Maryland Energy Administration

LED Streetlight Conversions in Maryland & Virginia:

Opportunities, Challenges, and Strategies in 2020

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Executive Summary

Municipalities across the U.S. are realizing dramatic reductions in their electric utility bills by upgrading their streetlighting assets. Streetlighting can account for as much as 40% of all electricity consumed by a municipal government. Expense reductions are achieved by replacing old light fixtures with light-emitting diode or "LED" technologies. In some instances, conversions may also require upgrades of poles and related equipment.

In 2020, LED streetlighting technology has matured so that features such as color rendering have been optimized while material costs have decreased. LEDs deliver streetlighting levels comparable to – or better than – older technologies but do so while consuming 50-70% less electricity than the high-pressure sodium or mercury vapor lamps that they replace.

The economics for streetlight conversion can be challenging, thanks to disparate stakeholder interests. Utilities are obligated to provide safe and reliable service while earning a regulated rate of return for their shareholders. Municipalities are interested in improving the health and safety of their communities, ensuring their environmental and financial sustainability, and reducing operating expenses. Streetlight retrofits are significantly influenced by electric utility regulations, which allow a streetlighting tariff to blend capital, operating, overhead, and profit to yield allowable revenues and rates of return to the utility. These tariffs may be improved over time to reflect changing costs of service and allowable returns on investment. However, tariff revisions may not always keep up with changes in technology and potential savings. Stranded asset costs[1] may impact both the utility and its customers. Utilities and their municipal streetlighting customers would all benefit from asset management plans that provide a standardized cost formula for the early retirement of inefficient lights. Municipal decision-makers could then budget for phased-in conversions while utilities could pace their conversions to minimize impacts on other ratepayers.

If LED technologies are not explicitly priced beyond the reach of municipalities, then a lack of consistent pricing in existing tariffs can also dissuade conversion efforts. Limited resources may hinder municipal efforts to create an inventory of fixtures subject to conversion. Procurement and finance activities may pose additional challenges.

The Maryland Energy Administration leads a two-state effort to accelerate the adoption of LED technology for streetlighting purposes. A grant awarded by the U.S. Department of Energy in early 2019 partially funds this two-year program.[2] The implicit goal of this program was to prescribe the cheapest, easiest way for Maryland and Virginia municipalities to pursue the adoption of LED streetlights. While the grant provides technical assistance, it does not provide the capital to acquire and install fixtures. By opting into this program, a municipality would receive technical assistance to navigate challenges such as developing fixture inventories, conducting investment analyses, selecting suitable procurement and finance options, and crafting suitable legislative and regulatory strategies. To date, 22 municipalities in Maryland and Virginia have ratified commitment letters that entitle them to receive program assistance.

This report is an intermediate deliverable of Clean Energy Solutions, Inc., MEA's lead technical consultant for this program. It endeavors to objectively describe the current status of Maryland and Virginia markets for LED streetlight conversions. As such, the report necessarily examines the terms and conditions for conversion as set forth in the tariffs of both states' larger utility companies. We find that, as of the date of this report, the desired terms and conditions for the easiest and most cost-

[1] The residual value of assets that are retired or otherwise written off before their costs are totally recovered through amortization.

[2] See Appendix A, "Methodology," for a full explanation of the program and the development of this report.

effective means for conversion remain elusive. The hurdle is embedded in electric utility tariff proposals that have yet to be shared for review and comment by regulators and the public at large. Such proposals are expected in late 2020 or early 2021. It is possible that proposed tariffs may not offer reduced expenses for adopters of LