
0MINLT	Flashing Lights	0	106	0.0	0	$0	0MINLT	Flashing Lights	0	106	0.0	0	$0	$0
EMPESD	Preemption Devices	2	41	0.1	708	$50	EMPESD	Preemption Devices	2	41	0.1	708	$50	$0
G 000 TA - 12	12” Incandescent Traffic Arrow Green	150	22	3.3	2,281	$160	TA-LED-G-12	Traffic Signal, Arrow, 12" - Green	6	22	0.1	91	$6	$154
G 000 TL - 12	12” Incandescent Green	150	80	12.0	44,582	$3,128	TL-LED-G-12	Traffic Signal, Round, 12" - Green	7	80	0.5	1,991	$140	$2,989
G 000 TL - 8	8” Incandescent Green	69	10	0.7	2,563	$180	TL-LED-G-8	Traffic Signal, Round, 8" - Green	6	10	0.1	223	$16	$164
G LED TA - 12	12” LED Traffic Arrow Green	13	6	0.1	54	$4	TA-LED-G-12	Traffic Signal, Arrow, 12" - Green	6	6	0.0	25	$2	$2
G LED TA - 8	8” LED Traffic Arrow Green	9	54	0.5	336	$24	TA-LED-G-8	Traffic Signal, Arrow, 8" - Green	6	54	0.3	224	$16	$8
G LED TL - 12	12” LED Green	12	349	4.2	15,559	$1,092	TL-LED-G-12	Traffic Signal, Round, 12" - Green	7	349	2.3	8,687	$610	$482
G LED TL - 8	8” LED Green	14	71	1.0	3,693	$259	TL-LED-G-8	Traffic Signal, Round, 8" - Green	6	71	0.4	1,583	$111	$148
HNDSGN - 12	12" Incandescent Hand/Man	138	68	9.4	81,078	$5,689	PED-WALK-COUNT	Pedestrian, White Person, Countdown	8	68	0.5	4,700	$330	$5,359
R 000 TL - 12	12” Incandescent Red	150	26	3.9	18,533	$1,300	TL-LED-R-12	Traffic Signal, Round, 12" - Red	6	26	0.2	766	$54	$1,247
R 000 TL - 8	8” Incandescent Red	69	5	0.3	1,639	$115	TL-LED-R-8	Traffic Signal, Round, 8" - Red	6	5	0.0	143	$10	$105
R LED TL - 12	12” LED Red	11	448	4.9	23,418	$1,643	TL-LED-R-12	Traffic Signal, Round, 12" - Red	6	448	2.8	13,199	$926	$717
TRCONT	Motor Controller	15	85	1.3	11,016	$773	TRCONT	Motor Controller	15	85	1.3	11,016	$773	$0
WALKSGN - 9	9" Incandesent Walk/Don't Walk	69	8	0.6	4,769	$335	PED-WALK	Pedestrian, White Person	7	8	0.1	449	$32	$303
Y 000 TA - 12	12” Incandescent Traffic Arrow Yellow	150	54	8.1	5,599	$393	TA-LED-Y-12	Traffic Signal, Arrow, 12" - Yellow	7	54	0.4	272	$19	$374
Y 000 TA - 8	8” Incandescent Traffic Arrow Yellow	69	2	0.1	95	$7	TA-LED-Y-8	Traffic Signal, Arrow, 8" - Yellow	6	2	0.0	8	$1	$6
Y 000 TL - 12	12” Incandescent Yellow	150	393	59.0	10,187	$715	TL-LED-Y-12	Traffic Signal, Round, 12" - Yellow	10	393	3.8	659	$46	$669
Y 000 TL - 8	8” Incandescent Yellow	69	78	5.4	930	$65	TL-LED-Y-8	Traffic Signal, Round, 8" - Yellow	6	78	0.5	81	$6	$60
Metered Area Lighting Total			**2,052**	**115.5**	**233,348**	**$16,374**				**2,052**	**14.2**	**51,133**	**$3,588**	**$12,786**

Annual Maintenance Savings

The following table shows the annual maintenance savings for each existing fixture type and the upgrade recommendation. Average annual maintenance expenses were modeled for both the existing and proposed fixture types. Average annual maintenance expenses for proposed fixtures were further reduced to reflect a 1-year labor warranty and a 10-year parts warranty. The assumptions used to estimate Annual Maintenance savings are provided in Appendix B, Project Assumptions.

Unmetered Streetlight Maintenance Savings

Existing				Upgrade				Savings
Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Annual Maintenance Savings
Unmetered Streetlight								
Cobrahead								
02500L	Cobrahead, 202W INC	2	$35	CHS-20W12LED-4K	Cobrahead, 19W, LED	2	$10	$24
04000M	Cobrahead, 100W MV	773	$13,354	CHS-35W16LED-4K	Cobrahead, 38W, LED	773	$3,923	$9,432
05800S	Cobrahead, 70W HPS	1	$17	CHS-35W16LED-4K	Cobrahead, 38W, LED	1	$5	$12
08000M	Cobrahead, 175W MV	573	$9,899	CHM-72W32LED-4K	Cobrahead, 73W, LED	573	$3,529	$6,370
09500S	Cobrahead, 100W HPS	2	$35	CHS-54W16LED-4K	Cobrahead, 53W, LED	2	$11	$23
12000M	Cobrahead, 250W MV	61	$1,054	CHM-108W48LED-4K	Cobrahead, 106W, LED	61	$406	$647
13000H	Cobrahead, 175W MH	4	$69	CHM-72W32LED-4K	Cobrahead, 73W, LED	4	$25	$44
20000M	Cobrahead, 400W MV	277	$4,785	CHL-215W96LED-4K	Cobrahead, 207W, LED	277	$2,665	$2,120
20500H	Cobrahead, 250W MH	14	$242	CHM-108W48LED-4K	Cobrahead, 106W, LED	14	$93	$149
25000S	Cobrahead, 250W HPS	6	$104	CHM-108W48LED-4K	Cobrahead, 106W, LED	6	$40	$64
42000M	Cobrahead, 750W MV	48	$829	CHL-241W112LED-4K	Cobrahead, 243W, LED	48	$462	$367
Cobrahead Total		**1,761**	**$30,423**			**1,761**	**$11,169**	**$19,254**
Decorative								
OPTIMA-250W-MH	Lumec Optima Deco, 250W HPS	60	$1,037	No Upgrade	No Upgrade	60	$1,037	$0
Decorative Total		**60**	**$1,037**			**60**	**$1,037**	**$0**
Unmetered Total		**1,821**	**$31,460**			**1,821**	**$12,206**	**$19,254**

Unmetered Traffic Signal Maintenance Savings

Existing				Upgrade				Savings
Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Annual Maintenance Savings
Unmetered Traffic Signal Lighting								
00LOOP	Loops	146	$2,522	00LOOP	Loops	146	$2,522	$0
0MINLT	Flashing Lights	106	$1,831	0MINLT	Flashing Lights	106	$1,831	$0
EMPESD	Preemption Devices	41	$708	EMPESD	Preemption Devices	41	$708	$0
G 000 TA - 12	12” Incandescent Traffic Arrow Green	22	$380	TA-LED-G-12	Traffic Signal, Arrow, 12" - Green	22	$8	$372
G 000 TL - 12	12” Incandescent Green	80	$1,382	TL-LED-G-12	Traffic Signal, Round, 12" - Green	80	$145	$1,237
G 000 TL - 8	8” Incandescent Green	10	$173	TL-LED-G-8	Traffic Signal, Round, 8" - Green	10	$17	$155
G LED TA - 12	12” LED Traffic Arrow Green	6	$104	TA-LED-G-12	Traffic Signal, Arrow, 12" - Green	6	$2	$102
G LED TA - 8	8” LED Traffic Arrow Green	54	$933	TA-LED-G-8	Traffic Signal, Arrow, 8" - Green	54	$23	$910
G LED TL - 12	12” LED Green	349	$6,029	TL-LED-G-12	Traffic Signal, Round, 12" - Green	349	$635	$5,395
G LED TL - 8	8” LED Green	71	$1,227	TL-LED-G-8	Traffic Signal, Round, 8" - Green	71	$124	$1,103
HNDSGN - 12	12" Incandescent Hand/Man	68	$1,175	PED-WALK-COUNT	Pedestrian, White Person, Countdown	68	$893	$282
R 000 TL - 12	12” Incandescent Red	26	$449	TL-LED-R-12	Traffic Signal, Round, 12" - Red	26	$58	$391
R 000 TL - 8	8” Incandescent Red	5	$86	TL-LED-R-8	Traffic Signal, Round, 8" - Red	5	$10	$76
R LED TL - 12	12” LED Red	448	$7,740	TL-LED-R-12	Traffic Signal, Round, 12" - Red	448	$999	$6,741
TRCONT	Motor Controller	85	$1,468	TRCONT	Motor Controller	85	$1,468	($0)
WALKSGN - 9	9" Incandesent Walk/Don't Walk	8	$138	PED-WALK	Pedestrian, White Person	8	$105	$33
Y 000 TA - 12	12” Incandescent Traffic Arrow Yellow	54	$933	TA-LED-Y-12	Traffic Signal, Arrow, 12" - Yellow	54	$18	$915
Y 000 TA - 8	8” Incandescent Traffic Arrow Yellow	2	$35	TA-LED-Y-8	Traffic Signal, Arrow, 8" - Yellow	2	$1	$34
Y 000 TL - 12	12” Incandescent Yellow	393	$6,789	TL-LED-Y-12	Traffic Signal, Round, 12" - Yellow	393	$36	$6,753
Y 000 TL - 8	8” Incandescent Yellow	78	$1,348	TL-LED-Y-8	Traffic Signal, Round, 8" - Yellow	78	$6	$1,341
Unmetered Total		**2,052**	**$35,450**			**2,052**	**$9,612**	**$25,839**

Bill of Material and Project Costs

The following table shows the bill of material (BOM) for proposed upgrade scope of work. In addition to material and installation costs, a summary of DSP Fees and Program Fees are included – all per unit costs associated with, material, installation, DSP fees, and Program fees are further defined in Appendix C. Rebates from PECO and PJM (regional transmission organization) are also included in this table and further defined in Appendix B.

Fixture Type Code	Fixture Type Description	Fixture Quantity	Material Costs	Install Costs	Rebates	KLS Fees	DVRPC Program Fees	Contin-gency	Interest Costs	Total Project Costs
Cobrahead										
CHL-215W96LED-4K	Cobrahead, 207W, LED	277	$100,827	$30,470	($24,465)	$9,418	$4,410	$13,130	$28,101	$161,891
CHM-72W32LED-4K	Cobrahead, 73W, LED	577	$107,907	$63,470	($32,935)	$19,618	$6,122	$17,138	$38,045	$219,363
CHS-35W16LED-4K	Cobrahead, 38W, LED	774	$110,346	$85,140	($22,900)	$26,316	$7,180	$19,549	$44,131	$269,762
CHL-241W112LED-4K	Cobrahead, 243W, LED	48	$17,472	$5,280	($5,112)	$1,632	$764	$2,275	$4,869	$27,181
CHS-20W12LED-4K	Cobrahead, 19W, LED	2	$285	$220	($72)	$68	$19	$51	$114	$684
CHS-54W16LED-4K	Cobrahead, 53W, LED	2	$332	$220	($109)	$68	$20	$55	$123	$710
CHM-108W48LED-4K	Cobrahead, 106W, LED	81	$17,233	$8,910	($6,919)	$2,754	$922	$2,614	$5,759	$31,273
Cobrahead Total		**1,761**	**$354,402**	**$193,710**	**($92,512)**	**$59,874**	**$19,437**	**$54,811**	**$121,142**	**$710,864**
Traffic Signal										
TA-LED-G-12	Traffic Signal, Arrow, 12" - Green	28	$1,858	$840	$0	$299	$96	$270	$597	$3,959
TA-LED-G-8	Traffic Signal, Arrow, 8" - Green	54	$4,795	$1,620	$0	$576	$221	$641	$1,395	$9,248
TA-LED-Y-12	Traffic Signal, Arrow, 12" - Yellow	54	$3,445	$1,620	$0	$576	$181	$506	$1,124	$7,451
TA-LED-Y-8	Traffic Signal, Arrow, 8" - Yellow	2	$178	$60	$0	$21	$8	$24	$52	$343
TL-LED-G-12	Traffic Signal, Round, 12" - Green	429	$27,366	$12,870	$0	$4,576	$1,436	$4,024	$8,926	$59,197
TL-LED-G-8	Traffic Signal, Round, 8" - Green	81	$4,858	$2,430	$0	$864	$262	$729	$1,623	$10,765
TL-LED-R-12	Traffic Signal, Round, 12" - Red	474	$28,425	$14,220	$0	$5,056	$1,532	$4,265	$9,500	$62,998
TL-LED-R-8	Traffic Signal, Round, 8" - Red	5	$262	$150	$0	$53	$15	$41	$93	$614
TL-LED-Y-12	Traffic Signal, Round, 12" - Yellow	393	$28,579	$11,790	$0	$4,192	$1,421	$4,037	$8,882	$58,900
TL-LED-Y-8	Traffic Signal, Round, 8" - Yellow	78	$4,678	$2,340	$0	$832	$252	$702	$1,563	$10,367
0MINLT	Flashing Lights	106	$0	$0	$0	$1,131	$57	$0	$211	$1,398
00LOOP	Loops	146	$0	$0	$0	$1,557	$78	$0	$290	$1,926
TRCONT	Motor Controller	85	$0	$0	$0	$907	$45	$0	$169	$1,121
PED-WALK	Pedestrian, White Person	8	$1,531	$800	$0	$85	$74	$233	$484	$3,207
PED-WALK-COUNT	Pedestrian, White Person, Countdown	68	$13,014	$6,800	$0	$725	$631	$1,981	$4,111	$27,262
EMPESD	Preemption Devices	41	$0	$0	$0	$437	$22	$0	$82	$541
Traffic Signal Total		**2,052**	**$118,986**	**$55,540**	**$0**	**$21,888**	**$6,330**	**$17,453**	**$39,100**	**$259,297**
BOM Total		**3,873**	**$473,388**	**$249,250**	**($92,512)**	**$81,762**	**$25,767**	**$72,264**	**$160,242**	**$970,161**

Financial Analysis & Summary

Payback Analysis Matrix

The payback analysis matrix is provided as a decision-making tool to assess the opportunity of ECMs available and to define a project scope that best meets the needs of the municipality. If a PECO buyback is planned prior to this project being implemented, we show the payback associated with that activity. A separate payback calculation is made for each ECM as well as for common control alternates to be considered. This section also shows typical combinations of upgrade solutions to aid with the project scoping decision.

Energy Conservation Measure (ECM)	Energy Savings	Mainte-nance Savings	Total Oper-ating Savings	Material Costs	Install Costs	KLS Fees	DVRPC Program Costs	Cost Contin-gency	Interest Costs	Rebates	Total Project Costs	Payback w/ Financing (Years)	Payback w/o Financing (Years)
PECO Inventory Adjust	($331)	$0	**($331)**	$0	$0	$0	$0	$0	$0	$0	**$0**	**0.0**	**0.0**
Area Lighting													
Cobrahead	$66,404	$19,254	**$85,657**	$354,402	$193,710	$59,874	$19,437	$54,811	$121,142	($92,512)	**$710,864**	**8.3**	**6.9**
Decorative													
Traffic Signals	$12,786	$25,839	**$38,625**	$118,986	$55,540	$21,888	$6,330	$17,453	$39,100	$0	**$259,297**	**6.7**	**5.7**
Totals	**$78,859**	**$45,092**	**$123,951**	**$473,388**	**$249,250**	**$81,762**	**$25,767**	**$72,264**	**$160,242**	**($92,512)**	**$970,161**	**7.8**	**6.5**

Cash Flow Analysis

The cash flow analysis shows how the project savings offset project costs, resulting in little to no capital outlay for this project.

Project Cash Flow *(Requested ECM Scope)*

Project Summary	
Construction Cost	$722,638
Buyback Cost	$0
DSP Fees (KLS)	$81,762
Program Fees (DVRPC)	$25,767
Contingency	$72,264
Total Project Cost	**$902,431**
Capital Contribution	
Financed Amount	**$902,431**
Loan Rate	3.40%
Loan Term (Years)	9
Loan Payment	$118,075
Interest Paid	$160,242

ECM	In Scope
PECO Buyback	No
Cobrahead Lighting	Yes
Decorative Lighting	No
Area Lighting	No
Traffic Signals	Yes

Period	Energy Cost Savings	Maintenance Cost Savings	Rebates	Total Savings	Phase 2 KLS & Program Fees	Loan Payment	Balance
Design				**$0**	**$44,774**		($44,774)
Construction				**$0**	**($44,774)**		$44,774
1	$78,859	$45,092	$92,512	**$216,463**		$118,075	$98,389
2	$78,859	$45,092		**$123,951**		$118,075	$5,877
3	$78,859	$45,092		**$123,951**		$118,075	$5,877
4	$78,859	$45,092		**$123,951**		$118,075	$5,877
5	$78,859	$45,092		**$123,951**		$118,075	$5,877
6	$78,859	$45,092		**$123,951**		$118,075	$5,877
7	$78,859	$45,092		**$123,951**		$118,075	$5,877
8	$78,859	$45,092		**$123,951**		$118,075	$5,877
9	$78,859	$45,092		**$123,951**		$118,075	$5,877
10	$78,859	$45,092		**$123,951**		$0	$123,951
11	$78,859	$45,092		**$123,951**		$0	$123,951
12	$78,859	$45,092		**$123,951**		$0	$123,951
13	$78,859	$45,092		**$123,951**		$0	$123,951
14	$78,859	$45,092		**$123,951**		$0	$123,951
15	$78,859	$45,092		**$123,951**		$0	$123,951
16	$78,859	$45,092		**$123,951**		$0	$123,951
17	$78,859	$45,092		**$123,951**		$0	$123,951
18	$78,859	$45,092		**$123,951**		$0	$123,951
19	$78,859	$45,092		**$123,951**		$0	$123,951
20	$78,859	$45,092		**$123,951**		$0	$123,951
Total	**$1,577,179**	**$901,848**	**$92,512**	**$2,571,539**	**$0**	**$1,062,673**	**$1,508,866**

Project Cash Flow *(Requested ECM Scope)* with Capital Contribution

Project Summary	
Construction Cost	$722,638
Buyback Cost	$0
DSP Fees (KLS)	$81,762
Program Fees (DVRPC)	$25,767
Contingency	$72,264
Total Project Cost	**$902,431**
Capital Contribution	$902,431
Financed Amount	**$0**
Loan Rate	0.00%
Loan Term (Years)	0
Loan Payment	#NUM!
Interest Paid	#NUM!

ECM	In Scope
PECO Buyback	No
Cobrahead Lighting	Yes
Decorative Lighting	No
Area Lighting	No
Traffic Signals	Yes

Period	Energy Cost Savings	Maintenance Cost Savings	Rebates	Total Savings	Capital Contribution	Loan Payment	Balance
Design				**$0**	**$44,774**		($44,774)
Construction				**$0**	**$857,657**		($857,657)
1	$78,859	$45,092	$92,512	**$216,463**		$0	$216,463
2	$78,859	$45,092		**$123,951**		$0	$123,951
3	$78,859	$45,092		**$123,951**		$0	$123,951
4	$78,859	$45,092		**$123,951**		$0	$123,951
5	$78,859	$45,092		**$123,951**		$0	$123,951
6	$78,859	$45,092		**$123,951**		$0	$123,951
7	$78,859	$45,092		**$123,951**		$0	$123,951
8	$78,859	$45,092		**$123,951**		$0	$123,951
9	$78,859	$45,092		**$123,951**		$0	$123,951
10	$78,859	$45,092		**$123,951**		$0	$123,951
11	$78,859	$45,092		**$123,951**		$0	$123,951
12	$78,859	$45,092		**$123,951**		$0	$123,951
13	$78,859	$45,092		**$123,951**		$0	$123,951
14	$78,859	$45,092		**$123,951**		$0	$123,951
15	$78,859	$45,092		**$123,951**		$0	$123,951
16	$78,859	$45,092		**$123,951**		$0	$123,951
17	$78,859	$45,092		**$123,951**		$0	$123,951
18	$78,859	$45,092		**$123,951**		$0	$123,951
19	$78,859	$45,092		**$123,951**		$0	$123,951
20	$78,859	$45,092		**$123,951**		$0	$123,951
Total	**$1,577,179**	**$901,848**	**$92,512**	**$2,571,539**	**$902,431**	**$0**	**$1,669,108**

Phase 1 Action Items

The purpose of this Feasibility Study is to provide an assessment of the opportunity associated with the upgrade of a municipalities existing outdoor lighting system to LED, which may include roadway and area lighting fixtures as well as traffic signals. This study will act as a decision-making tool for your municipality to decide whether to proceed to Phase 2 of the RSLPP, Project Development. Project Development Phase will include comprehensive audits, design and analysis resulting in a final project design proposal.

The following is a list of action items for municipality staff, management and council members to aid finalizing the Feasibility Study and presenting the opportunity for council consideration and a decision on whether to continue to Phase 2, Project Development.

Staff/Management Action Items

- ☐ Municipal Staff/Management - provide additional data to improve or clarify the Feasibility Study
- ☐ KLS - make final modifications to the Feasibility Study
- ☐ Municipal Staff/Management – final approval of Feasibility Study
- ☐ Municipal Staff/Management – establish position on agenda for relevant committee or council meetings
- ☐ Municipal Staff/Management – prepare packet information with Feasibility Study for relevant committee or council meetings
- ☐ Municipal Staff/Management – continue to build awareness and provide preliminary updates to other municipality staff and management as well as council members

Council Action Items

- ☐ KLS – present summary of Feasibility Study to relevant committee or council meetings
- ☐ Municipality Solicitor – Review resolutions and contracts required to proceed to the Project Development Phase
- ☐ Council – Review, analyze and discuss Feasibility Study with municipality staff and management and KLS
- ☐ Council – Take action to approve or reject decision to continue to the Project Development Phase and authorize municipality management to sign Project Development Phase contract with KLS.

Appendix A:
RSLPP Phase Overview

Phase 1: Feasibility: Data-driven analysis of upgrade opportunities resulting in a no-cost Feasibility Study.

- Municipalities receive a data-driven, no-cost Feasibility Study showing estimated savings, project costs, rebates and financial payback. This study is developed by KLS using data, information, and input provided by the municipality.
- **Municipalities use the Feasibility Study as a tool to decide whether to proceed to Phase 2 and contract with KLS for Project Development Services.**
- The RSLPP Project Team provides a contract form and resolution for municipalities to proceed to Phase 2.

Phase 2: Project Development: Field audits, design and analysis resulting in a final design project proposal.

- KLS conducts field audits of the municipality's existing lighting system showing GPS location and attributes of each fixture. KLS also conducts a comprehensive and standardized design of upgraded lighting system.
- KLS develops and DVRPC issues solicitations and contracts for materials, distributor, and installation contractor for the purpose of arranging cooperative purchasing agreements that municipalities are able to piggyback off of.
- The RSLPP Project Team organizes a pool of financing for municipalities who wish to finance their projects.
- KLS prepares final design proposal showing forecasted savings, final project costs, rebates, and financial payback.
- **Municipalities use the Final Design Proposal as a tool to decide whether to proceed to Phase 3, Construction.**
- The RSLPP Project Team provides a contract form and resolution for contracting between municipality and installation contractor for construction (the construction contract). Municipalities piggyback off of DVRPC's installation contract for construction.
- Municipalities that finance participate in the pool of financing arranged by the RSLPP.

Phase 3: Construction: Comprehensive Installation Services and Project Management of Installation including reporting and issue resolution during construction.

- Construction, including the procurement of all equipment, is provided by the RSLPP selected installation contractor according to the municipality's construction contract.
- KLS provides robust project management services ensuring consistent communication of progress and issue resolution.
- KLS manages the municipality's PECO Bill Updates and the applicable rebate application processes.

Phase 4: Post Construction Operations and Maintenance Confirmation of project savings and strategies for on-going maintenance.

- KLS provides the municipalities strategies for maintaining new system and on-going standardization, verification of project savings, and (if desired) prepare and/or update municipality lighting ordinances.

Appendix B:
Project Assumptions

The following assumptions were used in the development of this Feasibility Study:

1) **Energy use**
    a. **Un-metered:**
        i. **Streetlights:** Energy use for un-metered streetlight service is calculated by PECO using the following algorithm:
            1. kWh = Billed Wattage of fixture x quantity of fixture x 4092 (annual operating hours)/1000
        ii. **Traffic Signals:** Energy use for un-metered traffic signal service is calculated by PECO using the following algorithm:
            1. kWh = Billed Wattage of fixture x quantity of fixture x annual operating hours (yellow = 175.2 hours; green = 3766.8 hours; red = 4819 hours)/1000.
    b. **Metered:** Energy use for metered fixtures is calculated using the estimated wattage of each fixture X annual operating hours (4092 hours assumed for all metered streetlight fixtures and area lighting, while a lower number of hours may be used for other outdoor lighting types if provided or indicated by the municipality)/1000.
2) **Energy Costs:**
    a. Across the entire RSLPP, energy costs were estimated according to the following PECO rates included in PECO's Proposed Tariff Electric Pa. P.U.C. No. 6, filed as a 2018 Electric Distribution Rate Case with the Pennsylvania Public Utility Commission.
        i. SL-E, SL-S, SL-C, TSLS, and GS.
    b. KLS used the generation supply rate listed for each PECO account on the utility bills supplied by the municipality.
3) **Maintenance cost savings**
    a. Average annual maintenance expenses were modeled for both the existing and proposed fixture types.
        i. Maintenance expenses are based on the probability a component (e.g. lamp, ballast/driver, fixture, photocell) will fail multiplied by the material and labor replacement cost. Failure probability is based on the annual operating hours of a component divided by its published rated or expected life.
    b. Use of average annual maintenance expenses assumes that both the existing and new lighting systems have a standard distribution fixture and component ages. Average annual maintenance expenses for proposed LED fixtures were further reduced by 50% to reflect a 1-year labor warranty, a 10-year parts warranty and the expected life of a new fixture and its components.

4) **Project rebates:** There are two rebate types available to municipalities in the RSLPP:
    a. **PECO Smart Ideas:** Through Phase 3 of Act 129, PECO's offers lighting rebates to municipal customers. These rebates vary from $25 - $75 per streetlight and vary from $10 - $60 for metered area lighting depending on the watts reduced by each fixture conversion. Rebates have been estimated in Phase 1 based on the scope of work included in this Feasibility Study. Municipalities that proceed to Phase 2 will have a pre-application submitted on their behalf by the KLS to PECO based on the scope of work

defined in the municipality's Final Design Proposal. Submitting a pre-application will "reserve" rebates for municipalities that proceed to Phase 3, construction.

b. **PJM:** PJM, the Regional Transmission Operator for this region offers rebates for outdoor lighting projects through its Capacity Market. Energy efficiency projects can receive PJM Capacity Market rebates for the first four years that a project is installed based on the kW reductions of the project, and the price/kW of this rebate is determined by a "forward auction" in each utility territory within PJM. The current rate for these incentives in PECO territory ranges from $18.70-$28.90 per kW reduced depending on the year. The PJM Capacity Market rebate has been estimated based on the scope of work defined in this Feasibility Study, the associated kW reduction and a $15.00 per kW rebate. Municipalities that proceed to Phase 3 (Construction) of the RSLPP will have the opportunity to have receive this rebate through a RSLPP-arranged aggregator.

5) Project Contingency

a. For project budgeting we used a 10% contingency.

6) Material & Installation Costs

a. RSLPP Round I costs, with some minor adjustments to reflect price increases for labor, were used for material and installation.

7) Financing

a. For financing forecasts, a **3.40%** interest rate was used. This rate is published by PennSEF, a joint partnership between the Foundation for Renewable Energy and Environment (FREE) and the Pennsylvania Department of Treasury. The rate above is based on a BBB rating, tax-exempt status and a **5-10 year** financing term. The published values are derived from recent actual bond rates that correspond to each credit rating and term. However, the values shown have been adjusted to reflect that financing lease obligations be made "subject to appropriation." The "subject to appropriation" requirement can protect the participant in certain circumstances, but it results in rates that are slightly higher than rates for General Obligation bonds.

Appendix C:
DSP & Program Fees Breakdown

Design Service Professional (KLS) Unit Pricing

DVRPC conducted a comprehensive RFP process to identify and select a design services professional to support all four Phases of the RSLPP. Municipalities are able to "piggy-back" off the DVRPC's cooperative purchasing agreement for DSP services. The table below not only defines the final DSP unit priced fee structure but also shows the assumed volume for your project and the total associated fees. The finance resolution provided for RSLPP municipalities who wish to proceed to Phase 2, Project Development, includes provisions for reimbursement of Project Development Phase fees with a financing package put in place for the Construction Phase.

DSP Unit Price Schedule and Payment Milestones

DSP Service Item	KLS Unit Price (Fee) Schedule	KLS Billing Milestones	Fixture & Signal Quantity	KLS Fees	DVRPC Program Fees	Total KLS & DVRPC Fees
Project Development (Phase II)						
Field Audit	$9/Fixture	100% at Completion of audit (if less than 1 month); Otherwise on monthly auditing progress	1,761	$15,849	$792	**$16,641**
Field Audit (Traffic Signals)	$8/Signal (not lamp)		2,052	$5,472	$274	**$5,746**
Mapping	$1/Fixture or Signal		3,813	$2,445	$122	**$2,567**
Design	$7/Fixture or Signal	50% at Preliminary Design Review; 50% at Final Design Review	1,761	$12,327	$616	**$12,943**
Design (Traffic Signals)	$6/Signal (not lamp)		2,052	$4,104	$205	**$4,309**
Utility bill update & rebate processes	$1/Fixture or Signal	50% at Final Utility Bill Update; 50% at Final Rebate Submittal	3,813	$2,445	$122	**$2,567**
Project Development Sub-Total				**$42,642**	**$2,132**	**$44,774**
Construction Project Management (Phase III)						
Project Management Services	$10/Fixture or Signal	20% at Pre-Construction Meeting; Remainder on Monthly Installation Progress Billing	3,813	$24,450	$22,902	**$47,352**
PECO Buyback	$5/Fixture (with max fee of $5,000 and min fee of $1,000)	At Buyback Completion		$0	$0	**$0**
Field deployable installation data capture	$3/Fixture or Signal	Monthly Installation Progress Billing	3,813	$7,335	$367	**$7,702**
Project Management Sub-Total				**$31,785**	**$23,268**	**$55,053**
Post-Construction Services (Phase IV)						
Project annual Energy and Operational Savings Report	$1/Fixture or Signal	100% at Report Delivery	3,813	$2,445	$122	**$2,567**
Operations and Maintenance Plan for a municipality's new LED system.	$1/Fixture or Signal	100% at Plan Delivery	3,813	$2,445	$122	**$2,567**
Development of Operation and Maintenance Manual	$1/Fixture or Signal	100% at Manual Delivery	3,813	$2,445	$122	**$2,567**
Development or update of a lighting ordinance	$1,000/municipality (minimum)	Estimated Cost Between $1,000 - $10,000	0	$0	$0	**$0**
Post-Construction Sub-Total				**$7,335**	**$367**	**$7,702**
Total Fees				**$81,762**	**$25,767**	**$107,529**

Notes:
1) All unit prices above are "not to exceed" as defined in the municipalities DSP contract.
2) DVRPC program fees are based on the RSLPP LOI signed by each participating muncipality.

DVRPC Program Fees

The following Program Fees have been established by DVRPC to allow DVRPC to recoup the upfront costs DVRPC has incurred for program development, program management, and for the development and issuance of contracts and solicitations associated with material, distributor, installation contractor, and finance. These fees are reflected throughout this Feasibility Study as "Program Fees":

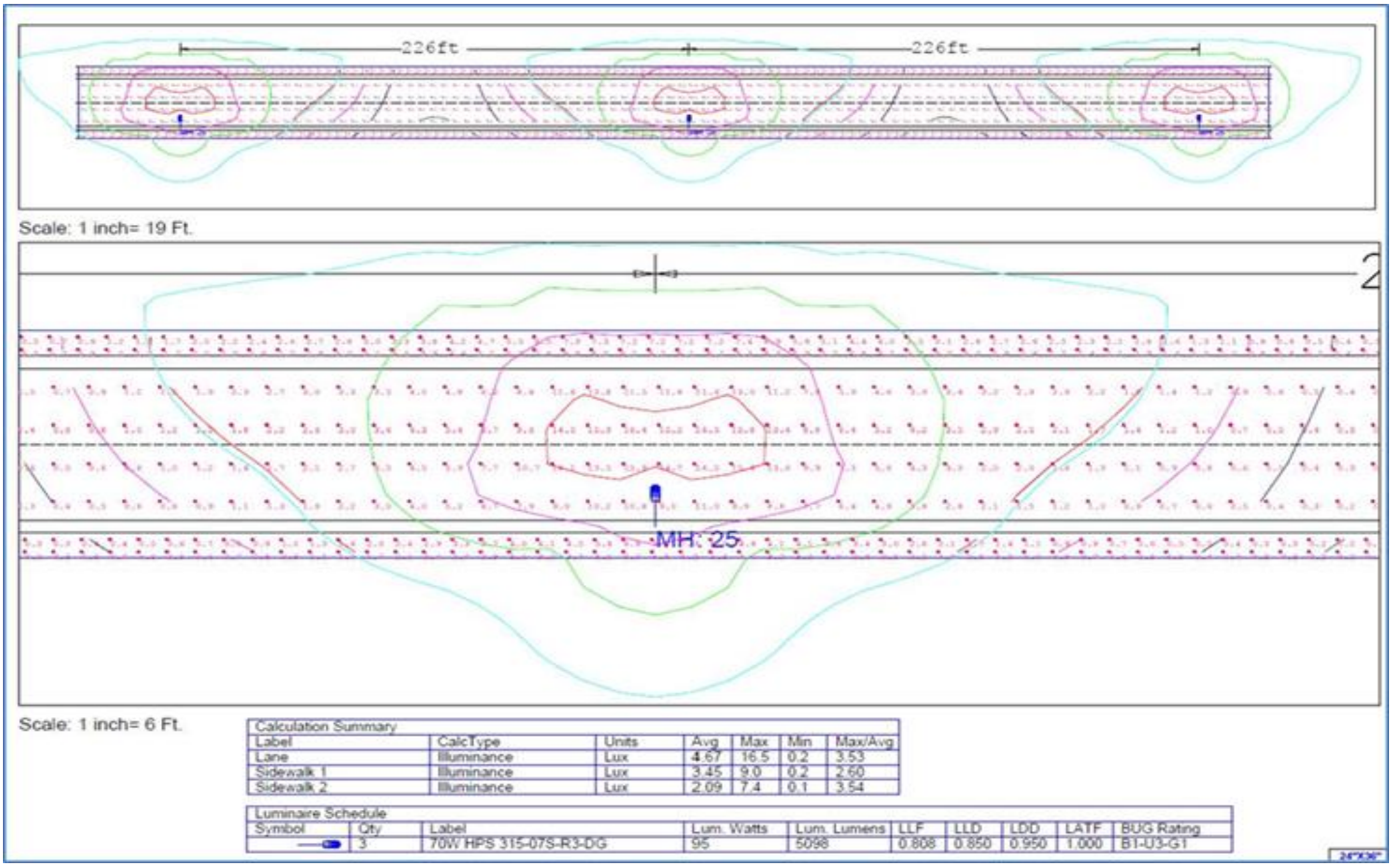
- 5% of DSP Total Fees

- Up to 3% of Construction Costs (Material & Installation costs only).
    - 3% has been used as a conservative estimate for this Feasibility Study.

Appendix D:
Photometric Analysis Example

The photometric comparison below shows how a traditional fixture and technology compares to a similar style fixture using LED technology. With all application specifications the same for both it allows for a fair comparison between the existing and new lighting solutions.

Traditional 70W High-Pressure Sodium Cobrahead on a Local Street



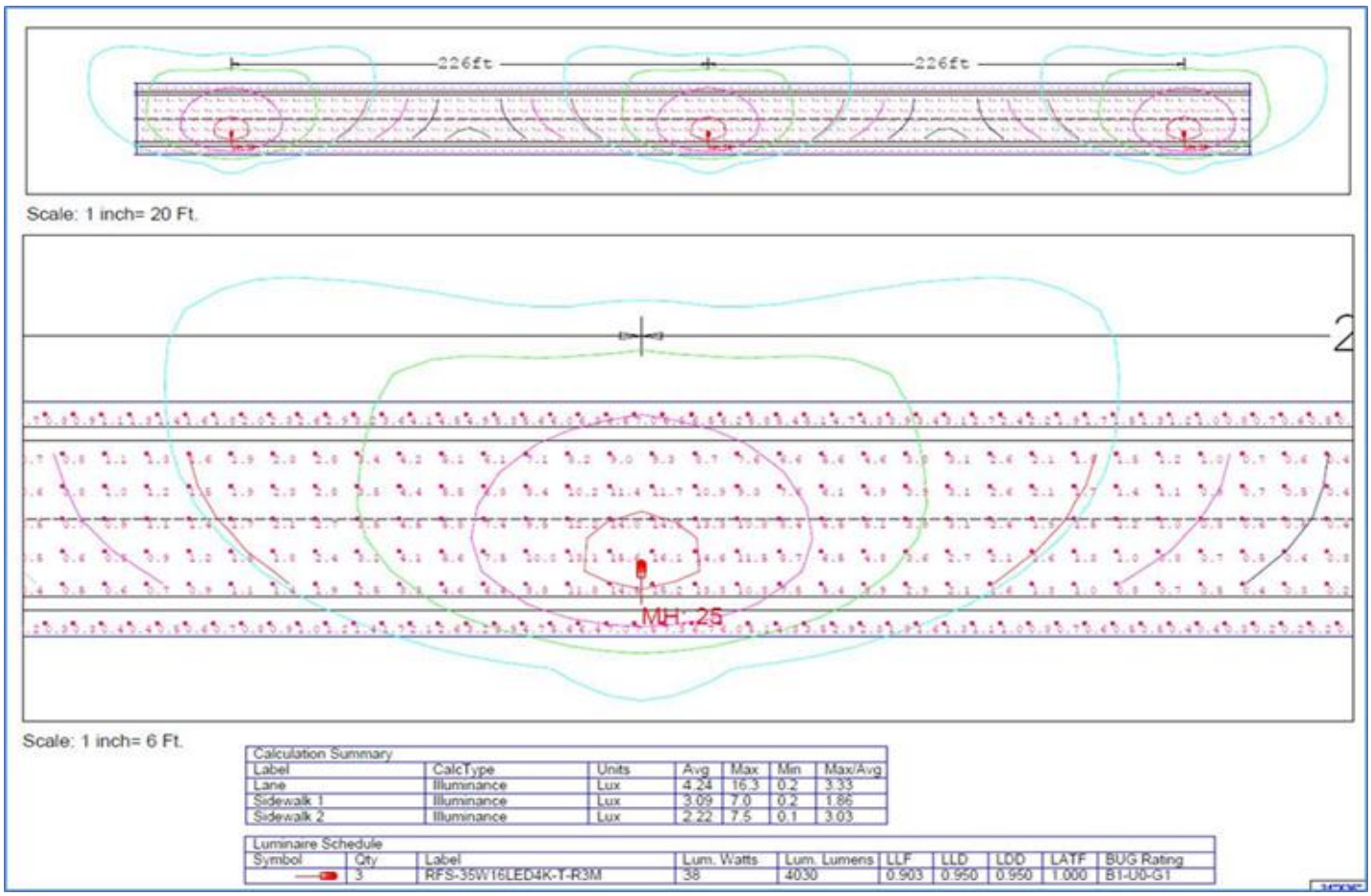
Calculation Summary

Label	CalcType	Units	Avg	Max	Min	Max/Avg
Lane	Illuminance	Lux	4.67	16.5	0.2	3.53
Sidewalk 1	Illuminance	Lux	3.45	9.0	0.2	2.60
Sidewalk 2	Illuminance	Lux	2.09	7.4	0.1	3.54

Luminaire Schedule

Symbol	Qty	Label	Lum. Watts	Lum. Lumens	LLF	LLD	LDD	LATF	BUG Rating
	3	70W HPS 315-07S-R3-DG	95	5098	0.808	0.850	0.950	1.000	B1-U3-G1

New 35W LED Cobrahead on a Local Street



Calculation Summary

Label	CalcType	Units	Avg	Max	Min	Max/Avg
Lane	Illuminance	Lux	4.24	16.3	0.2	3.33
Sidewalk 1	Illuminance	Lux	3.09	7.0	0.2	1.86
Sidewalk 2	Illuminance	Lux	2.22	7.5	0.1	3.03

Luminaire Schedule

Symbol	Qty	Label	Lum. Watts	Lum. Lumens	LLF	LLD	LDD	LATF	BUG Rating
	3	RFS-35W16LED4K-T-R3M	38	4030	0.903	0.950	0.950	1.000	B1-U0-G1

Appendix D: Sample Project Proposal

Roadway, Street & Area Lighting Upgrade
Project Specifications & Proposal

Tredyffrin Township

6/23/2020

Prepared by:

Keystone Lighting Solutions
Michael Fuller, President

In Partnership with:

Delaware Valley Regional Planning Commission's
Regional Streetlight Procurement Program

Report Version 6.23.20.A

Table of Contents

Executive Summary

RSLPP Overview

The Delaware Valley Regional Planning Commission's Regional Streetlight Procurement Program (RSLPP) allows regional municipalities to improve the performance of municipal street lighting, and specifically to design, procure, install, and finance the transition to light-emitting-diode (LED) lighting technology, and to maintain those improvements. The RSLPP is organized in four Phases: Phase 1: Feasibility; Phase 2: Project Development; Phase 3: Construction; and Phase 4: Post-Construction Operations and Maintenance.

Phase 2 Project Development Overview & Approach

Keystone Lighting Solutions (KLS) was competitively selected by the RSLPP to serve as the Design Services Professional for all four Phases of the program.

In Phase 1, KLS was contracted with DVRPC to provide a no-cost Feasibility Study for all participating municipalities. Municipalities proceeded to Phase 2 of the RSLPP by contracting with KLS to provide Project Development services, including a field audit of lighting equipment, analysis of gathered lighting data and attributes, a preliminary design (reviewed by the municipality), and a final design catered to municipal needs. Further, KLS is contracted with DVRPC to, on behalf of all municipalities in the RSLPP, develop and evaluate solicitations for the required vendors (distribution partner, manufacturer, and installation contractor) for this work. Project Development results in the following key deliverables, developed by KLS:

1. All raw data gathered during field auditing, delivered via web map and Excel. Data will have been scrubbed based on municipal feedback for data quality control (e.g. identification of correct boundary fixtures, etc.)
2. Final Project Specifications & Proposal guided by a design process that includes the following two steps. A detailed description of Project Design can be found in the Design Approach and Standardized Upgrade Plan section of this document.
    a. A preliminary design based on roadway classification, key attributes from the field audit process (e.g. pole spacing, lamp type/wattage, location of intersections, etc.) identification of "special need" areas (e.g. high-crash locations), verified by photometric analysis, then
    b. A final design, that replaced preliminary design, based on municipal feedback to preliminary design.
3. A Project Installation Worksheet, detailing a line by line installation schedule - provided at a later date with the final construction contract.
4. A Summary Bill of Material that lists unique products, their quantity, and extended total price – provided as Appendix D of this document.
5. A Schedule of Installation Values that lists unique Installation Items (e.g. cobrahead installation), Quantity, Unit Price & Extended Total Price - provided as Appendix C of this document.

6. A summary of DSP and DVRPC Program Fees – provided as Appendix E of this document.

How Contracting will work:

This Final Project Specification & Proposal has been developed by KLS to serve as the basis of your Construction Contract with the Installation Contractor. DVRPC's contracts with each of the RSLPP selected vendors (Distributor, Manufacturer, and Installer) have been assigned to the Installation Contractor who will hold the construction contract with each municipality. Municipality's "piggy-back" off of DVRPC's Construction Contract using Chapter 19 of the Commonwealth Procurement Code, 62 Pa.C.S. § 1901 et seq. Items 2-5 listed above will form the unique aspects of each municipalities Construction Contract with the selected RSLPP Installation Contractor, and will guide your construction project. Municipalities that enter into a Construction Contract with the Installation Contractor will have their Construction Contract managed by KLS as part of Phase 3 (Construction) services.

Project Goals and Special Applications

The following list of project goals and special applications was developed during discussions between municipality staff/management and KLS as part of your feasibility study. These goals and special applications were applied to the Final Design presented in this report

- **Project Goals**
  - Reduce Energy Costs
  - Reduce Maintenance Costs
  - Meet or Exceed Existing Lighting System Performance

- **Special Applications**
  - Tredyffrin will evaluate the need for additional lighting at specific locations after the new lighting system is installed.

Project Scope of Work

The following is a list of all possible energy conservation measures (ECMs) presented for the lighting upgrade project. The "In Scope" column indicates which ECMs the municipality has chosen to include in the scope of work for the Final Project Specifications and Proposal:

Upgrade Category	In Scope
PECO Buyback	No
Cobrahead Lighting	Yes
Decorative Lighting	Yes
Area Lighting	Yes
Traffic Signals	Yes
Control Alternates*	**In Scope**
Manual Fixture Controls	No
Networked Control System	Yes

** Basic photocell or timeclock control is included for all upgrade categories no using network controls*

Executive Financial Summary

Below is an Executive Financial Summary. This summary table provides Total Annual Operating Cost Savings (includes energy and maintenance cost savings), Total Project Costs, and Payback for each Energy Conservation Measure (ECM).

PECO Baseline Adjustments	Total Annual Operating Savings	Total Project Costs	Payback (Years)	GHG Reduction (MT/Year)
Streetlight Adjustment	($7,300)	$0	0.0	(37.3)
Traffic Signal Adjustment	$367	$0	0.0	1.9

Typical ECM Combinations	Total Annual Operating Savings	Total Project Costs	Payback (Years)	GHG Reduction (MT/Year)
Cobrahead + Decorative + Area Lighting + Traffic Signals[1] + Network Controls	$112,730	$997,829	8.9	382.2

Notes:

1) Includes costs and savings of ECM upgrade + PECO baseline adjustments

Existing Lighting System

Unmetered Streetlight Energy and Cost Baseline

The table below represents the current Energy and Cost baseline for Unmetered Streetlights in your municipality, developed using the inventory of equipment that is represented on your unmetered PECO streetlight bill. Any energy cost savings realized from upgrades to the unmetered fixtures installed in your community will be realized through changes to this PECO bill(s). Because the quantities, types, and wattages of fixtures reflected on the PECO bill(s) vary from what is actually installed in the municipality, the table on the following page (Verified Existing Street Lighting System) is used as the basis of the Scope of Work for this project.

PECO Unmetered Streetlight Baseline
(Consolidated Summary of all PECO Streetlight Bills)

Fixture Type Code	Fixture Type Description	Location Count	Fixture Quantity	Fixture Watts	Total kW	Annual Operating Hours	Total kWh/ Year	Total Annual Electric Costs
Streetlights								
02500L	Streetlight, 202W INC		2	202	0.4	4,092	1,653	$117
04000M	Streetlight, 100W MV		773	115	88.9	4,092	363,758	$25,757
05800S	Streetlight, 70W HPS		1	94	0.1	4,092	385	$27
08000M	Streetlight, 175W MV		573	191	109.4	4,092	447,841	$31,711
09500S	Streetlight, 100W HPS		2	131	0.3	4,092	1,072	$76
12000M	Streetlight, 250W MV		121	275	33.3	4,092	136,161	$9,641
20000M	Streetlight, 400W MV		277	429	118.8	4,092	486,265	$34,432
25000S	Streetlight, 250W HPS		6	294	1.8	4,092	7,218	$511
42000M	Streetlight, 750W MV		48	768	36.9	4,092	150,847	$10,681
20500H	Streetlight, 250W MH		14	294	4.1	4,092	16,843	$1,193
13000H	Streetlight, 175W MH		4	192	0.8	4,092	3,143	$223
Streetlight Totals			**1,821**		**394.7**		**1,615,186**	**$114,369**
Energy Usage Sub-Total			**1,821**		**394.7**		**1,615,186**	**$114,369**
Locations	Service Locations	1,760						$141,082
Total Electric Bill Costs		**1,760**						**$255,450**

*Service Location Distribution Charge (SLDC), also known as the "Tap Fee" is based on $6.68 per location, per month. This is a fixed charge on your bill, and it is not impacted by the wattage of the fixture at each location. The costs associated with SLDC are expected to stay the same unless the quantity of service locations changes as a result of your RSLPP project. Estimates for any expected changes in SLDC as a result of the project will be modeled in the following section.

Unmetered Streetlight Audit Verified Inventory and Adjustments

The table below represents the field-audited lighting inventory for all Unmetered Streetlights located in your municipality. This audit information has been analyzed by KLS and the municipality to ensure its accuracy. The inventory presented in the table below lists the quantities and types of fixtures eligible for conversion to LED, and serves as the basis for the scope of work for your project. Any differences from the existing PECO baseline and the field-audited lighting inventory is reflected in the adjustment table at the bottom of the page and will carry forward in the economic analysis in later sections.

Verified Existing Streetlight System *(Based on field audit)*								
Fixture Type Code	**Fixture Type Description**	**Location Count**	**Fixture Quantity**	**Fixture Watts**	**Total kW**	**Annual Operating Hours**	**Total kWh/ Year**	**Total Annual Electric Costs**
Cobrahead								
CH-100W-HPS	Cobrahead, 100W HPS		143	131	18.7	4,092	76,655	$5,428
CH-100W-MV	Cobrahead, 100W MV		288	115	33.1	4,092	135,527	$9,596
CH-150W-HPS	Cobrahead, 150W HPS		6	192	1.2	4,092	4,714	$334
CH-175W-MV	Cobrahead, 175W MV		329	191	62.8	4,092	257,137	$18,207
CH-250W-HPS	Cobrahead, 250W HPS		55	294	16.2	4,092	66,168	$4,685
CH-70W-HPS	Cobrahead, 70W HPS		8	94	0.8	4,092	3,077	$218
CH-54W-LED	Cobrahead, 54W LED		1	54	0.1	4,092	221	$16
CH-99W-LED	Cobrahead, 99W LED		22	99	2.2	4,092	8,912	$631
CH-100W-MH	Cobrahead, 100W MH		4	131	0.5	4,092	2,144	$152
CH-143W-LED	Cobrahead, 143W LED		3	143	0.4	4,092	1,755	$124
CH-175W-MH	Cobrahead, 175W MH		5	192	1.0	4,092	3,928	$278
CH-161W-LED	Cobrahead, 161W LED		2	161	0.3	4,092	1,318	$93
CH-202W-INC	Cobrahead, 202W INC		1	202	0.2	4,092	827	$59
CH-250W-LED	Cobrahead, 250W LED		1	250	0.3	4,092	1,023	$72
CH-250W-MH	Cobrahead, 250W MH		31	294	9.1	4,092	37,294	$2,641
CH-250W-MV	Cobrahead, 250W MV		33	275	9.1	4,092	37,135	$2,629
CH-400W-HPS	Cobrahead, 400W HPS		51	450	23.0	4,092	93,911	$6,650
CH-400W-MH	Cobrahead, 400W MH		75	450	33.8	4,092	138,105	$9,779
CH-400W-MV	Cobrahead, 400W MV		44	429	18.9	4,092	77,241	$5,469
CH-750W-MV	Cobrahead, 750W MV		1	768	0.8	4,092	3,143	$223
CH-99W-HPS	Cobrahead, Undefined Lamp Type and Wattage		54	131	7.1	4,092	28,947	$2,050
SEC-100W-MV	Security Light, 100W MV		3	115	0.3	4,092	1,412	$100
SEC-99W-HPS	Security Light, Undefined Lamp Type and Wattage		1	131	0.1	4,092	536	$38
Cobrahead Totals			**1,161**		**239.8**		**981,131**	**$69,472**
Decorative								
4SC-175W-MV	4-Sided Colonial, 175W MV		22	191	4.2	4,092	17,195	$1,218
4SC-100W-MV	4-Sided Colonial, 100W MV		238	115	27.4	4,092	111,998	$7,930
4SC-99W-HPS	4-Sided Colonial, Undefined Lamp Type and Watts		21	131	2.8	4,092	11,257	$797
4SC-250W-MV	4-Sided Colonial, 250W MV		1	275	0.3	4,092	1,125	$80
4SC-100W-HPS	4-Sided Colonial, 100W HPS		13	131	1.7	4,092	6,969	$493
4SC-175W-MH	4-Sided Colonial, 175W MH		4	192	0.8	4,092	3,143	$223
4SC-750W-MV	4-Sided Colonial, 750W MV		1	768	0.8	4,092	3,143	$223
4SC-150W-HPS	4-Sided Colonial, 150W HPS		2	192	0.4	4,092	1,571	$111
4SL-202W-INC	4-Sided Lantern, 202W INC		1	202	0.2	4,092	827	$59
BL-99W-MH	Bollard, MH, undefined wattage		2	131	0.3	4,092	1,072	$76
4SC-250W-MH	4-Sided Colonial, 250W MH		3	294	0.9	4,092	3,609	$256
4SL-99W-HPS	4-Sided Lantern, Undefined Lamp Type and Wattage		2	131	0.3	4,092	1,072	$76
6SL-99W-HPS	6-Sided Lantern, Undefined Lamp Type and Wattage		8	131	1.0	4,092	4,288	$304
8SL-99W-HPS	8-Sided Lantern, Undefined Lamp Type and Wattage		3	131	0.4	4,092	1,608	$114
CTO-99W-HPS	Contempo, Undefined Lamp Type and Watts		8	131	1.0	4,092	4,288	$304
Decorative Totals			**329**	**3,146**	**42.3**		**173,165**	**$12,262**

Unmetered Streetlight Audit Verified Inventory and Adjustments *(continued)*

Verified Existing Streetlight System
(Based on field audit)

Fixture Type Code	Fixture Type Description	Location Count	Fixture Quantity	Fixture Watts	Total kW	Annual Operating Hours	Total kWh/ Year	Total Annual Electric Costs
Decorative (Retrofit)								
CA-250W-MH	Caged Acorn, 250W, MH		10	275	2.8	4,092	11,253	$797
CA-400W-MV	Caged Acorn, 400W, MV		11	429	4.7	4,092	19,310	$1,367
CA-750W-MV	Caged Acorn, 750W, MV		5	768	3.8	4,092	15,713	$1,113
CA-99W-HPS	Caged Acorn, Undefined Lamp Type and Wattage		57	131	7.5	4,092	30,555	$2,164
Decorative (Retrofit) Totals			**83**	**1,603**	**18.8**		**76,831**	**$5,440**
Area Lighting								
SB-100W-MV	Shoebox Area Light, 100W MV		50	115	5.8	4,092	23,529	$1,666
SB-175W-MV	Shoebox, 175W MV		45	191	8.6	4,092	35,171	$2,490
SB-250W-HPS	Shoebox Area Light, 250W HPS		84	275	23.1	4,092	94,525	$6,693
SB-250W-MV	Shoebox Area Light, 250W MV		52	275	14.3	4,092	58,516	$4,143
SB-400W-MV	Shoebox Area Light, 400W MV		152	429	65.2	4,092	266,831	$18,894
SB-99W-HPS	Shoebox Area Light, Undefined Lamp Type and Wattage		16	131	2.1	4,092	8,577	$607
Area Lighting			**399**	**1,416**	**119.0**		**487,149**	**$34,494**
Energy Usage Sub-Total			**1,972**		**419.9**		**1,718,276**	**$121,668**
Locations	Service Locations	1,760						$141,082
Total Electric Bill Costs		**1,760**						**$262,750**

PECO Inventory Adjustment and Impact
(PECO bill impact of differences between PECO baseline and audit of existing fixtures)

Adjustment Type	Location Count	Fixture Quantity	Fixture Watts	Total kW	Annual Operating Hours	Total kWh/ Year	Total Annual Electric Costs
PECO Baseline kWh		1,821		394.7	4,092	1,615,186	$114,369
Audit Verified Existing kWh		1,972		419.9	4,092	1,718,276	$121,668
kWh Adjustment Savings (+) and Costs (-)		(151)		(25.2)		(103,090)	($7,300)
PECO Baseline Locations							
Audit Verified Existing Locations							
Location Adjustment Savings (+) and Costs (-)	0						$0
Total Adjustment Savings (+) and Costs (-)							**($7,300)**

Traffic Signal Lamps and Signs Energy and Cost Baseline

The table below represents the current Energy and Cost baseline for Unmetered Traffic Signal Lamps and Signs in your municipality, developed using information from the municipality's unmetered PECO traffic signal bill(s). This project's energy and cost baseline for unmetered service will be tied to the inventory of equipment on your unmetered PECO traffic signal lamps and signs bill. Any energy cost savings realized from upgrades to the unmetered traffic signal lamps and signs installed in your community will be realized through changes to this PECO bill(s). Because the quantities, types, and wattages of traffic signal lamps and signs reflected on the PECO bill(s) vary from what is actually installed in the municipality, the table on the following page is used as the basis of the Scope of Work for this project.

PECO Unmetered Traffic Signal Baseline
(Consolidated Summary of all PECO Traffic Signal Bills)

Lamp, Sign or Control Type Code	Lamp, Sign or Control Description	Location Count	Lamp, Sign or Control Quantity	Lamp, Sign or Control Watts	Total kW	Annual Operating Hours	Total kWh/ Year	Total Annual Electric Costs
00LOOP	Loops		146	5	0.7	8,640	6,307	$441
0MINLT	Flashing Lights		106	0	0.0	0	0	$0
EMPESD	Preemption Devices		41	2	0.1	8,640	708	$50
G 000 TA - 12	12" Incandescent Traffic Arrow Green		22	150	3.3	691	2,281	$160
G 000 TL - 12	12" Incandescent Green		80	150	12.0	3,715	44,582	$3,118
G 000 TL - 8	8" Incandescent Green		10	69	0.7	3,715	2,563	$179
G LED TA - 12	12" LED Traffic Arrow Green		6	13	0.1	691	54	$4
G LED TA - 8	8" LED Traffic Arrow Green		54	9	0.5	691	336	$23
G LED TL - 12	12" LED Green		349	12	4.2	3,715	15,559	$1,088
G LED TL - 8	8" LED Green		71	14	1.0	3,715	3,693	$258
HNDSGN - 12	12" Incandescent Hand/Man		68	138	9.4	8,640	81,078	$5,670
R 000 TL - 12	12" Incandescent Red		26	150	3.9	4,752	18,533	$1,296
R 000 TL - 8	8" Incandescent Red		5	69	0.3	4,752	1,639	$115
R LED TL - 12	12" LED Red		448	11	4.9	4,752	23,418	$1,638
TRCONT	Motor Controller		85	15	1.3	8,640	11,016	$770
WALKSGN - 9	9" Incandesent Walk/Don't Walk		8	69	0.6	8,640	4,769	$334
Y 000 TA - 12	12" Incandescent Traffic Arrow Yellow		54	150	8.1	691	5,599	$392
Y 000 TA - 8	8" Incandescent Traffic Arrow Yellow		2	69	0.1	691	95	$7
Y 000 TL - 12	12" Incandescent Yellow		393	150	59.0	173	10,187	$712
Y 000 TL - 8	8" Incandescent Yellow		78	69	5.4	173	930	$65
Energy Usage Sub-Total			**2,052**		**115.5**		**233,348**	**$16,320**
Locations	Service Locations	49						$2,158
Total Electric Bill Costs		**49**						**$18,478**

*Service Location Distribution Charge (SLDC), also known as the "Tap Fee" is based on $3.67 per intersection, per month. This is a fixed charge on your bill, and it is not impacted by the wattage of the fixtures at each intersection. The costs associated with SLDC are expected to stay the same unless the quantify of service locations changes as a result of your RSLPP project. Estimates for any expected changes in SLDC as a result of the project will be modeled in the following section.

Unmetered Traffic Signal Lamps and Signs Audit Verified Inventory and Adjustments

The table below represents the field-audited lighting inventory for all Unmetered Streetlights located in your municipality. This audit information has been analyzed by KLS and the municipality to ensure its accuracy. The inventory presented in the table below lists the quantities and types of fixtures eligible for conversion to LED, and serves as the basis for the scope of work for your project. Any differences from the existing PECO baseline and the field-audited lighting inventory is reflected in the adjustment table at the bottom of the page and will carry forward in the economic analysis in later sections.

Verified Existing Traffic Signal System
(Based on field audit)

Lamp, Sign or Control Type Code	Lamp, Sign or Control Description	Location Count	Lamp, Sign or Control Quantity	Lamp, Sign or Control Watts	Total kW	Annual Operating Hours	Total kWh/ Year	Total Annual Electric Costs
00LOOP	Loops		146	5	0.7	8,640	6,307	$441
0MINLT	Flashing Lights		131	0	0.0	0	0	$0
EMPESD	Preemption Devices		41	2	0.1	8,640	708	$50
G LED TA - 12	12” LED Traffic Arrow Green		91	13	1.2	691	818	$57
G LED TL - 12	12” LED Green		398	12	4.8	3,715	17,744	$1,241
G LED TL - 8	8” LED Green		44	14	0.6	3,715	2,289	$160
HNDSGN	LED Hand/Man		8	8	0.1	8,640	553	$39
R LED TL - 12	12” LED Red		411	11	4.5	4,752	21,484	$1,503
R LED TL - 8	8” LED Red		43	6	0.3	4,752	1,226	$86
TRCONT	Motor Controller		85	15	1.3	8,640	11,016	$770
WALKSGN - 12	12" Incandesent Walk/Don't Walk		130	144	18.7	8,640	161,741	$11,312
WALKSGN - 9	9" Incandesent Walk/Don't Walk		4	69	0.3	8,640	2,385	$167
Y LED TA - 12	12” LED Traffic Arrow Yellow		67	10	0.7	691	463	$32
Y LED TL - 12	12” LED Yellow		405	18	7.3	173	1,260	$88
Y LED TL - 8	8” LED Yellow		45	12	0.5	173	93	$7
R LED TA - 12	12” LED Traffic Arrow Red		3	10	0.0	691	21	$1
Energy Usage Sub-Total			**2,052**		**41**		**228,107**	**$15,953**
Locations	Service Locations	49						$2,158
Total Electric Bill Costs		**49**						**$18,111**

PECO Inventory Adjustment and Impact

Adjustment Type	Location Count	Lamp, Sign or Control Quantity	Lamp, Sign or Control Watts	Total kW	Annual Operating Hours	Total kWh/ Year	Total Annual Electric Costs
PECO Baseline kWh		2,052		115.5		233,348	$16,320
Audit Verified Existing kWh		2,052		41.0		228,107	$15,953
kWh Adjustment Savings (+) and Costs (-)		0		74.5		5,242	$367
PECO Baseline Locations	49						$2,158
Audit Verified Existing Locations	49						$2,158
Location Adjustment Savings (+) and Costs (-)	0						$0
Total Adjustment Savings (+) and Costs (-)							**$367**

Design Approach and Standardized Upgrade Plan

Design Approach

The RSLPP is focused on delivering operating cost savings with low project costs while maintaining or improving lighting performance relative to the existing lighting system. The replacement fixtures used for this project were identified during the RSLPP procurement process, which evaluated and selected the best performing LED fixtures that could be applied to typical applications found in our region's roadways. The following typical applications were evaluated during the RSLPP procurement process to select high-performing manufacturer solutions: Cobrahead (Local, Major & Collector roadways) and 4-Sided Colonial (low and high volume Local Residential streets). For each typical application analysis KLS evaluates illumination (quantity of light) levels and uniformity ratios (how light spreads) against IES RP-8 standards. Actual municipality applications will likely not match typical applications (i.e. pole spacing, fixture mounting height) and therefore are likely not to meet IES RP-8 standards. However, evaluation solutions against IES RP-8 standards during the procurement process ensures that the best possible applications will be available for the RSLPP projects.

Lighting performance is not solely based on illumination levels and uniformity, but is also impacted by other factors including high angle glare, source-brightness, uplight/backlight, and color temperature. Many of these factors impact a human's perceived visibility of a lit environment. These factors were also evaluated in the RSLPP procurement process.

The final project design and specifications for LED lighting fixtures represented in this document were developed using the following general approach:

1) **Gather field audit information** – The design process begins with a field audit to identify the existing locations and attributes of your incumbent street lighting system and when possible match them with pre-existing PECO address information. The locations of your existing streetlights will remain for your LED conversion project, as moving fixtures to new locations would be cost prohibitive and unnecessary to achieve the RSLPP design goals. During the field audit, KLS gathers many key pieces of information on your existing lighting system, including but not limited to the geolocation of the pole, pole type and style, the fixture style (e.g. cobrahead or decorative), the mounting height of the fixture, length of the arm, angle of the arm to the roadway or intersection, and the wattage of the lamp. These attributes inform the rest of the design process. The audit process uses various sources to identify lamp wattage and type, in preference order: municipality confirmed specifications, observed lamp identified tag on fixture, PECO data when record can be matched to existing information, likely wattage given application and adjacent fixtures with known lamp types and wattages.

2) **Identify the correct fixture type for the application** – In most cases the existing fixture style that was identified in the field audit (e.g. cobrahead or decorative) is the appropriate fixture type for the lighting application, and a replacement LED fixture of the same style will be used. If a different fixture style is warranted it will be specified and reviewed with the municipality.

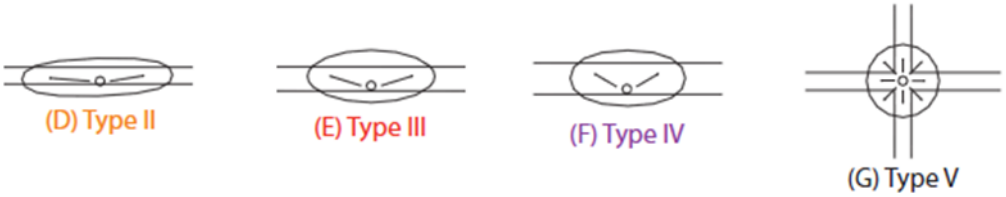
3) **Identify the correct LED wattage and lumen package for proposed fixture** – There are two aspects to identifying the correct replacement wattage and lumen package for the new fixture. The first aspect is to identify a replacement LED fixture that meets or exceeds the illumination

levels of the existing fixture. The second aspect is standardizing the replacement fixtures to make sure that similar fixture types and wattages are utilized on similar roadway types defined by traffic volume data or roadway classification and municipal input. See the table in the Standardized Upgrade Plan for an overview of the standardization upgrade strategy applied to RSLPP projects.

Upgrade recommendations will also be advised by a less technical, but equally relevant approach, which is to utilize the general knowledge of what upgrades have worked well on previous rounds of the RSLPP and other KLS projects. This secondary assessment is be used as a "sanity" check to the previous analysis driven approach discussed above. Some municipalities may make a decision, possibly consistent with current illumination levels, to have a relatively higher or lower illumination level than the standard recommended by KLS.

For area lighting applications (non-roadway), spaces to be illuminated are highly variable and not subject to standardization, the design approach of meeting or exceeding the lighting performance of the existing fixture is utilized.

4) **Identify the correct fixture distribution type** – All LED fixtures provide options for a distribution type, which is how light spreads out from the fixture to the ground or work surface. These distribution types as defined by the Illumination Engineering Society have the following shapes:



For roadway lighting applications with a fixture and arm, Type II distributions are used for mid-street general roadway applications. For intersections, Type III or V distributions are the options considered. When a single fixture is illuminating an intersection and the arm positioned at an angle (e.g. 45-degree) such that the fixture is in-line with the middle of an intersection a type V distribution is utilized. For all other intersections a Type III distribution will be utilized.

For street lighting applications with a post-top fixture (e.g. 4-Sided Colonial) Type II distributions will be utilized at mid-street locations and Type V at intersections.

For area lighting applications, spaces to be illuminated are highly variable requiring distribution types to be specified on a case by case basis. It is common for forward-throw type IV distributions to be utilized for area lighting applications such as parking lots with fixtures located on the perimeter.

It should be noted that in addition to specifying the correct distribution types that control how light is spread toward the ground, the RSLPP also minimizes uplight through the specification of "cut-off" fixtures. Cut-off fixtures have no uplight (above 90-degrees). All RSLPP cobrahead, shoebox, wallpack types will be specified as "cut-off" fixtures. Due to the nature of the fixture design, decorative fixtures "cut-off" is not typically available for specification, but the RSLPP utilizes fixtures that minimize uplight.

5) **Select the preferred color temperature** – Color temperature is the general perception of the light source color. The metric for color temperature is the Correlated Color Temperature (CCT) measured in Kelvin (K) temperature. Older technology color temperatures could range from yellow (high pressure sodium, CCT = ~2200K) to warm-white (incandescent, ~2700K) to white (metal halide, CCT = ~4000K) and blue-white (mercury vapor, CCT = ~5000K+). LED technology is generally available within a range of white options from 3000K (warm white) to 6500K (blue white). The RSLPP offers CCT options from ~3000K (warm white) to ~4000K (white). Municipalities make their selection of color temperature based on preferences utilizing input from KLS and evaluating previous installation in neighboring municipalities. Color temperatures can be mixed within a municipality utilizing different types in different areas (e.g. residential neighborhoods, commercial districts, etc.).

6) **Traffic signal lamp and sign upgrades** – LED traffic signal lamp and pedestrian sign upgrades are direct 1-for-1 replacements of the existing lamps and signs. LED upgrades meet the same fit, form and function of the existing lamps and signs while delivering significant operating cost savings for an attractive return on investment.

Standardized Upgrade Plan

Based on the general design approach discussed above, the following standardized upgrade plan has been developed for this lighting upgrade project.

Cobrahead					
Local Roadway					
Existing Lamp Type	**Typical Lamp Wattage**	**Proposed LED Fixture Watts**	**Optional Bump Up Wattage[1]**	**Distribution Type[2]**	**Color Temperature**
High Pressure Sodium	70W or 100W	38W	53W	Mid-Street > Type 2 Intersection > Type 3 or 5	Municipality Choice 3000K or 4000K
Metal Halide	100W or 175W	38W	53W		
Mercury Vapor	100W or 175W	38W	53W		
Collector Roadway					
Existing Lamp Type	**Typical Lamp Wattage**	**Proposed LED Fixture Watts**	**Optional Bump Up Wattage[1]**	**Distribution Type**	**Color Temperature**
High Pressure Sodium	150W	73W	88W	Mid-Street > Type 2 Intersection > Type 3 or 5	Municipality Choice 3000K or 4000K
Metal Halide	175W or 250W	73W	88W		
Mercury Vapor	175W or 250W	73W	88W		
Major Roadway					
Existing Lamp Type	**Typical Lamp Wattage**	**Proposed LED Fixture Watts**	**Optional Bump Up Wattage[1]**	**Distribution Type**	**Color Temperature**
High Pressure Sodium	250W or 400W	106W	161W	Mid-Street > Type 2 Intersection > Type 3 or 5	Municipality Choice 3000K or 4000K
Metal Halide	250W or 400W	106W	161W		
Mercury Vapor	250W or 400W	106W	161W		
Notes:					
1) Bump up wattage could be selected for overall higher illumination levels (30-40%) throughout a municipality or at intersections. It also would be the recommended specification level when using controls with the expectation of dimming down to the desired design level at time of installation.					
2) Type 5 distribution to be used at intersections with a single fixture illuminating the interesection with arm positioned on 45-degree angle toward center of the intersection. All other intersection applications should use Type 3.					

4-Sided Colonial					
All Roadway Types					
Existing Lamp Type	**Typical Lamp Wattage**	**Proposed LED Fixture Watts**	**Optional Bump Up Wattage[1]**	**Distribution Type**	**Color Temperature**
High Pressure Sodium	70W or 100W	39W	46W	Mid-Street > Type 2 Intersection > Type 5	Municipality Choice 3000K or 4000K
Metal Halide	100W or 175W	39W	46W		
Mercury Vapor	100W or 175W	39W	46W		
Notes:					
1) Bump up wattage could be selected for overall higher illumination levels throughout a municipality or at intersections					

Premium Decorative Fixtures (Lanterns & Acorns)					
All Roadway Types					
Existing Lamp Type	**Typical Lamp Wattage**	**Proposed LED Fixture Watts**	**Optional Bump Up Wattage[1]**	**Distribution Type**	**Color Temperature**
High Pressure Sodium	150W	40W	70W	Mid-Street > Type 2 Intersection > Type 5	Municipality Choice 3000K or 4000K
Metal Halide	175W	40W	70W		
Mercury Vapor	175W	40W	70W		
Notes:					
1) Bump up wattage could be selected for overall higher illumination levels throughout a municipality or at intersections					

Advanced Lighting Control Upgrade Options

Standard control solutions, such as fixture-mounted photocells that are currently being used in the municipality's existing lighting system will be offered as baseline replacement solutions for all new LED fixtures in this project. Retrofit kits will reuse existing photocells. Fixtures that are currently controlled by time clocks and/or master photocells, those centralized control systems will be used to control new LED fixtures. Advanced Lighting Controls can be layered on the standard LED fixture upgrade options in place of or in addition to the standard control solutions. The benefits of Advanced Lighting Control include the potential for additional energy and maintenance savings. There are no additional design costs associated with the specification of advanced lighting controls, but depending on the type of controls specified, there will be additional project costs to purchase and install the controls. The sections below define the available control options that have been identified through the RSLPP procurement process. Savings and project costs for Manual Fixture Controls and Network Control Solutions are provided for consideration in later sections.

Manual Fixture Controls

Manual Fixture Controls are available to control LED cobrahead and 4-sided colonial fixtures solutions selected through the RSLPP, and these would be specified in addition to a standard photocell. A manual fixture control is located in the fixture housing, not visible to the public, and allows for light levels to be adjusted up or down. When this control option is requested, the next higher fixture lumen package is specified and during installation the control is "dialed-down" to the desired wattage and lumen output at the time of installation. This option is not typically used to save energy but rather to provide future flexibility to increase or decrease illumination levels based on application needs. When LED fixtures are dimmed, they do experience longer life, which delivers additional maintenance savings. In Round I of the RSLPP more than 30% of municipalities choose this option. Manual fixture controls are not typically used area lighting fixtures. Below are the components and additional costs associated with these manual fixture controls:

- Cobrahead
  - Manual fixture control adder = $15.29
  - Next higher lumen package fixture adder = $10-30
  - No additional installation related costs
- 4-Sided Colonial
  - Manual fixture control adder = $16.57
  - Next higher lumen package fixture adder = $0-30
  - No additional installation related costs

Stand-Alone Dimming Controls

Stand-alone dimming controls are typically useful for area lighting fixtures where automatic dimming is desired during the fixture "on" period or where a timeclock is not available to turn lights off during the typical photocell fixture "on" period. Two types of stand-alone dimming controls are available: a **photocell replacement option** or a **separate dimming module** wired as an additional fixture component. These local connected controls allow for "pre-set" dimming schedules to be defined for each fixture. For example, if it is desired for a set of fixtures (e.g. parking lot) to illuminate at dusk, dim down to 30% at 2am and turn off at dawn, the local

connected control can be set for this specific dimming strategy. Often these controls can be connected to a local networking technology (e.g. Bluetooth) and re-programmed on-site. Below are the options and additional costs associated with these stand-alone dimming controls:

- Photocell Replacement Option
  - Photocell replacement unit price adder = $44.02
  - No additional installation related costs
- Separate Dimming Module
  - Dimming module unit price adder = Pricing not evaluated in the RSLPP procurement process but available upon request
  - Installation unit price adder = Pricing not evaluated in the RSLPP procurement process but available upon request

Network Control System

If a municipality wants complete control of a lighting system with remote networked access, then a network control system can be specified and designed. These control systems allow a municipality to manage and remotely modify master dimming schedules for all connected fixtures. A network control system also monitors the operations of all connected fixtures. Outages or under-performing fixtures can be quickly identified and, in most cases, be included in a proactive reporting to the municipality. This option can be used to save energy but is typically specified for the asset management benefits. In Round I of the RSLPP one municipality choose this option.

For this round of the RSLPP, the network control system selected utilizes fixture mounted nodes that communicate via a mesh network to one or more gateways (municipality size) that communicate to a cloud-based server. Municipalities can access the cloud-based server with a standard internet connection. This control system will likely be eligible for the PECO SL-C tariff which could generate additional energy savings. Municipalities that install a network control system will not also need photocells.

Below are the components and additional costs associated with a network control system:

- Fixture Node
  - Node unit price adder = $101.32
    - Node replaces standard photocell and associated cost ($11.87)
  - Node annual fees = $2/node/year or $40/node for 20 years
  - No additional installation related costs
- Control System Gateway
  - Gateway unit price adder = $1,593
  - Installation unit price adder = $3,000
  - Multiple gateways may be required depending on municipality size

Upgrade Specifications & Savings

Annual Energy Savings – Unmetered Streetlights

The following table shows the energy and cost comparison between the field audit verified existing streetlight system and the proposed LED upgrade solutions. The resulting annual energy savings associated with the LED upgrade is also shown. If any differences were identified between the PECO energy and cost baseline and the field audit verified existing streetlight system, those adjustments and associated cost impacts are reflected in the PECO Inventory Adjustment at the bottom of the chart. The cost or savings impact of any service location adjustments (e.g. due to PECO buyback and tariff change) is also shown in this table.

Existing							Upgrade							Savings
Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Annual Energy Cost Savings
Cobrahead														
CH-100W-HPS	Cobrahead, 100W HPS	131	13	1.7	6,969	$493	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	13	1.4	5,639	$485	$9
CH-100W-HPS	Cobrahead, 100W HPS	131	6	0.8	3,216	$228	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	6	0.6	2,603	$224	$4
CH-100W-HPS	Cobrahead, 100W HPS	131	1	0.1	536	$38	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	1	0.1	434	$37	$1
CH-100W-HPS	Cobrahead, 100W HPS	131	85	11.1	45,564	$3,226	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	85	3.2	13,217	$1,136	$2,090
CH-100W-HPS	Cobrahead, 100W HPS	131	12	1.6	6,433	$455	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	12	0.5	1,866	$160	$295
CH-100W-HPS	Cobrahead, 100W HPS	131	9	1.2	4,824	$342	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	9	0.3	1,399	$120	$221
CH-100W-HPS	Cobrahead, 100W HPS	131	12	1.6	6,433	$455	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	12	0.9	3,585	$308	$147
CH-100W-HPS	Cobrahead, 100W HPS	131	3	0.4	1,608	$114	CH-88W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	3	0.2	896	$77	$37
CH-100W-HPS	Cobrahead, 100W HPS	131	2	0.3	1,072	$76	CH-88W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	2	0.1	597	$51	$25
CH-100W-MV	Cobrahead, 100W MV	115	54	6.2	25,411	$1,799	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	54	5.7	23,423	$2,014	($214)
CH-100W-MV	Cobrahead, 100W MV	115	8	0.9	3,765	$267	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	8	0.8	3,470	$298	($32)
CH-100W-MV	Cobrahead, 100W MV	115	2	0.2	941	$67	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	2	0.2	868	$75	($8)
CH-100W-MV	Cobrahead, 100W MV	115	172	19.8	80,940	$5,731	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	172	6.5	26,745	$2,299	$3,432
CH-100W-MV	Cobrahead, 100W MV	115	23	2.6	10,823	$766	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	23	0.9	3,576	$307	$459
CH-100W-MV	Cobrahead, 100W MV	115	9	1.0	4,235	$300	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	9	0.3	1,399	$120	$180
CH-100W-MV	Cobrahead, 100W MV	115	16	1.8	7,529	$533	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	16	1.2	4,779	$411	$122
CH-100W-MV	Cobrahead, 100W MV	115	3	0.3	1,412	$100	CH-88W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	3	0.2	896	$77	$23
CH-100W-MV	Cobrahead, 100W MV	115	1	0.1	471	$33	CH-88W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	1	0.1	299	$26	$8
CH-150W-HPS	Cobrahead, 150W HPS	192	1	0.2	786	$56	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	1	0.1	434	$37	$18
CH-150W-HPS	Cobrahead, 150W HPS	192	3	0.6	2,357	$167	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	3	0.1	466	$40	$127
CH-150W-HPS	Cobrahead, 150W HPS	192	1	0.2	786	$56	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	1	0.0	155	$13	$42
CH-150W-HPS	Cobrahead, 150W HPS	192	1	0.2	786	$56	CH-88W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	1	0.1	299	$26	$30
CH-175W-MV	Cobrahead, 175W MV	191	135	25.8	105,512	$7,471	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	135	14.3	58,557	$5,035	$2,437
CH-175W-MV	Cobrahead, 175W MV	191	52	9.9	40,642	$2,878	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	52	5.5	22,555	$1,939	$939
CH-175W-MV	Cobrahead, 175W MV	191	35	6.7	27,355	$1,937	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	35	3.7	15,181	$1,305	$632
CH-175W-MV	Cobrahead, 175W MV	191	23	4.4	17,976	$1,273	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	23	0.9	3,576	$307	$965
CH-175W-MV	Cobrahead, 175W MV	191	33	6.3	25,792	$1,826	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	33	1.3	5,131	$441	$1,385
CH-175W-MV	Cobrahead, 175W MV	191	28	5.3	21,884	$1,550	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	28	1.1	4,354	$374	$1,175
CH-175W-MV	Cobrahead, 175W MV	191	15	2.9	11,724	$830	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	15	1.1	4,481	$385	$445
CH-175W-MV	Cobrahead, 175W MV	191	4	0.8	3,126	$221	CH-88W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	4	0.3	1,195	$103	$119
CH-175W-MV	Cobrahead, 175W MV	191	4	0.8	3,126	$221	CH-88W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	4	0.3	1,195	$103	$119

Annual Energy Savings – Unmetered Streetlights *(continued)*

Existing							Upgrade							Savings
Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Annual Energy Cost Savings
Cobrahead														
CH-250W-HPS	Cobrahead, 250W HPS	294	14	4.1	16,843	$1,193	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	14	1.5	6,073	$522	$671
CH-250W-HPS	Cobrahead, 250W HPS	294	16	4.7	19,249	$1,363	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	16	1.7	6,940	$597	$766
CH-250W-HPS	Cobrahead, 250W HPS	294	2	0.6	2,406	$170	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	2	0.2	868	$75	$96
CH-250W-HPS	Cobrahead, 250W HPS	294	9	2.6	10,827	$767	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	9	0.3	1,399	$120	$646
CH-250W-HPS	Cobrahead, 250W HPS	294	7	2.1	8,421	$596	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	7	0.3	1,088	$94	$503
CH-250W-HPS	Cobrahead, 250W HPS	294	2	0.6	2,406	$170	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	2	0.1	311	$27	$144
CH-250W-HPS	Cobrahead, 250W HPS	294	2	0.6	2,406	$170	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	2	0.1	597	$51	$119
CH-250W-HPS	Cobrahead, 250W HPS	294	2	0.6	2,406	$170	CH-88W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	2	0.1	597	$51	$119
CH-250W-HPS	Cobrahead, 250W HPS	294	1	0.3	1,203	$85	CH-88W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	1	0.1	299	$26	$60
CH-70W-HPS	Cobrahead, 70W HPS	94	3	0.3	1,154	$82	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	3	0.3	1,301	$112	($30)
CH-70W-HPS	Cobrahead, 70W HPS	94	3	0.3	1,154	$82	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	3	0.3	1,301	$112	($30)
CH-70W-HPS	Cobrahead, 70W HPS	94	1	0.1	385	$27	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	1	0.0	155	$13	$14
CH-70W-HPS	Cobrahead, 70W HPS	94	1	0.1	385	$27	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	1	0.1	299	$26	$2
CH-54W-LED	Cobrahead, 54W LED	54	1	0.1	221	$16	CH-54W-LED-NCS	Add Cimcon Node to existing CH-54W-LED	54	1	0.1	221	$16	$0
CH-99W-LED	Cobrahead, 99W LED	99	22	2.2	8,912	$631	CH-99W-LED-NCS	Add Cimcon Node to existing CH-99W-LED	99	22	2.2	8,912	$631	$0
CH-100W-MH	Cobrahead, 100W MH	131	2	0.3	1,072	$76	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	2	0.2	868	$75	$1
CH-100W-MH	Cobrahead, 100W MH	131	1	0.1	536	$38	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	1	0.0	155	$13	$25
CH-100W-MH	Cobrahead, 100W MH	131	1	0.1	536	$38	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	1	0.0	155	$13	$25
CH-143W-LED	Cobrahead, 143W LED	143	3	0.4	1,755	$124	CH-143W-LED-NCS	Add Cimcon Node to existing CH-143W-LED	143	3	0.4	1,755	$124	$0
CH-175W-MH	Cobrahead, 175W MH	192	1	0.2	786	$56	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	1	0.1	434	$37	$18
CH-175W-MH	Cobrahead, 175W MH	192	3	0.6	2,357	$167	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	3	0.1	466	$40	$127
CH-175W-MH	Cobrahead, 175W MH	192	1	0.2	786	$56	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	1	0.0	155	$13	$42
CH-161W-LED	Cobrahead, 161W LED	161	2	0.3	1,318	$93	CH-161W-LED-NCS	Add Cimcon Node to existing CH-161W-LED	161	2	0.3	1,318	$93	$0
CH-202W-INC	Cobrahead, 202W INC	202	1	0.2	827	$59	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	1	0.1	434	$37	$21
CH-250W-LED	Cobrahead, 250W LED	250	1	0.3	1,023	$72	CH-250W-LED-NCS	Add Cimcon Node to existing CH-250W-LED	250	1	0.3	1,023	$72	$0
CH-250W-MH	Cobrahead, 250W MH	294	18	5.3	21,655	$1,533	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	18	1.9	7,808	$671	$862
CH-250W-MH	Cobrahead, 250W MH	294	3	0.9	3,609	$256	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	3	0.3	1,301	$112	$144
CH-250W-MH	Cobrahead, 250W MH	294	4	1.2	4,812	$341	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	4	0.2	622	$53	$287
CH-250W-MH	Cobrahead, 250W MH	294	2	0.6	2,406	$170	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	2	0.1	311	$27	$144
CH-250W-MH	Cobrahead, 250W MH	294	1	0.3	1,203	$85	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	1	0.0	155	$13	$72
CH-250W-MH	Cobrahead, 250W MH	294	3	0.9	3,609	$256	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	3	0.2	896	$77	$179
CH-250W-MV	Cobrahead, 250W MV	275	24	6.6	27,007	$1,912	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	24	2.5	10,410	$895	$1,017
CH-250W-MV	Cobrahead, 250W MV	275	7	1.9	7,877	$558	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	7	0.7	3,036	$261	$297
CH-250W-MV	Cobrahead, 250W MV	275	2	0.6	2,251	$159	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	2	0.1	311	$27	$133

Annual Energy Savings – Unmetered Streetlights *(continued)*

Existing							Upgrade							Savings
Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Annual Energy Cost Savings
Cobrahead														
CH-400W-HPS	Cobrahead, 400W HPS	450	22	9.9	40,511	$2,869	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	22	2.3	9,543	$820	$2,048
CH-400W-HPS	Cobrahead, 400W HPS	450	16	7.2	29,462	$2,086	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	16	1.7	6,940	$597	$1,490
CH-400W-HPS	Cobrahead, 400W HPS	450	2	0.9	3,683	$261	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	2	0.2	868	$75	$186
CH-400W-HPS	Cobrahead, 400W HPS	450	4	1.8	7,366	$522	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	4	0.2	622	$53	$468
CH-400W-HPS	Cobrahead, 400W HPS	450	1	0.5	1,841	$130	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	1	0.0	155	$13	$117
CH-400W-HPS	Cobrahead, 400W HPS	450	3	1.4	5,524	$391	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	3	0.1	466	$40	$351
CH-400W-HPS	Cobrahead, 400W HPS	450	1	0.5	1,841	$130	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	1	0.1	299	$26	$105
CH-400W-HPS	Cobrahead, 400W HPS	450	2	0.9	3,683	$261	CH-88W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	2	0.1	597	$51	$209
CH-400W-MH	Cobrahead, 400W MH	450	41	18.5	75,497	$5,346	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	41	4.3	17,784	$1,529	$3,817
CH-400W-MH	Cobrahead, 400W MH	450	18	8.1	33,145	$2,347	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	18	1.9	7,808	$671	$1,676
CH-400W-MH	Cobrahead, 400W MH	450	3	1.4	5,524	$391	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	3	0.3	1,301	$112	$279
CH-400W-MH	Cobrahead, 400W MH	450	10	4.5	18,414	$1,304	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	10	0.4	1,555	$134	$1,170
CH-400W-MH	Cobrahead, 400W MH	450	2	0.9	3,683	$261	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	2	0.1	311	$27	$234
CH-400W-MH	Cobrahead, 400W MH	450	1	0.5	1,841	$130	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	1	0.1	299	$26	$105
CH-400W-MH	Cobrahead, 400W MH	429	33	14.2	57,930	$4,102	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	33	3.5	14,314	$1,231	$2,871
CH-400W-MH	Cobrahead, 400W MH	429	8	3.4	14,044	$994	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	8	0.8	3,470	$298	$696
CH-400W-MH	Cobrahead, 400W MH	429	1	0.4	1,755	$124	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	1	0.1	434	$37	$87
CH-400W-MH	Cobrahead, 400W MH	429	1	0.4	1,755	$124	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	1	0.0	155	$13	$111
CH-400W-MH	Cobrahead, 400W MH	429	1	0.4	1,755	$124	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	1	0.1	299	$26	$99
CH-750W-MV	Cobrahead, 750W MV	768	1	0.8	3,143	$223	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	1	0.1	434	$37	$185
CH-99W-HPS	Cobrahead, Undefined Lamp Type and Wattage	131	27	3.5	14,473	$1,025	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	27	2.9	11,711	$1,007	$18
CH-99W-HPS	Cobrahead, Undefined Lamp Type and Wattage	131	7	0.9	3,752	$266	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	7	0.7	3,036	$261	$5
CH-99W-HPS	Cobrahead, Undefined Lamp Type and Wattage	131	18	2.4	9,649	$683	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	18	0.7	2,799	$241	$443
CH-99W-HPS	Cobrahead, Undefined Lamp Type and Wattage	131	1	0.1	536	$38	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	1	0.0	155	$13	$25
CH-99W-HPS	Cobrahead, Undefined Lamp Type and Wattage	131	1	0.1	536	$38	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	1	0.1	299	$26	$12
SEC-100W-MV	Security Light, 100W MV	115	1	0.1	471	$33	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	1	0.1	434	$37	($4)
SEC-100W-MV	Security Light, 100W MV	115	1	0.1	471	$33	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	1	0.1	434	$37	($4)
SEC-100W-MV	Security Light, 100W MV	115	1	0.1	471	$33	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	1	0.0	155	$13	$20
SEC-99W-HPS	Security Light, Undefined Lamp Type and Wattage	131	1	0.1	536	$38	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	1	0.0	155	$13	$25
							SL-C Tariff Change	SL-E to SL-C Tariff Change with Network Control System Upgrade						$21,542
Cobrahead Total			**1,161**	**239.8**	**981,131**	**$69,472**				**1,161**	**88.5**	**362,081**	**$30,930**	**$60,085**

Annual Energy Savings – Unmetered Streetlights *(continued)*

Existing							Upgrade							Savings
Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Annual Energy Cost Savings
Decorative														
4SC-175W-MV	4-Sided Colonial, 175W MV	191	12	2.3	9,379	$664	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	12	0.5	1,915	$165	$499
4SC-175W-MV	4-Sided Colonial, 175W MV	191	10	1.9	7,816	$553	4SC-46W-LED-T5-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	10	0.4	1,596	$137	$416
4SC-100W-MV	4-Sided Colonial, 100W MV	115	205	23.6	96,469	$6,831	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	205	8.0	32,716	$2,813	$4,018
4SC-100W-MV	4-Sided Colonial, 100W MV	115	33	3.8	15,529	$1,100	4SC-46W-LED-T5-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	33	1.3	5,266	$453	$647
4SC-99W-HPS	4-Sided Colonial, Undefined Lamp Type and Watts	131	18	2.4	9,649	$683	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	18	0.7	2,873	$247	$436
4SC-99W-HPS	4-Sided Colonial, Undefined Lamp Type and Watts	131	3	0.4	1,608	$114	4SC-46W-LED-T5-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	3	0.1	479	$41	$73
4SC-250W-MV	4-Sided Colonial, 250W MV	275	1	0.3	1,125	$80	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	1	0.0	160	$14	$66
4SC-100W-HPS	4-Sided Colonial, 100W HPS	131	9	1.2	4,824	$342	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	9	0.4	1,436	$123	$218
4SC-100W-HPS	4-Sided Colonial, 100W HPS	131	4	0.5	2,144	$152	4SC-46W-LED-T5-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	4	0.2	638	$55	$97
4SC-175W-MH	4-Sided Colonial, 175W MH	192	4	0.8	3,143	$223	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	4	0.2	638	$55	$168
4SC-750W-MV	4-Sided Colonial, 750W MV	768	1	0.8	3,143	$223	4SC-46W-LED-T5-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	1	0.0	160	$14	$209
4SC-150W-HPS	4-Sided Colonial, 150W HPS	192	2	0.4	1,571	$111	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	2	0.1	319	$27	$84
4SL-202W-INC	4-Sided Lantern, 202W INC	202	1	0.2	827	$59	No Upgrade	No Upgrade	202	1	0.2	827	$59	$0
BL-99W-MH	Bollard, MH, undefined wattage	131	2	0.3	1,072	$76	No Upgrade	No Upgrade	131	2	0.3	1,072	$76	$0
4SC-250W-MH	4-Sided Colonial, 250W MH	294	3	0.9	3,609	$256	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	3	0.1	479	$41	$214
4SL-99W-HPS	4-Sided Lantern, Undefined Lamp Type and Wattage	131	2	0.3	1,072	$76	No Upgrade	No Upgrade	131	2	0.3	1,072	$76	$0
6SL-99W-HPS	6-Sided Lantern, Undefined Lamp Type and Wattage	131	8	1.0	4,288	$304	No Upgrade	No Upgrade	131	8	1.0	4,288	$304	$0
8SL-99W-HPS	8-Sided Lantern, Undefined Lamp Type and Wattage	131	3	0.4	1,608	$114	No Upgrade	No Upgrade	131	3	0.4	1,608	$114	$0
CTO-99W-HPS	Contempo, Undefined Lamp Type and Watts	131	8	1.0	4,288	$304	No Upgrade	No Upgrade	131	8	1.0	4,288	$304	$0
Decorative Total			**329**	**42.3**	**173,165**	**$12,262**				**329**	**15.1**	**61,830**	**$5,116**	**$7,145**
Decorative (Retrofit)														
CA-250W-MH	Caged Acorn, 250W, MH	275	8	2.2	9,002	$637	RTK-CA-70W-LED-T2-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	70	8	0.6	2,292	$162	$475
CA-250W-MH	Caged Acorn, 250W, MH	275	2	0.6	2,251	$159	RTK-CA-70W-LED-T5-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	70	2	0.1	573	$41	$119
CA-400W-MV	Caged Acorn, 400W, MV	429	10	4.3	17,555	$1,243	RTK-CA-70W-LED-T2-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	70	10	0.7	2,864	$203	$1,040
CA-400W-MV	Caged Acorn, 400W, MV	429	1	0.4	1,755	$124	RTK-CA-70W-LED-T5-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	70	1	0.1	286	$20	$104
CA-750W-MV	Caged Acorn, 750W, MV	768	4	3.1	12,571	$890	RTK-CA-70W-LED-T2-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	70	4	0.3	1,146	$81	$809
CA-750W-MV	Caged Acorn, 750W, MV	768	1	0.8	3,143	$223	RTK-CA-70W-LED-T5-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	70	1	0.1	286	$20	$202
CA-99W-HPS	Caged Acorn, Undefined Lamp Type and Wattage	131	53	6.9	28,411	$2,012	RTK-CA-70W-LED-T2-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	70	53	3.7	15,181	$1,075	$937
CA-99W-HPS	Caged Acorn, Undefined Lamp Type and Wattage	131	4	0.5	2,144	$152	RTK-CA-70W-LED-T5-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	70	4	0.3	1,146	$81	$71
Decorative (Retrofit) Total			**83**	**18.8**	**76,831**	**$5,440**				**83**	**5.8**	**23,775**	**$1,683**	**$3,757**

Annual Energy Savings – Unmetered Streetlights *(continued)*

Existing							Upgrade							Savings
Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Annual Energy Cost Savings
Area Lighting														
SB-100W-MV	Shoebox Area Light, 100W MV	115	33	3.8	15,529	$1,100	SB-54W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	38	33	1.2	5,104	$439	$661
SB-100W-MV	Shoebox Area Light, 100W MV	115	10	1.2	4,706	$333	SB-54W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	38	10	0.4	1,547	$133	$200
SB-100W-MV	Shoebox Area Light, 100W MV	115	1	0.1	471	$33	SB-54W-LED-T5-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 5, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	38	1	0.0	155	$13	$20
SB-100W-MV	Shoebox Area Light, 100W MV	115	5	0.6	2,353	$167	SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	5	0.4	1,460	$125	$41
SB-100W-MV	Shoebox Area Light, 100W MV	115	1	0.1	471	$33	SB-99W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	1	0.1	292	$25	$8
SB-175W-MV	Shoebox, 175W MV	191	27	5.2	21,102	$1,494	SB-54W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	38	27	1.0	4,176	$359	$1,135
SB-175W-MV	Shoebox, 175W MV	191	9	1.7	7,034	$498	SB-54W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	38	9	0.3	1,392	$120	$378
SB-175W-MV	Shoebox, 175W MV	191	4	0.8	3,126	$221	SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	4	0.3	1,168	$100	$121
SB-175W-MV	Shoebox, 175W MV	191	4	0.8	3,126	$221	SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	105	4	0.4	1,719	$148	$74
SB-175W-MV	Shoebox, 175W MV	191	1	0.2	782	$55	SB-145W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	105	1	0.1	430	$37	$18
SB-250W-HPS	Shoebox Area Light, 250W HPS	275	17	4.7	19,130	$1,355	SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	17	1.2	4,963	$427	$928
SB-250W-HPS	Shoebox Area Light, 250W HPS	275	56	15.4	63,017	$4,462	SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	105	56	5.9	24,061	$2,069	$2,393
SB-250W-HPS	Shoebox Area Light, 250W HPS	275	11	3.0	12,378	$876	SB-145W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	105	11	1.2	4,726	$406	$470
SB-250W-MV	Shoebox Area Light, 250W MV	275	2	0.6	2,251	$159	SB-54W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	38	2	0.1	309	$27	$133
SB-250W-MV	Shoebox Area Light, 250W MV	275	19	5.2	21,381	$1,514	SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	19	1.4	5,547	$477	$1,037
SB-250W-MV	Shoebox Area Light, 250W MV	275	9	2.5	10,128	$717	SB-99W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	9	0.6	2,627	$226	$491
SB-250W-MV	Shoebox Area Light, 250W MV	275	16	4.4	18,005	$1,275	SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	105	16	1.7	6,875	$591	$684
SB-250W-MV	Shoebox Area Light, 250W MV	275	6	1.7	6,752	$478	SB-145W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	105	6	0.6	2,578	$222	$256
SB-400W-MV	Shoebox Area Light, 400W MV	429	23	9.9	40,376	$2,859	SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	23	1.6	6,714	$577	$2,282
SB-400W-MV	Shoebox Area Light, 400W MV	429	3	1.3	5,266	$373	SB-99W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	3	0.2	876	$75	$298
SB-400W-MV	Shoebox Area Light, 400W MV	429	109	46.8	191,346	$13,549	SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	105	109	11.4	46,833	$4,027	$9,522
SB-400W-MV	Shoebox Area Light, 400W MV	429	17	7.3	29,843	$2,113	SB-145W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	105	17	1.8	7,304	$628	$1,485
SB-99W-HPS	Shoebox Area Light, Undefined Lamp Type and Wattage	131	1	0.1	536	$38	SB-54W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	38	1	0.0	155	$13	$25
SB-99W-HPS	Shoebox Area Light, Undefined Lamp Type and Wattage	131	3	0.4	1,608	$114	SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	3	0.2	876	$75	$39
SB-99W-HPS	Shoebox Area Light, Undefined Lamp Type and Wattage	131	4	0.5	2,144	$152	SB-99W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	4	0.3	1,168	$100	$51
SB-99W-HPS	Shoebox Area Light, Undefined Lamp Type and Wattage	131	8	1.0	4,288	$304	SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	105	8	0.8	3,437	$296	$8
Area Lighting Total			**399**	**119.0**	**487,149**	**$34,494**				**399**	**33.4**	**136,490**	**$11,735**	**$22,759**
Existing and Upgrade Totals			**1,972**	**419.9**	**1,718,276**	**$121,668**				**1,972**	**142.8**	**584,175**	**$49,465**	**$93,746**
Baseline Adjustments														
kWh Adjustment	PECO Inventory kWh Adjustment			(25.2)	(103,090)	($7,300)								($7,300)
Locations Adjustment	PECO Inventory Locations Adjustment													$0
Baseline Adjustments Total				**(25.2)**	**(103,090)**	**($7,300)**					**0.0**	**0**	**$0**	**($7,300)**
Streetlight Total			**1,972**	**394.7**	**1,615,186**	**$114,368.59**				**1,972**	**142.8**	**584,175**	**$49,465**	**$86,446**

PECO Streetlight Bill Comparison

The following table provides a comparison of what how the existing PECO streetlight compares to the proposed PECO streetlight bill and the resulting project savings.

Existing Bill						Upgrade Bill						Project Savings	
Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kWh/ Year	Annual Electric Costs	Fixture Type Code	Fixture Type Description	Watts/ Fixture	Fixture Quantity	Total kWh/ Year	Annual Electric Costs	Annual kWh Savings	Annual Energy Cost Savings
Streetlights						**Cobraheads**							
02500L	Streetlight, 202W INC	202	2	1,653	$117	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	390	169,163	$14,544		
04000M	Streetlight, 100W MV	115	773	363,758	$25,757	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	144	62,460	$5,370		
05800S	Streetlight, 70W HPS	94	1	385	$27	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	106	48	20,820	$1,790		
08000M	Streetlight, 175W MV	191	573	447,841	$31,711	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	336	52,247	$4,492		
09500S	Streetlight, 100W HPS	131	2	1,072	$76	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	84	13,062	$1,123		
12000M	Streetlight, 250W MV	275	121	136,161	$9,641	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	38	54	8,397	$722		
13000H	Streetlight, 175W MH	192	4	3,143	$223	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	53	15,832	$1,361		
20000M	Streetlight, 400W MV	429	277	486,265	$34,432	CH-88W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	13	3,883	$334		
20500H	Streetlight, 250W MH	294	14	16,843	$1,193	CH-88W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	73	10	2,987	$257		
25000S	Streetlight, 250W HPS	294	6	7,218	$511	CH-143W-LED-NCS	Add Cimcon Node to existing CH-143W-LED	143	3	1,755	$124		
42000M	Streetlight, 750W MV	768	48	150,847	$10,681	CH-161W-LED-NCS	Add Cimcon Node to existing CH-161W-LED	161	2	1,318	$93		
						CH-250W-LED-NCS	Add Cimcon Node to existing CH-250W-LED	250	1	1,023	$72		
						CH-54W-LED-NCS	Add Cimcon Node to existing CH-54W-LED	54	1	221	$16		
						CH-99W-LED-NCS	Add Cimcon Node to existing CH-99W-LED	99	22	8,912	$631		
						Cobrahead Sub-Total			**1,161**	**362,081**	**$30,930**		
						Decorative							
						BL-99W-MH	Bollard, MH, undefined wattage	131	2	1,072	$76		
						4SL-202W-INC	4-Sided Lantern, 202W INC	202	1	827	$59		
						4SL-99W-HPS	4-Sided Lantern, Undefined Lamp Type and Wattage	131	2	1,072	$76		
						6SL-99W-HPS	6-Sided Lantern, Undefined Lamp Type and Wattage	131	8	4,288	$304		
						8SL-99W-HPS	8-Sided Lantern, Undefined Lamp Type and Wattage	131	3	1,608	$114		
						CTO-99W-HPS	Contempo, Undefined Lamp Type and Watts	131	8	4,288	$304		
						4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	254	40,535	$3,485		
						4SC-46W-LED-T5-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	39	51	8,139	$700		
						Decorative Sub-Total			**329**	**61,830**	**$5,116**		
						Decorative (RTK)							
						RTK-CA-70W-LED-T2-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	70	75	21,483	$1,521		
						RTK-CA-70W-LED-T5-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	70	8	2,292	$162		
						Decorative Sub-Total			**83**	**23,775**	**$1,683**		
						Area Lighting							
						SB-54W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	38	63	9,745	$838		
						SB-54W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	38	19	2,939	$253		
						SB-54W-LED-T5-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 5, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	38	1	155	$13		
						SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	71	20,727	$1,782		
						SB-99W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	17	4,963	$427		
						SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	105	193	82,924	$7,130		
						SB-145W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	105	35	15,038	$1,293		
						Area Lighting Sub-Total			**399**	**136,490**	**$11,735**		
Streetlight Energy			**1,821**	**1,615,186**	**$114,369**	**Streetlight Energy**			**1,972**	**584,175**	**$49,465**	**1,031,011**	**$64,904**
Streetlight Locations			**1,760**		**$141,082**	**Streetlight Locations**			**1,760**		**$119,539**		**$21,542**
Streetlight Total Bill					**$255,450**	**Streetlight Total Bill**					**$169,004**		**$86,446**

Annual Energy Savings – Unmetered Traffic Signal Lamps and Signs

The following table shows the energy and cost comparison between the field audit verified existing traffic signal lamps and signs and the proposed LED upgrade solutions. The resulting annual energy savings associated with the LED upgrade is also shown. If any differences were identified between the PECO Baseline and Existing System, those pre-upgrade adjustments and associated cost impacts are reflected in the PECO Adjustment at the bottom of the chart. The cost or savings impact of any service location adjustments (e.g. due to PECO buyback and tariff change) is also shown in this table.

Existing							Upgrade							Savings
Lamp, Sign or Control Type Code	Lamp, Sign or Control Description	Lamp, Sign or Control Watts	Lamp, Sign or Control Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Lamp, Sign or Control Type Code	Lamp, Sign or Control Description	Lamp, Sign or Control Watts	Lamp, Sign or Control Quantity	Total kW	Total kWh/ Year	Annual Electric Costs	Annual Energy Cost Savings
Traffic Signal Lamps, Signs and Controls														
00LOOP	Loops	5	146	0.7	6,307	$441	No Upgrade	No Upgrade	5	146	0.7	6,307	$441	$0
0MINLT	Flashing Lights	0	131	0.0	0	$0	No Upgrade	No Upgrade	0	131	0.0	0	$0	$0
EMPESD	Preemption Devices	2	41	0.1	708	$50	No Upgrade	No Upgrade	2	41	0.1	708	$50	$0
G LED TA - 12	12” LED Traffic Arrow Green	13	91	1.2	818	$57	TA-LED-G-12	Traffic Signal, Arrow, 12" - Green	6	91	0.5	377	$26	$31
G LED TL - 12	12” LED Green	12	398	4.8	17,744	$1,241	TL-LED-G-12	Traffic Signal, Round, 12" - Green	7	398	2.7	9,907	$693	$548
G LED TL - 8	8” LED Green	14	44	0.6	2,289	$160	TL-LED-G-8	Traffic Signal, Round, 8" - Green	6	44	0.3	981	$69	$91
HNDSGN	LED Hand/Man	8	8	0.1	553	$39	No Upgrade	No Upgrade	8	8	0.1	553	$39	$0
R LED TL - 12	12” LED Red	11	411	4.5	21,484	$1,503	TL-LED-R-12	Traffic Signal, Round, 12" - Red	6	411	2.5	12,109	$847	$656
R LED TL - 8	8” LED Red	6	43	0.3	1,226	$86	TL-LED-R-8	Traffic Signal, Round, 8" - Red	6	43	0.3	1,226	$86	$0
TRCONT	Motor Controller	15	85	1.3	11,016	$770	No Upgrade	No Upgrade	15	85	1.3	11,016	$770	$0
WALKSGN - 12	12" Incandesent Walk/Don't Walk	144	130	18.7	161,741	$11,312	No Upgrade	No Upgrade	144	130	18.7	161,741	$11,312	$0
WALKSGN - 9	9" Incandesent Walk/Don't Walk	69	4	0.3	2,385	$167	No Upgrade	No Upgrade	69	4	0.3	2,385	$167	$0
Y LED TA - 12	12” LED Traffic Arrow Yellow	10	67	0.7	463	$32	TA-LED-Y-12	Traffic Signal, Arrow, 12" - Yellow	7	67	0.5	338	$24	$9
Y LED TL - 12	12” LED Yellow	18	405	7.3	1,260	$88	TL-LED-Y-12	Traffic Signal, Round, 12" - Yellow	10	405	3.9	679	$47	$41
Y LED TL - 8	8” LED Yellow	12	45	0.5	93	$7	TL-LED-Y-8	Traffic Signal, Round, 8" - Yellow	6	45	0.3	47	$3	$3
R LED TA - 12	12” LED Traffic Arrow Red	10	3	0.0	21	$1	TA-LED-R-12	Traffic Signal, Arrow, 12" - Red	7	3	0.0	15	$1	$0
Existing and Upgrade Totals			**2,052**	**41.0**	**228,107**	**$15,953**				**2,052**	**32.1**	**208,389**	**$14,574**	**$1,379**
Baseline Adjustments														
kWh Adjustment	PECO Inventory kWh Adjustment			74.5	5,177	$367								$367
Locations Adjustment	PECO Inventory Locations Adjustment													$0
Baseline Adjustments Total				**74.5**	**5,177**	**$367**					**0.0**	**0**	**$0**	**$367**
Streetlight Total			**2,052**	**115.5**	**233,284**	**$16,320**				**2,052**	**32.1**	**208,389**	**$14,574**	**$1,746**

PECO Traffic Signal Bill Comparison

The following table provides a comparison of what how the existing PECO streetlight compares to the proposed PECO streetlight bill and the resulting project savings.

Existing Bill						Upgrade Bill						Project Savings	
Lamp/Sign Type Code	Lamp/Sign Type Description	Lamp/Sign Watts	Lamp/Sign Quantity	Total kWh/ Year	Annual Electric Costs	Signal Type Code	Signal Type Description	Watts/ Fixture	Fixture Quantity	Total kWh/ Year	Annual Electric Costs	Annual kWh Savings	Annual Energy Cost Savings
Traffic Signals, Signs and Controls						**Traffic Signals, Signs and Controls**							
00LOOP	Loops	5	146	6,307	$441	00LOOP	Loops	5	146	6,307	$441		
0MINLT	Flashing Lights	0	106	0	$0	0MINLT	Flashing Lights	0	131	0	$0		
EMPESD	Preemption Devices	2	41	708	$50	EMPESD	Preemption Devices	2	41	708	$50		
G 000 TA - 12	12" Incandescent Traffic Arrow Green	150	22	2,281	$160	HNDSGN	LED Hand/Man	8	8	553	$39		
G 000 TL - 12	12" Incandescent Green	150	80	44,582	$3,118	TA-LED-G-12	Traffic Signal, Arrow, 12" - Green	6	91	377	$26		
G 000 TL - 8	8" Incandescent Green	69	10	2,563	$179	TA-LED-R-12	Traffic Signal, Arrow, 12" - Red	7	3	15	$1		
G LED TA - 12	12" LED Traffic Arrow Green	13	6	54	$4	TA-LED-Y-12	Traffic Signal, Arrow, 12" - Yellow	7	67	338	$24		
G LED TA - 8	8" LED Traffic Arrow Green	9	54	336	$23	TL-LED-G-12	Traffic Signal, Round, 12" - Green	7	398	9,907	$693		
G LED TL - 12	12" LED Green	12	349	15,559	$1,088	TL-LED-G-8	Traffic Signal, Round, 8" - Green	6	44	981	$69		
G LED TL - 8	8" LED Green	14	71	3,693	$258	TL-LED-R-12	Traffic Signal, Round, 12" - Red	6	411	12,109	$847		
HNDSGN - 12	12" Incandescent Hand/Man	138	68	81,078	$5,670	TL-LED-R-8	Traffic Signal, Round, 8" - Red	6	43	1,226	$86		
R 000 TL - 12	12" Incandescent Red	150	26	18,533	$1,296	TL-LED-Y-12	Traffic Signal, Round, 12" - Yellow	10	405	679	$47		
R 000 TL - 8	8" Incandescent Red	69	5	1,639	$115	TL-LED-Y-8	Traffic Signal, Round, 8" - Yellow	6	45	47	$3		
R LED TL - 12	12" LED Red	11	448	23,418	$1,638	TRCONT	Motor Controller	15	85	11,016	$770		
TRCONT	Motor Controller	15	85	11,016	$770	WALKSGN - 9	9" Incandesent Walk/Don't Walk	69	4	2,385	$167		
WALKSGN - 9	9" Incandesent Walk/Don't Walk	69	8	4,769	$334	WALKSGN - 12	12" Incandesent Walk/Don't Walk	144	130	161,741	$11,312		
Y 000 TA - 12	12" Incandescent Traffic Arrow Yellow	150	54	5,599	$392								
Y 000 TA - 8	8" Incandescent Traffic Arrow Yellow	69	2	95	$7								
Y 000 TL - 12	12" Incandescent Yellow	150	393	10,187	$712								
Y 000 TL - 8	8" Incandescent Yellow	69	78	930	$65								
Traffic Signal Energy			**2,052**	**233,348**	**$16,320**	**Traffic Signal Energy**			**2,052**	**208,389**	**$14,574**	**24,959**	**$1,746**
Traffic Signal Locations			**49**		**$2,158**	**Traffic Signal Locations**			**49**		**$2,158**		**$0**
Traffic Signal Total Bill					**$18,478**	**Traffic Signal Total Bill**					**$16,732**		**$1,746**

Annual Maintenance Savings – Unmetered Streetlights

The following table shows the annual maintenance savings for each existing fixture type and the upgrade recommendation. Average annual maintenance expenses were modeled for both the existing and proposed fixture types. Average annual maintenance expenses for proposed fixtures were further reduced to reflect a 1-year labor warranty and a 10-year parts warranty. The assumptions used to estimate Annual Maintenance savings are provided in Appendix B, Project Assumptions. If any differences were identified between the PECO inventory baseline and the field audit verified existing streetlight system, those maintenance related cost impacts are reflected in the PECO Inventory Adjustment at the bottom of the chart.

Existing				Upgrade				Savings
Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Annual Maintenance Savings
Cobrahead								
CH-100W-HPS	Cobrahead, 100W HPS	13	$186	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	13	$54	$132
CH-100W-HPS	Cobrahead, 100W HPS	6	$86	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	6	$25	$61
CH-100W-HPS	Cobrahead, 100W HPS	1	$14	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	1	$4	$10
CH-100W-HPS	Cobrahead, 100W HPS	85	$1,217	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	85	$394	$823
CH-100W-HPS	Cobrahead, 100W HPS	12	$172	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	12	$56	$116
CH-100W-HPS	Cobrahead, 100W HPS	9	$129	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	9	$42	$87
CH-100W-HPS	Cobrahead, 100W HPS	12	$172	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	12	$55	$117
CH-100W-HPS	Cobrahead, 100W HPS	3	$43	CH-88W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	3	$14	$29
CH-100W-HPS	Cobrahead, 100W HPS	2	$29	CH-88W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	2	$9	$19
CH-100W-MV	Cobrahead, 100W MV	54	$773	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	54	$226	$548
CH-100W-MV	Cobrahead, 100W MV	8	$115	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	8	$33	$81
CH-100W-MV	Cobrahead, 100W MV	2	$29	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	2	$8	$20
CH-100W-MV	Cobrahead, 100W MV	172	$2,463	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	172	$797	$1,666
CH-100W-MV	Cobrahead, 100W MV	23	$329	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	23	$107	$223
CH-100W-MV	Cobrahead, 100W MV	9	$129	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	9	$42	$87
CH-100W-MV	Cobrahead, 100W MV	16	$229	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	16	$74	$156
CH-100W-MV	Cobrahead, 100W MV	3	$43	CH-88W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	3	$14	$29
CH-100W-MV	Cobrahead, 100W MV	1	$14	CH-88W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	1	$5	$10
CH-150W-HPS	Cobrahead, 150W HPS	1	$14	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	1	$4	$10
CH-150W-HPS	Cobrahead, 150W HPS	3	$43	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	3	$14	$29
CH-150W-HPS	Cobrahead, 150W HPS	1	$14	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	1	$5	$10
CH-150W-HPS	Cobrahead, 150W HPS	1	$14	CH-88W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	1	$5	$10
CH-175W-MV	Cobrahead, 175W MV	135	$1,933	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	135	$564	$1,369
CH-175W-MV	Cobrahead, 175W MV	52	$745	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	52	$217	$527
CH-175W-MV	Cobrahead, 175W MV	35	$501	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	35	$146	$355
CH-175W-MV	Cobrahead, 175W MV	23	$329	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	23	$107	$223
CH-175W-MV	Cobrahead, 175W MV	33	$473	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	33	$153	$320
CH-175W-MV	Cobrahead, 175W MV	28	$401	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	28	$130	$271
CH-175W-MV	Cobrahead, 175W MV	15	$215	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	15	$69	$146
CH-175W-MV	Cobrahead, 175W MV	4	$57	CH-88W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	4	$18	$39
CH-175W-MV	Cobrahead, 175W MV	4	$57	CH-88W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	4	$18	$39

Annual Maintenance Savings – Unmetered Streetlights *(continued)*

Existing				Upgrade				Savings
Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Annual Maintenance Savings
Cobrahead								
CH-250W-HPS	Cobrahead, 250W HPS	14	$201	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	14	$59	$142
CH-250W-HPS	Cobrahead, 250W HPS	16	$229	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	16	$67	$162
CH-250W-HPS	Cobrahead, 250W HPS	2	$29	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	2	$8	$20
CH-250W-HPS	Cobrahead, 250W HPS	9	$129	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	9	$42	$87
CH-250W-HPS	Cobrahead, 250W HPS	7	$100	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	7	$32	$68
CH-250W-HPS	Cobrahead, 250W HPS	2	$29	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	2	$9	$19
CH-250W-HPS	Cobrahead, 250W HPS	2	$29	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	2	$9	$19
CH-250W-HPS	Cobrahead, 250W HPS	2	$29	CH-88W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	2	$9	$19
CH-250W-HPS	Cobrahead, 250W HPS	1	$14	CH-88W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	1	$5	$10
CH-70W-HPS	Cobrahead, 70W HPS	3	$43	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	3	$13	$30
CH-70W-HPS	Cobrahead, 70W HPS	3	$43	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	3	$13	$30
CH-70W-HPS	Cobrahead, 70W HPS	1	$14	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	1	$5	$10
CH-70W-HPS	Cobrahead, 70W HPS	1	$14	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	1	$5	$10
CH-54W-LED	Cobrahead, 54W LED	1	$6	CH-54W-LED-NCS	Add Cimcon Node to existing CH-54W-LED	1	$6	$0
CH-99W-LED	Cobrahead, 99W LED	22	$135	CH-99W-LED-NCS	Add Cimcon Node to existing CH-99W-LED	22	$135	$0
CH-100W-MH	Cobrahead, 100W MH	2	$29	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	2	$8	$20
CH-100W-MH	Cobrahead, 100W MH	1	$14	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	1	$5	$10
CH-100W-MH	Cobrahead, 100W MH	1	$14	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	1	$5	$10
CH-143W-LED	Cobrahead, 143W LED	3	$18	CH-143W-LED-NCS	Add Cimcon Node to existing CH-143W-LED	3	$18	$0
CH-175W-MH	Cobrahead, 175W MH	1	$14	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	1	$4	$10
CH-175W-MH	Cobrahead, 175W MH	3	$43	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	3	$14	$29
CH-175W-MH	Cobrahead, 175W MH	1	$14	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	1	$5	$10
CH-161W-LED	Cobrahead, 161W LED	2	$12	CH-161W-LED-NCS	Add Cimcon Node to existing CH-161W-LED	2	$12	$0
CH-202W-INC	Cobrahead, 202W INC	1	$43	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	1	$4	$39
CH-250W-LED	Cobrahead, 250W LED	1	$6	CH-250W-LED-NCS	Add Cimcon Node to existing CH-250W-LED	1	$6	$0
CH-250W-MH	Cobrahead, 250W MH	18	$258	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	18	$75	$183
CH-250W-MH	Cobrahead, 250W MH	3	$43	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	3	$13	$30
CH-250W-MH	Cobrahead, 250W MH	4	$57	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	4	$19	$39
CH-250W-MH	Cobrahead, 250W MH	2	$29	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	2	$9	$19
CH-250W-MH	Cobrahead, 250W MH	1	$14	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	1	$5	$10
CH-250W-MH	Cobrahead, 250W MH	3	$43	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	3	$14	$29
CH-250W-MV	Cobrahead, 250W MV	24	$344	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	24	$100	$243
CH-250W-MV	Cobrahead, 250W MV	7	$100	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	7	$29	$71
CH-250W-MV	Cobrahead, 250W MV	2	$29	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	2	$9	$19

Annual Maintenance Savings – Unmetered Streetlights *(continued)*

Existing				Upgrade				Savings
Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Annual Maintenance Savings
Cobrahead								
CH-400W-HPS	Cobrahead, 400W HPS	22	$315	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	22	$92	$223
CH-400W-HPS	Cobrahead, 400W HPS	16	$229	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	16	$67	$162
CH-400W-HPS	Cobrahead, 400W HPS	2	$29	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	2	$8	$20
CH-400W-HPS	Cobrahead, 400W HPS	4	$57	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	4	$19	$39
CH-400W-HPS	Cobrahead, 400W HPS	1	$14	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	1	$5	$10
CH-400W-HPS	Cobrahead, 400W HPS	3	$43	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	3	$14	$29
CH-400W-HPS	Cobrahead, 400W HPS	1	$14	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	1	$5	$10
CH-400W-HPS	Cobrahead, 400W HPS	2	$29	CH-88W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	2	$9	$19
CH-400W-MH	Cobrahead, 400W MH	41	$587	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	41	$171	$416
CH-400W-MH	Cobrahead, 400W MH	18	$258	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	18	$75	$183
CH-400W-MH	Cobrahead, 400W MH	3	$43	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	3	$13	$30
CH-400W-MH	Cobrahead, 400W MH	10	$143	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	10	$46	$97
CH-400W-MH	Cobrahead, 400W MH	2	$29	CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	2	$9	$19
CH-400W-MH	Cobrahead, 400W MH	1	$14	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	1	$5	$10
CH-400W-MH	Cobrahead, 400W MH	33	$473	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	33	$138	$335
CH-400W-MH	Cobrahead, 400W MH	8	$115	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	8	$33	$81
CH-400W-MH	Cobrahead, 400W MH	1	$14	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	1	$4	$10
CH-400W-MH	Cobrahead, 400W MH	1	$14	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	1	$5	$10
CH-400W-MH	Cobrahead, 400W MH	1	$14	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	1	$5	$10
CH-750W-MV	Cobrahead, 750W MV	1	$14	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	1	$4	$10
CH-99W-HPS	Cobrahead, Undefined Lamp Type and Wattage	27	$387	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	27	$113	$274
CH-99W-HPS	Cobrahead, Undefined Lamp Type and Wattage	7	$100	CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	7	$29	$71
CH-99W-HPS	Cobrahead, Undefined Lamp Type and Wattage	18	$258	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	18	$83	$174
CH-99W-HPS	Cobrahead, Undefined Lamp Type and Wattage	1	$14	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	1	$5	$10
CH-99W-HPS	Cobrahead, Undefined Lamp Type and Wattage	1	$14	CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	1	$5	$10
SEC-100W-MV	Security Light, 100W MV	1	$14	CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	1	$4	$10
SEC-100W-MV	Security Light, 100W MV	1	$14	CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	1	$4	$10
SEC-100W-MV	Security Light, 100W MV	1	$14	CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	1	$5	$10
SEC-99W-HPS	Security Light, Undefined Lamp Type and Wattage	1	$14	CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	1	$5	$10
Cobrahead Total		**1,161**	**$16,419**			**1,161**	**$5,158**	**$11,262**

Annual Maintenance Savings – Unmetered Streetlights *(continued)*

Existing				Upgrade				Savings
Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Annual Maintenance Savings
Decorative								
4SC-175W-MV	4-Sided Colonial, 175W MV	12	$123	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	12	$126	($3)
4SC-175W-MV	4-Sided Colonial, 175W MV	10	$102	4SC-46W-LED-T5-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	10	$105	($3)
4SC-100W-MV	4-Sided Colonial, 100W MV	205	$2,097	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	205	$2,157	($59)
4SC-100W-MV	4-Sided Colonial, 100W MV	33	$338	4SC-46W-LED-T5-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	33	$347	($10)
4SC-99W-HPS	4-Sided Colonial, Undefined Lamp Type and Watts	18	$258	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	18	$189	$68
4SC-99W-HPS	4-Sided Colonial, Undefined Lamp Type and Watts	3	$43	4SC-46W-LED-T5-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	3	$32	$11
4SC-250W-MV	4-Sided Colonial, 250W MV	1	$12	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	1	$11	$2
4SC-100W-HPS	4-Sided Colonial, 100W HPS	9	$129	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	9	$95	$34
4SC-100W-HPS	4-Sided Colonial, 100W HPS	4	$57	4SC-46W-LED-T5-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	4	$42	$15
4SC-175W-MH	4-Sided Colonial, 175W MH	4	$33	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	4	$42	($9)
4SC-750W-MV	4-Sided Colonial, 750W MV	1	$14	4SC-46W-LED-T5-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	1	$11	$4
4SC-150W-HPS	4-Sided Colonial, 150W HPS	2	$20	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	2	$21	($1)
4SL-202W-INC	4-Sided Lantern, 202W INC	1	$43	No Upgrade	No Upgrade	1	$43	$0
BL-99W-MH	Bollard, MH, undefined wattage	2	$16	No Upgrade	No Upgrade	2	$16	$0
4SC-250W-MH	4-Sided Colonial, 250W MH	3	$37	4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	3	$32	$5
4SL-99W-HPS	4-Sided Lantern, Undefined Lamp Type and Wattage	2	$16	No Upgrade	No Upgrade	2	$16	$0
6SL-99W-HPS	6-Sided Lantern, Undefined Lamp Type and Wattage	8	$65	No Upgrade	No Upgrade	8	$65	$0
8SL-99W-HPS	8-Sided Lantern, Undefined Lamp Type and Wattage	3	$25	No Upgrade		3	$25	$0
CTO-99W-HPS	Contempo, Undefined Lamp Type and Watts	8	$115	No Upgrade	No Upgrade	8	$115	$0
Decorative Total		**329**	**$3,544**			**329**	**$3,489**	**$55**
Decorative (Retrofit)								
CA-250W-MH	Caged Acorn, 250W, MH	8	$65	RTK-CA-70W-LED-T2-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	8	$45	$20
CA-250W-MH	Caged Acorn, 250W, MH	2	$16	RTK-CA-70W-LED-T5-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	2	$11	$5
CA-400W-MV	Caged Acorn, 400W, MV	10	$82	RTK-CA-70W-LED-T2-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	10	$56	$26
CA-400W-MV	Caged Acorn, 400W, MV	1	$8	RTK-CA-70W-LED-T5-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	1	$6	$3
CA-750W-MV	Caged Acorn, 750W, MV	4	$33	RTK-CA-70W-LED-T2-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	4	$23	$10
CA-750W-MV	Caged Acorn, 750W, MV	1	$8	RTK-CA-70W-LED-T5-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	1	$6	$3
CA-99W-HPS	Caged Acorn, Undefined Lamp Type and Wattage	53	$759	RTK-CA-70W-LED-T2-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	53	$298	$461
CA-99W-HPS	Caged Acorn, Undefined Lamp Type and Wattage	4	$57	RTK-CA-70W-LED-T5-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	4	$23	$35
Decorative (Retrofit) Total		**83**	**$1,029**			**83**	**$467**	**$562**

Annual Maintenance Savings – Unmetered Streetlights *(continued)*

Existing				Upgrade				Savings
Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Fixture Type Code	Fixture Type Description	Fixture Quantity	Annual Maintenance Costs	Annual Maintenance Savings
Area Lighting								
SB-100W-MV	Shoebox Area Light, 100W MV	33	$473	SB-54W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	33	$78	$394
SB-100W-MV	Shoebox Area Light, 100W MV	10	$143	SB-54W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	10	$24	$119
SB-100W-MV	Shoebox Area Light, 100W MV	1	$14	SB-54W-LED-T5-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 5, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	1	$2	$12
SB-100W-MV	Shoebox Area Light, 100W MV	5	$72	SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	5	$19	$53
SB-100W-MV	Shoebox Area Light, 100W MV	1	$14	SB-99W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	1	$4	$11
SB-175W-MV	Shoebox, 175W MV	27	$387	SB-54W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	27	$64	$323
SB-175W-MV	Shoebox, 175W MV	9	$129	SB-54W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	9	$21	$108
SB-175W-MV	Shoebox, 175W MV	4	$57	SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	4	$15	$42
SB-175W-MV	Shoebox, 175W MV	4	$57	SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	4	$16	$41
SB-175W-MV	Shoebox, 175W MV	1	$14	SB-145W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	1	$4	$10
SB-250W-HPS	Shoebox Area Light, 250W HPS	17	$139	SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	17	$63	$76
SB-250W-HPS	Shoebox Area Light, 250W HPS	56	$458	SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	56	$222	$236
SB-250W-HPS	Shoebox Area Light, 250W HPS	11	$90	SB-145W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	11	$44	$46
SB-250W-MV	Shoebox Area Light, 250W MV	2	$29	SB-54W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	2	$5	$24
SB-250W-MV	Shoebox Area Light, 250W MV	19	$272	SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	19	$70	$202
SB-250W-MV	Shoebox Area Light, 250W MV	9	$129	SB-99W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	9	$33	$96
SB-250W-MV	Shoebox Area Light, 250W MV	16	$229	SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	16	$64	$166
SB-250W-MV	Shoebox Area Light, 250W MV	6	$86	SB-145W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	6	$24	$62
SB-400W-MV	Shoebox Area Light, 400W MV	23	$329	SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	23	$85	$244
SB-400W-MV	Shoebox Area Light, 400W MV	3	$43	SB-99W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	3	$11	$32
SB-400W-MV	Shoebox Area Light, 400W MV	109	$1,561	SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	109	$433	$1,128
SB-400W-MV	Shoebox Area Light, 400W MV	17	$243	SB-145W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	17	$67	$176
SB-99W-HPS	Shoebox Area Light, Undefined Lamp Type and Wattage	1	$14	SB-54W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	1	$2	$12
SB-99W-HPS	Shoebox Area Light, Undefined Lamp Type and Wattage	3	$43	SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	3	$11	$32
SB-99W-HPS	Shoebox Area Light, Undefined Lamp Type and Wattage	4	$57	SB-99W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	4	$15	$42
SB-99W-HPS	Shoebox Area Light, Undefined Lamp Type and Wattage	8	$115	SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	8	$32	$83
Area Lighting Total		**399**	**$5,199**			**399**	**$1,428**	**$3,770**
Existing and Upgrade Totals		**1,972**	**$26,191**			**1,972**	**$10,542**	**$15,649**

Unmetered Traffic Signal Maintenance Savings

The following table shows the annual maintenance savings for each existing traffic signal lamp, sign and control and the upgrade recommendation. Average annual maintenance expenses were modeled for both the existing and proposed fixture types. Average annual maintenance expenses for proposed fixtures were further reduced to reflect a 1-year labor warranty and a 10-year parts warranty. The assumptions used to estimate Annual Maintenance savings are provided in Appendix B, Project Assumptions. If any differences were identified between the PECO inventory baseline and the field audit verified existing streetlight system, those maintenance related cost impacts are reflected in the PECO Inventory Adjustment at the bottom of the chart.

Existing				Upgrade				Savings
Lamp, Sign or Control Type Code	Lamp, Sign or Control Description	Lamp, Sign or Control Quantity	Annual Maintenance Costs	Lamp, Sign or Control Type Code	Lamp, Sign or Control Description	Lamp, Sign or Control Quantity	Annual Maintenance Costs	Annual Maintenance Savings
Unmetered Traffic Signal Lighting								
00LOOP	Loops	146	$0	No Upgrade	No Upgrade	146	$0	$0
0MINLT	Flashing Lights	131	$917	No Upgrade	No Upgrade	131	$917	$0
EMPESD	Preemption Devices	41	$0	No Upgrade	No Upgrade	41	$0	$0
G LED TA - 12	12” LED Traffic Arrow Green	91	$637	TA-LED-G-12	Traffic Signal, Arrow, 12" - Green	91	$112	$525
G LED TL - 12	12” LED Green	398	$2,786	TL-LED-G-12	Traffic Signal, Round, 12" - Green	398	$432	$2,354
G LED TL - 8	8” LED Green	44	$308	TL-LED-G-8	Traffic Signal, Round, 8" - Green	44	$49	$259
HNDSGN	LED Hand/Man	8	$28	No Upgrade	No Upgrade	8	$28	$0
R LED TL - 12	12” LED Red	411	$2,877	TL-LED-R-12	Traffic Signal, Round, 12" - Red	411	$446	$2,431
R LED TL - 8	8” LED Red	43	$301	TL-LED-R-8	Traffic Signal, Round, 8" - Red	43	$48	$253
TRCONT	Motor Controller	85	$0	No Upgrade	No Upgrade	85	$0	$0
WALKSGN - 12	12" Incandesent Walk/Don't Walk	130	$0	No Upgrade	No Upgrade	130	$0	$0
WALKSGN - 9	9" Incandesent Walk/Don't Walk	4	$0	No Upgrade	No Upgrade	4	$0	$0
Y LED TA - 12	12” LED Traffic Arrow Yellow	67	$469	TA-LED-Y-12	Traffic Signal, Arrow, 12" - Yellow	67	$82	$387
Y LED TL - 12	12” LED Yellow	405	$2,835	TL-LED-Y-12	Traffic Signal, Round, 12" - Yellow	405	$439	$2,396
Y LED TL - 8	8” LED Yellow	45	$315	TL-LED-Y-8	Traffic Signal, Round, 8" - Yellow	45	$50	$265
R LED TA - 12	12” LED Traffic Arrow Red	3	$21	TA-LED-R-12	Traffic Signal, Arrow, 12" - Red	3	$4	$17
Existing and Upgrade Totals		**2,052**	**$11,494**			**2,052**	**$2,605**	**$8,889**

Bill of Material and Project Costs

The following table shows the bill of material (BOM) for proposed upgrade scope of work. In addition to material and installation costs, a summary of DSP Fees and Program Fees are included – all per unit costs associated with, material, installation, DSP fees, and Program fees are further defined in Appendix C. Rebates from PECO and PJM (regional transmission organization) are also included in this table and further defined in Appendix B.

Fixture Type Code	Fixture Type Description	Fixture Quantity	Material Costs	Install Costs	Rebates	KLS Fees	DVRPC Program Fees	Contingency	Total Project Costs
Cobrahead									
CH-161W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	390	$131,212	$33,150	($21,699)	$13,260	$5,594	$4,602	**$166,119**
CH-161W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	144	$48,448	$12,240	($9,129)	$4,896	$2,065	$1,699	**$60,219**
CH-161W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	48	$16,149	$4,080	($2,732)	$1,632	$688	$566	**$20,384**
CH-53W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	336	$92,491	$28,560	($15,525)	$11,424	$4,203	$3,389	**$124,542**
CH-53W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	84	$23,123	$7,140	($4,597)	$2,856	$1,051	$847	**$30,420**
CH-53W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	54	$14,865	$4,590	($3,194)	$1,836	$675	$545	**$19,317**
CH-88W-LED-T2-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	53	$17,021	$4,505	($2,776)	$1,802	$736	$603	**$21,891**
CH-88W-LED-T3-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	13	$4,175	$1,105	($730)	$442	$180	$148	**$5,320**
CH-88W-LED-T5-3K-NCS (+SP2)	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	10	$3,211	$850	($646)	$340	$139	$114	**$4,008**
CH-143W-LED-NCS	Add Cimcon Node to existing CH-143W-LED	3	$413	$255	$0	$102	$25	$19	**$814**
CH-161W-LED-NCS	Add Cimcon Node to existing CH-161W-LED	2	$275	$170	$0	$68	$17	$12	**$542**
CH-250W-LED-NCS	Add Cimcon Node to existing CH-250W-LED	1	$138	$85	$0	$34	$8	$6	**$271**
CH-54W-LED-NCS	Add Cimcon Node to existing CH-54W-LED	1	$138	$85	$0	$34	$8	$6	**$271**
CH-99W-LED-NCS	Add Cimcon Node to existing CH-99W-LED	22	$3,028	$1,870	$0	$748	$184	$137	**$5,967**
NCS-Gateway	Network Control System - Gateway	3	$4,779	$9,000	$0	$0	$413	$386	**$14,578**
Cobrahead Total		**1,164**	**$359,465**	**$107,685**	**($61,027)**	**$39,474**	**$15,988**	**$13,080**	**$474,665**

Bill of Material and Project Costs *(continued)*

Fixture Type Code	Fixture Type Description	Fixture Quantity	Material Costs	Install Costs	Rebates	KLS Fees	DVRPC Program Fees	Contingency	Total Project Costs
Decorative									
4SC-46W-LED-T2-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	254	$126,242	$21,590	($9,033)	$8,636	$4,867	$4,139	**$156,441**
4SC-46W-LED-T5-3K-P7-NCSB	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	51	$25,348	$4,335	($2,074)	$1,734	$977	$831	**$31,151**
BL-99W-MH	Bollard, MH, undefined wattage	2	$0	$0	$0	$68	$3	$0	**$71**
4SL-202W-INC	4-Sided Lantern, 202W INC	1	$0	$0	$0	$34	$2	$0	**$36**
4SL-99W-HPS	4-Sided Lantern, Undefined Lamp Type and Wattage	2	$0	$0	$0	$68	$3	$0	**$71**
6SL-99W-HPS	6-Sided Lantern, Undefined Lamp Type and Wattage	8	$0	$0	$0	$272	$14	$0	**$286**
8SL-99W-HPS	8-Sided Lantern, Undefined Lamp Type and Wattage	3	$0	$0	$0	$102	$5	$0	**$107**
CTO-99W-HPS	Contempo, Undefined Lamp Type and Watts	8	$0	$0	$0	$272	$14	$0	**$286**
Decorative Total		**329**	**$151,590**	**$25,925**	**($11,107)**	**$11,186**	**$5,885**	**$4,970**	**$188,449**
Decorative (Retrofit)									
RTK-CA-70W-LED-T2-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	75	$17,204	$13,125	($4,975)	$2,550	$1,037	$849	**$29,791**
RTK-CA-70W-LED-T5-3K	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	8	$1,835	$1,400	($603)	$272	$111	$91	**$3,106**
Decorative (Retrofit) Total		**83**	**$19,040**	**$14,525**	**($5,578)**	**$2,822**	**$1,148**	**$940**	**$32,896**
Area Lighting									
SB-54W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	63	$21,631	$7,875	($2,810)	$2,142	$992	$826	**$30,656**
SB-54W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	19	$6,524	$2,375	($829)	$646	$299	$249	**$9,264**
SB-54W-LED-T5-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 54W, Type 5, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	1	$343	$125	($30)	$34	$16	$13	**$502**
SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	$29,730	$8,875	($5,886)	$2,414	$1,279	$1,081	**$37,493**
SB-99W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 99W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	17	$7,118	$2,125	($1,316)	$578	$306	$259	**$9,070**
SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	193	$86,528	$24,125	($16,661)	$6,562	$3,648	$3,098	**$107,300**
SB-145W-LED-T3-3K-P7-NCS (+SP2, ARM)	Shoebox, LED, 145W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	35	$15,692	$4,375	($3,109)	$1,190	$662	$562	**$19,371**
Area Lighting Total		**399**	**$167,566**	**$49,875**	**($30,642)**	**$13,566**	**$7,202**	**$6,088**	**$213,656**

Bill of Material and Project Costs *(continued)*

Fixture Type Code	Fixture Type Description	Fixture Quantity	Material Costs	Install Costs	Rebates	KLS Fees	DVRPC Program Fees	Contingency	Total Project Costs
Traffic Signal									
WALKSGN - 9	9" Incandesent Walk/Don't Walk	4	$0	$0	$0	$43	$2	$0	**$45**
0MINLT	Flashing Lights	131	$0	$0	$0	$1,397	$70	$0	**$1,467**
EMPESD	Preemption Devices	41	$0	$0	$0	$437	$22	$0	**$459**
00LOOP	Loops	146	$0	$0	$0	$1,557	$78	$0	**$1,635**
TRCONT	Motor Controller	85	$0	$0	$0	$907	$45	$0	**$952**
TL-LED-R-8	Traffic Signal, Round, 8" - Red	43	$1,315	$430	$0	$459	$75	$87	**$2,366**
TL-LED-Y-8	Traffic Signal, Round, 8" - Yellow	45	$1,376	$450	($16)	$480	$79	$91	**$2,460**
TL-LED-G-8	Traffic Signal, Round, 8" - Green	44	$1,346	$440	($21)	$469	$77	$89	**$2,400**
TL-LED-R-12	Traffic Signal, Round, 12" - Red	411	$12,047	$4,110	($118)	$4,384	$704	$808	**$21,934**
TL-LED-Y-12	Traffic Signal, Round, 12" - Yellow	405	$11,871	$4,050	($202)	$4,320	$694	$796	**$21,529**
TL-LED-G-12	Traffic Signal, Round, 12" - Green	398	$11,666	$3,980	($127)	$4,245	$682	$782	**$21,229**
TA-LED-R-12	Traffic Signal, Arrow, 12" - Red	3	$115	$30	($0)	$32	$6	$7	**$189**
TA-LED-Y-12	Traffic Signal, Arrow, 12" - Yellow	67	$2,562	$670	($11)	$715	$133	$162	**$4,230**
TA-LED-G-12	Traffic Signal, Arrow, 12" - Green	91	$3,479	$910	($38)	$971	$180	$219	**$5,721**
WALKSGN - 12	12" Incandesent Walk/Don't Walk	130	$0	$0	$0	$1,387	$69	$0	**$1,456**
HNDSGN	LED Hand/Man	8	$0	$0	$0	$85	$4	$0	**$90**
Traffic Signal Total		**2,052**	**$45,776**	**$15,070**	**($534)**	**$21,888**	**$2,920**	**$3,042**	**$88,163**
BOM Total		**4,027**	**$743,437**	**$213,080**	**($108,888)**	**$88,936**	**$33,142**	**$28,121**	**$997,829**

Financial Analysis

& Summary

Payback Analysis Matrix

The payback analysis matrix is provided as a decision-making tool to assess the opportunity of ECMs available and to define a project scope that best meets the needs of the municipality. If a PECO buyback is planned prior to this project being implemented, we show the payback associated with that activity. If the Phase 2 field audit identified differences between the unmetered PECO inventory and what is verified to be existing, those adjustments are reflected below as "PECO Inventory Adjust." The PECO Inventory Adjust amount will occur for all cobrahead or decorative ECMs, and therefore this amount is included in these ECMs values shown in the table below. A separate payback calculation is made for each ECM as well as for common control alternates to be considered. The full-implementation total includes the total payback calculations if all ECMs are completed.

PECO Baseline Adjustments	Energy Savings/ Year	Maintenance Savings/ Year	Total Operating Savings/ Year	Material Costs	Install Costs	KLS Fees	DVRPC Program Costs	Cost Contingency	Rebates	Total Project Costs	Payback (Years)
Streetlight Adjustment	($7,300)	$0	**($7,300)**	$0	$0	$0	$0	$0	$0	**$0**	**0.0**
Traffic Signal Adjustment	$367	$0	**$367**	$0	$0	$0	$0	$0	$0	**$0**	**0.0**

Typical ECM Combinations	Energy Savings/ Year	Maintenance Savings/ Year	Total Operating Savings/ Year	Material Costs	Install Costs	KLS Fees	DVRPC Program Costs	Cost Contingency	Rebates	Total Project Costs	Payback (Years)
Cobrahead + Decorative + Area Lighting + Traffic Signals[1] + Network Controls	$88,192	$24,538	**$112,730**	$743,437	$213,080	$88,936	$33,142	$28,121	($108,888)	**$997,829**	**8.9**

Notes:

1) Includes costs and savings of ECM upgrade + PECO baseline adjustments

Cash Flow Analysis

The cash flow analysis shows how the project savings offset project costs, resulting in little to no capital outlay for this project.

Project Cash Flow (+ Network Controls)

Project Summary	
Construction Cost	$956,517
Buyback Cost	$0
DSP Fees (KLS)	$88,936
Program Fees (DVRPC)	$33,142
Contingency	$28,121
Total Project Cost	**$1,106,716**
Capital Contribution	$1,106,716
Financed Amount	**$0**
Loan Rate	0.00%
Loan Term (Years)	0
Loan Payment	#NUM!
Interest Paid	#NUM!

ECM	In Scope
PECO Buyback	No
Cobrahead Lighting	Yes
Decorative Lighting	Yes
Area Lighting	Yes
Traffic Signals	Yes
Manual Fixture Controls	No
Network Control System	Yes

Construction	In Scope
Construction Start Date	2020Q3
Construction Duration (calendar days, assumes 2 crews)	84

Period	Energy Cost Savings	Maintenance Cost Savings	Rebates	Total Savings	Capital Contribution	Loan Payment	Balance
Design					**$48,762**		($48,762)
Construction					**$1,057,954**		($1,057,954)
1	$88,192	$24,538	$108,888	**$221,617**		$0	$221,617
2	$88,192	$24,538		**$112,730**		$0	$112,730
3	$88,192	$24,538		**$112,730**		$0	$112,730
4	$88,192	$24,538		**$112,730**		$0	$112,730
5	$88,192	$24,538		**$112,730**		$0	$112,730
6	$88,192	$24,538		**$112,730**		$0	$112,730
7	$88,192	$24,538		**$112,730**		$0	$112,730
8	$88,192	$24,538		**$112,730**		$0	$112,730
9	$88,192	$24,538		**$112,730**		$0	$112,730
10	$88,192	$24,538		**$112,730**		$0	$112,730
11	$88,192	$24,538		**$112,730**		$0	$112,730
12	$88,192	$24,538		**$112,730**		$0	$112,730
13	$88,192	$24,538		**$112,730**		$0	$112,730
14	$88,192	$24,538		**$112,730**		$0	$112,730
15	$88,192	$24,538		**$112,730**		$0	$112,730
16	$88,192	$24,538		**$112,730**		$0	$112,730
17	$88,192	$24,538		**$112,730**		$0	$112,730
18	$88,192	$24,538		**$112,730**		$0	$112,730
19	$88,192	$24,538		**$112,730**		$0	$112,730
20	$88,192	$24,538		**$112,730**		$0	$112,730
Total	**$1,763,839**	**$490,753**	**$108,888**	**$2,363,479**	**$1,106,716**	**$0**	**$1,256,763**

Appendix A:
RSLPP Phase Overview

Phase 1: Feasibility: Data-driven analysis of upgrade opportunities resulting in a no-cost Feasibility Study.

- Municipalities received a data-driven, no-cost Feasibility Study showing estimated savings, project costs, rebates and financial payback. This study is developed by KLS using data, information, and input provided by the municipality.
- **Municipalities used the Feasibility Study as a tool to decide whether to proceed to Phase 2 and contract with KLS for Project Development Services.**
- The RSLPP Project Team provides a contract form and resolution for municipalities to proceed to Phase 2.

Phase 2: Project Development: Field audits, design and analysis resulting in a final design project proposal.

- KLS conducted field audits of the municipality's existing lighting system showing GPS location and attributes of each fixture. KLS also conducted a comprehensive and standardized design of upgraded lighting system.
- KLS developed and DVRPC issues solicitations and contracts for materials, distributor, and installation contractor for the purpose of arranging cooperative purchasing agreements that municipalities are able to piggyback off of.
- The RSLPP Project Team organized a pool of financing for municipalities who wish to finance their projects.
- KLS prepared final design proposal showing forecasted savings, final project costs, rebates, and financial payback.
- **Municipalities use the Final Design Proposal as a tool to decide whether to proceed to Phase 3, Construction.**
- The RSLPP Project Team provides a contract form and resolution for contracting between municipality and installation contractor for construction (the construction contract). Municipalities piggyback off of DVRPC's installation contract for construction.
- Municipalities that finance participate in the pool of financing arranged by the RSLPP.

Phase 3: Construction: Comprehensive Installation Services and Project Management of Installation including reporting and issue resolution during construction.

- Construction, including the procurement of all equipment, is provided by the RSLPP selected installation contractor according to the municipality's construction contract.
- KLS provides robust project management services ensuring consistent communication of progress and issue resolution.
- KLS manages the municipality's PECO Bill Updates and the applicable rebate application processes.

Phase 4: Post Construction Operations and Maintenance Confirmation of project savings and strategies for on-going maintenance.

- KLS provides the municipalities strategies for maintaining new system and on-going standardization, verification of project savings, and (if desired) prepare and/or update municipality lighting ordinances.

Appendix B:
Project Assumptions

The following assumptions were used in the development of this Project Specification and Proposal:

1) **Energy Use**
    a. **Un-metered:**
        i. **Streetlights:** Energy use for un-metered streetlight service is calculated by PECO using the following algorithm:
            1. kWh **=** Billed Wattage of fixture x quantity of fixture x 4092 (annual operating hours)/1000
        ii. **Traffic Signals:** Energy use for un-metered traffic signal service is calculated by PECO using the following algorithm:
            1. kWh **=** Billed Wattage of fixture x quantity of fixture x annual operating hours (yellow = 175.2 hours; green = 3766.8 hours; red = 4819 hours)/1000.
    b. **Metered:** Energy use for metered fixtures is calculated using the estimated wattage of each fixture X annual operating hours (4092 hours assumed for all metered streetlight fixtures and area lighting, while a lower number of hours may be used for other outdoor lighting types if provided or indicated by the municipality)/1000.
2) **Energy Costs:**
    a. Across the entire RSLPP, energy costs were estimated according to the following PECO rates included in PECO's Current Electric Tariff effective July 1, 2019.
        i. SL-E, SL-S, SL-C, TSLS, and GS.
    b. KLS used the generation supply rate listed for each PECO account on the utility bills supplied by the municipality.
3) **Maintenance Cost Savings**
    a. Average annual maintenance expenses were modeled for both the existing and proposed fixture types.
        i. Maintenance expenses are based on the probability a component (e.g. lamp, ballast/driver, fixture, photocell) will fail multiplied by the material and labor replacement cost. Failure probability is based on the annual operating hours of a component divided by the component's published rated or expected life.
    b. Use of average annual maintenance expenses assumes that both the existing and new lighting systems have a standard distribution of fixture and component ages. Average annual maintenance expenses for proposed LED fixtures were further reduced by 50% to reflect a 1-year labor warranty, a 10-year parts warranty and the expected life of a new fixture and its components.
4) **Project rebates:** There are two rebate types available to municipalities in the RSLPP:
    a. **PECO Smart Ideas:** Through Phase 3 of Act 129, PECO's offers lighting rebates to municipal customers. These rebates vary from $25 - $75 per streetlight and vary from $10 - $60 for metered area lighting depending on the watts reduced by each fixture conversion. Rebates have been estimated in Phase 1 based on the scope of work included in this Feasibility Study. Municipalities that proceed to Phase 2 will have a pre-application submitted on their behalf by the KLS to PECO based on the scope of work defined in the municipality's Final Design Proposal. Submitting a pre-application will "reserve" rebates for municipalities that proceed to Phase 3, construction.

b. **PJM:** PJM, the Regional Transmission Operator for this region offers rebates for outdoor lighting projects through its Capacity Market. Energy efficiency projects can receive PJM Capacity Market rebates for the first four years that a project is installed based on the kW reductions of the project, and the price/kW of this rebate is determined by a "forward auction" in each utility territory within PJM. The current rate for these incentives in PECO territory ranges from $18.70-$28.90 per kW reduced depending on the year. The PJM Capacity Market rebate has been estimated based on the scope of work defined in this Feasibility Study, the associated kW reduction and a $15.00 per kW rebate. Municipalities that proceed to Phase 3 (Construction) of the RSLPP will have the opportunity to have receive this rebate through a RSLPP-arranged aggregator.

5) Project Contingency

a. For project budgeting we used a **2.8%** contingency.

6) Material, Distributor, and Installation Costs

a. All material and Installation Costs shown in this Final Project Specification and Proposal FPSP were the result of the procurement process established for Round 2 of the RSLPP through which KLS developed and DVRPC issued Request for Proposals on behalf of municipalities participating in the RSLPP for Manufacturer Product Solutions (materials), Distribution Partner Services (distributor), and installation contractor. For more information on these solicitations, please visit DVRPC.org/consultant.

Appendix C:
Project Summary Bill of Material

The Project Summary Bill of Material represents the pricing obtained through the RSLPP procurement process. Material Unit Prices include negotiated manufacturer costs, distributor markup and contractor markup.

Fixture Type Code	Manufacturer	Part #	Fixture Type Description	Fixture Quantity	Fixture Unit Price	Fixture Total Cost
Cobrahead						
CH-161W-LED-T2-3K-NCS (+SP2)	Signify	RFM-160W48LED3K-G2-R2M-UNV-DMG-RCD7-GY3	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	390	$336.44	$131,212
CH-161W-LED-T3-3K-NCS (+SP2)	Signify	RFM-160W48LED3K-G2-R3M-UNV-DMG-RCD7-GY3	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	144	$336.44	$48,448
CH-161W-LED-T5-3K-NCS (+SP2)	Signify	RFM-160W48LED3K-G2-5-UNV-DMG-RCD7-GY3	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	48	$336.44	$16,149
CH-53W-LED-T2-3K-NCS (+SP2)	Signify	RFS-54W16LED3K-G2-R2M-UNV-DMG-RCD7-GY3	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	336	$275.27	$92,491
CH-53W-LED-T3-3K-NCS (+SP2)	Signify	RFS-54W16LED3K-G2-R3M-UNV-DMG-RCD7-GY3	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	84	$275.27	$23,123
CH-53W-LED-T5-3K-NCS (+SP2)	Signify	RFS-54W16LED3K-G2-5-UNV-DMG-RCD7-GY3	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	54	$275.27	$14,865
CH-88W-LED-T2-3K-NCS (+SP2)	Signify	RFM-90W40LED3K-G2-R2M-UNV-DMG-RCD7-GY3	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	53	$321.15	$17,021
CH-88W-LED-T3-3K-NCS (+SP2)	Signify	RFM-90W40LED3K-G2-R3M-UNV-DMG-RCD7-GY3	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	13	$321.15	$4,175
CH-88W-LED-T5-3K-NCS (+SP2)	Signify	RFM-90W40LED3K-G2-5-UNV-DMG-RCD7-GY3	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	10	$321.15	$3,211
CH-143W-LED-NCS	Cimcon	Existing	Add Cimcon Node to existing CH-143W-LED	3	$137.64	$413
CH-161W-LED-NCS	Cimcon	Existing	Add Cimcon Node to existing CH-161W-LED	2	$137.64	$275
CH-250W-LED-NCS	Cimcon	Existing	Add Cimcon Node to existing CH-250W-LED	1	$137.64	$138
CH-54W-LED-NCS	Cimcon	Existing	Add Cimcon Node to existing CH-54W-LED	1	$137.64	$138
CH-99W-LED-NCS	Cimcon	Existing	Add Cimcon Node to existing CH-99W-LED	22	$137.64	$3,028
NCS-Gateway	Cimcon	Gateway-E	Network Control System - Gateway	3	$1,593.00	$4,779
Cobrahead Total				**1,164**		**$359,465**
Area Lighting						
SB-54W-LED-T2-3K-P7-NCS (+SP2, ARM)	Acuity	ATB0 10BLEDE15 MVOLT R2 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 54W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	63	$343.35	$21,631
SB-54W-LED-T3-3K-P7-NCS (+SP2, ARM)	Acuity	ATB0 10BLEDE15 MVOLT R3 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 54W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	19	$343.35	$6,524
SB-54W-LED-T5-3K-P7-NCS (+SP2, ARM)	Acuity	ATB0 10BLEDE15 MVOLT R5 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 54W, Type 5, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	1	$343.35	$343
SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Acuity	ATB0 20BLEDE15 MVOLT R2 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	$418.73	$29,730
SB-99W-LED-T3-3K-P7-NCS (+SP2, ARM)	Acuity	ATB0 20BLEDE15 MVOLT R2 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 99W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	17	$418.73	$7,118
SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Acuity	ATB0 30BLEDE15 MVOLT R2 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	193	$448.33	$86,528
SB-145W-LED-T3-3K-P7-NCS (+SP2, ARM)	Acuity	ATB0 30BLEDE15 MVOLT R3 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 145W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	35	$448.33	$15,692
Area Lighting Total				**399**		**$167,566**

Fixture Type Code	Manufacturer	Part #	Fixture Type Description	Fixture Quantity	Fixture Unit Price	Fixture Total Cost
Decorative						
4SC-46W-LED-T2-3K-P7-NCSB	Acuity	247L P45 AS 30K R2 AY P7	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	254	$497.02	$126,242
4SC-46W-LED-T5-3K-P7-NCSB	Acuity	247L P45 AS 30K R5 AY P7	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	51	$497.02	$25,348
Decorative Total				**305**		**$151,590**
Decorative (Retrofit)						
RTK-CA-70W-LED-T2-3K	Acuity	OM-70-3K-MO	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	75	$229.39	$17,204
RTK-CA-70W-LED-T5-3K	Acuity	OM-70-3K-MO	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	8	$229.39	$1,835
Decorative (Retrofit) Total				**83**		**$19,040**
Traffic Signal Lamps & Signs						
TL-LED-R-8	Leotek	TSL-08R-LX-IL6-A1-P3	Traffic Signal, Round, 8" - Red	43	$30.59	$1,315
TL-LED-Y-8	Leotek	TSL-08Y-LX-IL6-A1-P3	Traffic Signal, Round, 8" - Yellow	45	$30.59	$1,376
TL-LED-G-8	Leotek	TSL-08G-LX-IL6-A1-P3	Traffic Signal, Round, 8" - Green	44	$30.59	$1,346
TL-LED-R-12	Leotek	TSL-12R-LX-IL6-A1-P3	Traffic Signal, Round, 12" - Red	411	$29.31	$12,047
TL-LED-Y-12	Leotek	TSL-12Y-LX-IL6-A1-P3	Traffic Signal, Round, 12" - Yellow	405	$29.31	$11,871
TL-LED-G-12	Leotek	TSL-12G-LX-IL6-A1-P3	Traffic Signal, Round, 12" - Green	398	$29.31	$11,666
TA-LED-R-12	Leotek	Leotek Part #	Traffic Signal, Arrow, 12" - Red	3	$38.23	$115
TA-LED-Y-12	Leotek	TSL-12YA-IL6-A1-P3	Traffic Signal, Arrow, 12" - Yellow	67	$38.23	$2,562
TA-LED-G-12	Leotek	TSL-12GA-IL6-A1-P3	Traffic Signal, Arrow, 12" - Green	91	$38.23	$3,479
Traffic Signal Lamps and Signs Total				**1,507**		**$45,776**
BOM Total				**3,458**		**$743,437**

Appendix D:
Project Schedule of Installation Values

The Project Schedule of Installation Values represents the pricing obtained through the RSLPP procurement process. Installation Unit Prices are an all-inclusive turnkey unit price including installation contractor prevailing wage costs, equipment costs, bonding costs, overhead and profit.

Fixture Type Code	Manufacturer	Part #	Fixture Type Description	Fixture Quantity	Installation Unit Price	Fixture Total Cost	Construction Duration (Working Days)
Cobrahead							
CH-161W-LED-T2-3K-NCS (+SP2)	Signify	RFM-160W48LED3K-G2-R2M-UNV-DMG-RCD7-GY3	Cobrahead, LED, 161W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 106W)	390	$85	$33,150	10
CH-161W-LED-T3-3K-NCS (+SP2)	Signify	RFM-160W48LED3K-G2-R3M-UNV-DMG-RCD7-GY3	Cobrahead, LED, 161W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 106W)	144	$85	$12,240	4
CH-161W-LED-T5-3K-NCS (+SP2)	Signify	RFM-160W48LED3K-G2-5-UNV-DMG-RCD7-GY3	Cobrahead, LED, 161W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 106W)	48	$85	$4,080	1
CH-53W-LED-T2-3K-NCS (+SP2)	Signify	RFS-54W16LED3K-G2-R2M-UNV-DMG-RCD7-GY3	Cobrahead, LED, 53W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 38W)	336	$85	$28,560	8
CH-53W-LED-T3-3K-NCS (+SP2)	Signify	RFS-54W16LED3K-G2-R3M-UNV-DMG-RCD7-GY3	Cobrahead, LED, 53W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 38W)	84	$85	$7,140	2
CH-53W-LED-T5-3K-NCS (+SP2)	Signify	RFS-54W16LED3K-G2-5-UNV-DMG-RCD7-GY3	Cobrahead, LED, 53W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 38W)	54	$85	$4,590	1
CH-88W-LED-T2-3K-NCS (+SP2)	Signify	RFM-90W40LED3K-G2-R2M-UNV-DMG-RCD7-GY3	Cobrahead, LED, 88W, Type 2, 3000K, 7-Pin, Gray (NCS Dim to 73W)	53	$85	$4,505	1
CH-88W-LED-T3-3K-NCS (+SP2)	Signify	RFM-90W40LED3K-G2-R3M-UNV-DMG-RCD7-GY3	Cobrahead, LED, 88W, Type 3, 3000K, 7-Pin, Gray (NCS Dim to 73W)	13	$85	$1,105	0
CH-88W-LED-T5-3K-NCS (+SP2)	Signify	RFM-90W40LED3K-G2-5-UNV-DMG-RCD7-GY3	Cobrahead, LED, 88W, Type 5, 3000K, 7-Pin, Gray (NCS Dim to 73W)	10	$85	$850	0
CH-143W-LED-NCS	Cimcon	Existing	Add Cimcon Node to existing CH-143W-LED	3	$85	$255	0
CH-161W-LED-NCS	Cimcon	Existing	Add Cimcon Node to existing CH-161W-LED	2	$85	$170	0
CH-250W-LED-NCS	Cimcon	Existing	Add Cimcon Node to existing CH-250W-LED	1	$85	$85	0
CH-54W-LED-NCS	Cimcon	Existing	Add Cimcon Node to existing CH-54W-LED	1	$85	$85	0
CH-99W-LED-NCS	Cimcon	Existing	Add Cimcon Node to existing CH-99W-LED	22	$85	$1,870	1
NCS-Gateway	Cimcon	Gateway-E	Network Control System - Gateway	3	$3,000	$9,000	2
Cobrahead Total				**1,164**		**$107,685**	**28**
Area Lighting							
SB-54W-LED-T2-3K-P7-NCS (+SP2, ARM)	Signify	ATB0 10BLEDE15 MVOLT R2 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 54W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	63	$125	$7,875	3
SB-54W-LED-T3-3K-P7-NCS (+SP2, ARM)	Signify	ATB0 10BLEDE15 MVOLT R3 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 54W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	19	$125	$2,375	1
SB-54W-LED-T5-3K-P7-NCS (+SP2, ARM)	Signify	ATB0 10BLEDE15 MVOLT R5 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 54W, Type 5, 3000K, 7-Pin, Bronze (NCS Dim to 37W)	1	$125	$125	0
SB-99W-LED-T2-3K-P7-NCS (+SP2, ARM)	Signify	ATB0 20BLEDE15 MVOLT R2 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 99W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	71	$125	$8,875	3
SB-99W-LED-T3-3K-P7-NCS (+SP2, ARM)	Signify	ATB0 20BLEDE15 MVOLT R2 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 99W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 71W)	17	$125	$2,125	1
SB-145W-LED-T2-3K-P7-NCS (+SP2, ARM)	Signify	ATB0 30BLEDE15 MVOLT R2 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 145W, Type 2, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	193	$125	$24,125	8
SB-145W-LED-T3-3K-P7-NCS (+SP2, ARM)	Signify	ATB0 30BLEDE15 MVOLT R3 3K MP BZ 20 UMS-BZ P7	Shoebox, LED, 145W, Type 3, 3000K, 7-Pin, Bronze (NCS Dim to 105W)	35	$125	$4,375	1
Area Lighting Total				**399**		**$49,875**	**3**

Fixture Type Code	Manufacturer	Part #	Fixture Type Description	Fixture Quantity	Installation Unit Price	Fixture Total Cost	Construction Duration (Working Days)
Decorative							
4SC-46W-LED-T2-3K-P7-NCSB	Acuity	247L P45 AS 30K R2 AY P7	4-Sided Colonial, LED, 46W, Type 2, 3000K, 7-Pin, Black (NCS Dim to 39W)	254	$85	$21,590	6
4SC-46W-LED-T5-3K-P7-NCSB	Acuity	247L P45 AS 30K R5 AY P7	4-Sided Colonial, LED, 46W, Type 5, 3000K, 7-Pin, Black (NCS Dim to 39W)	51	$85	$4,335	1
Decorative Total				**305**		**$25,925**	**8**
Decorative (Retrofit)							
RTK-CA-70W-LED-T2-3K	Acuity	OM-70-3K-MO	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	75	$175	$13,125	5
RTK-CA-70W-LED-T5-3K	Acuity	OM-70-3K-MO	Caged Acorn Retrofit Kit, 70W, LED, 3000K, Mogul Base	8	$175	$1,400	1
Decorative (Retrofit) Total				**83**		**$14,525**	**5**
Traffic Signals							
TL-LED-R-8	Leotek	TSL-08R-LX-IL6-A1-P3	Traffic Signal, Round, 8" - Red	43	$10	$430	0
TL-LED-Y-8	Leotek	TSL-08Y-LX-IL6-A1-P3	Traffic Signal, Round, 8" - Yellow	45	$10	$450	0
TL-LED-G-8	Leotek	TSL-08G-LX-IL6-A1-P3	Traffic Signal, Round, 8" - Green	44	$10	$440	0
TL-LED-R-12	Leotek	TSL-12R-LX-IL6-A1-P3	Traffic Signal, Round, 12" - Red	411	$10	$4,110	4
TL-LED-Y-12	Leotek	TSL-12Y-LX-IL6-A1-P3	Traffic Signal, Round, 12" - Yellow	405	$10	$4,050	4
TL-LED-G-12	Leotek	TSL-12G-LX-IL6-A1-P3	Traffic Signal, Round, 12" - Green	398	$10	$3,980	4
TA-LED-R-12	Leotek	Leotek Part #	Traffic Signal, Arrow, 12" - Red	3	$10	$30	0
TA-LED-Y-12	Leotek	TSL-12YA-IL6-A1-P3	Traffic Signal, Arrow, 12" - Yellow	67	$10	$670	1
TA-LED-G-12	Leotek	TSL-12GA-IL6-A1-P3	Traffic Signal, Arrow, 12" - Green	91	$10	$910	1
Traffic Signals Total				**1,507**		**$15,070**	**16**
Installation Schedule Total				**3,458**		**$213,080**	**60**

Appendix E:
DSP & Program Fees Breakdown

Design Service Professional (KLS) Unit Pricing & DVRPC Program Fees

DVRPC conducted a comprehensive RFP process to identify and select a design services professional to support all four Phases of the RSLPP. Municipalities are able to "piggy-back" off the DVRPC's cooperative purchasing agreement for DSP services. The table below not only defines the final DSP unit priced fee structure but also shows the assumed volume for your project and the total associated fees. The finance resolution provided for RSLPP municipalities who wish to proceed to Phase 2, Project Development, includes provisions for reimbursement of Project Development Phase fees with a financing package put in place for the Construction Phase.

DSP Service Item	KLS Unit Price (Fee) Schedule	KLS Billing Milestones	Fixture & Signal Quantity	KLS Fees	DVRPC Program Fees	Total KLS & DVRPC Fees
Project Development (Phase II)						
Field Audit	$9/Fixture	100% at Completion of audit (if less than 1 month); Otherwise on monthly auditing progress	1,972	$17,748	$887	**$18,635**
Field Audit (Traffic Signals)	$8/Signal (not lamp)		2,052	$5,472	$274	**$5,746**
Mapping	$1/Fixture or Signal		4,024	$2,656	$133	**$2,789**
Design	$7/Fixture or Signal	50% at Preliminary Design Review; 50% at Final Design Review	1,972	$13,804	$690	**$14,494**
Design (Traffic Signals)	$6/Signal (not lamp)		2,052	$4,104	$205	**$4,309**
Utility bill update & rebate processes	$1/Fixture or Signal	50% at Final Utility Bill Update; 50% at Final Rebate Submittal	4,024	$2,656	$133	**$2,789**
Project Development Sub-Total				**$46,440**	**$2,322**	**$48,762**
Construction Project Management (Phase III)						
Project Management Services	$10/Fixture or Signal	20% at Pre-Construction Meeting; Remainder on Monthly Installation Progress Billing	4,024	$26,560	$30,024	**$56,584**
PECO Buyback	$5/Fixture (with max fee of $5,000 and min fee of $1,000)	At Buyback Completion		$0	$0	**$0**
Field deployable installation data capture	$3/Fixture or Signal	Monthly Installation Progress Billing	4,024	$7,968	$398	**$8,366**
Project Management Sub-Total				**$34,528**	**$30,422**	**$64,950**
Post-Construction Services (Phase IV)						
Project annual Energy and Operational Savings Report	$1/Fixture or Signal	100% at Report Delivery	4,024	$2,656	$133	**$2,789**
Operations and Maintenance Plan for a municipality's new LED system.	$1/Fixture or Signal	100% at Plan Delivery	4,024	$2,656	$133	**$2,789**
Development of Operation and Maintenance Manual	$1/Fixture or Signal	100% at Manual Delivery	4,024	$2,656	$133	**$2,789**
Development or update of a lighting ordinance	$1,000/municipality (minimum)	Estimated Cost Between $1,000 - $10,000	0	$0	$0	**$0**
Post-Construction Sub-Total				**$7,968**	**$398**	**$8,366**
Total Fees				**$88,936**	**$33,142**	**$122,078**

Notes:
1) All unit prices above are "not to exceed" as defined in the municipalities DSP contract.
2) DVRPC program fees are based on the RSLPP LOI signed by each participating muncipality.

DVRPC Program Fees

The following Program Fees have been established by DVRPC to allow DVRPC to recoup the upfront costs DVRPC has incurred for program development, program management, and for the development and issuance of contracts and solicitations associated with material, distributor, installation contractor, and finance. These fees are reflected throughout this Feasibility Study as "Program Fees":

- 5% of DSP Total Fees

- Up to 3% of Construction Costs (Material & Installation costs only).
    - 3% has been used as a conservative estimate for this Feasibility Study.

A Best Practices Guide for Multi-Municipal Aggregation Programs

Lessons Learned from DVRPC's Regional Streetlight Procurement Program

Publication Number: 00000

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Geographic Area Covered:

Bucks, Chester, Delaware, and Montgomery counties

Key Words:

Implementation, aggregation, LED, streetlight, Energy Performance Contracting, Design Bid Build, Energy, Regional Streetlight Procurement Program

Abstract:

Multi-municipal aggregation programs can be incredibly valuable in assisting local governments with implementation of projects. Aggregation programs remove several key technical, procurement, and decision-making challenges that local governments face. This guide includes the best practices and lessons learned from DVRPC's Regional Streetlight Procurement Program (RSLPP), a multi-municipal aggregation program designed to enable conversion of LED streetlighting systems. The lessons learned can also be applied to other applications of aggregated procurement and implementation for local governments. This guide also attempts to evaluate the pros and cons of the two distinct procurement methods that DVRPC used when implementing the two rounds of this program— energy performance contracting and design-bid-build.

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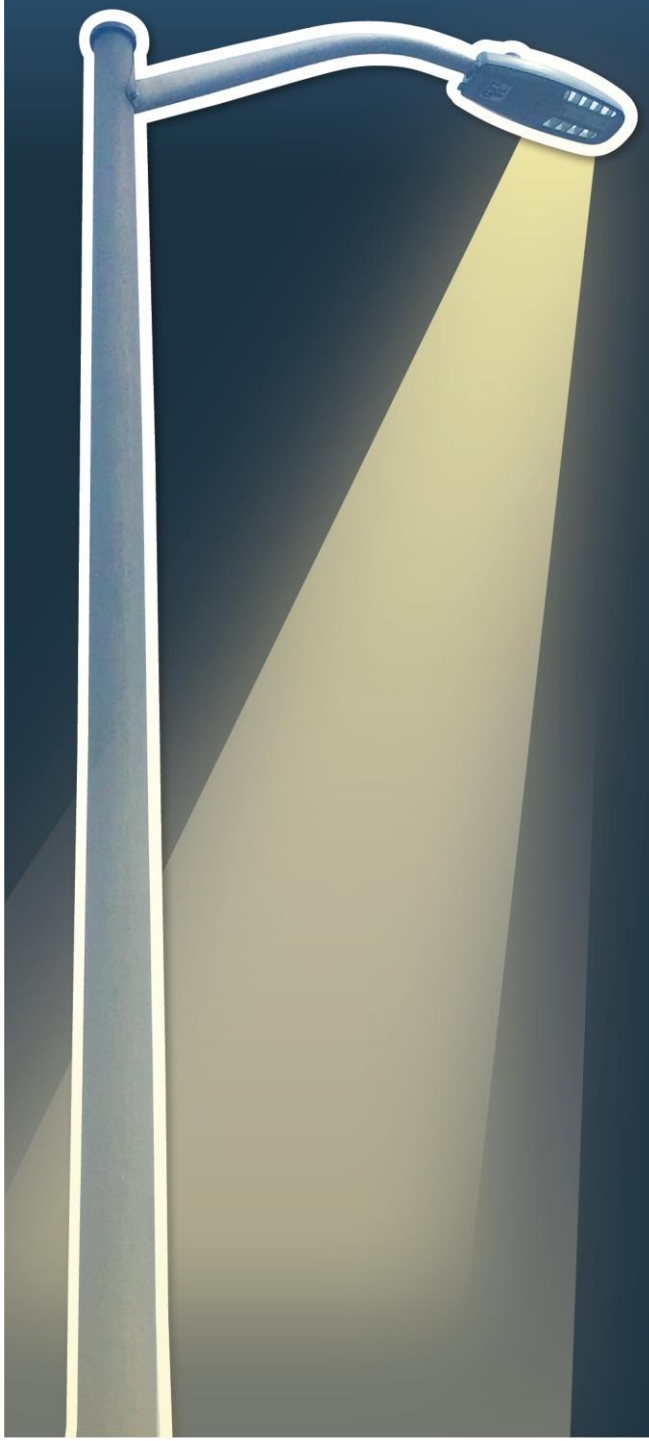

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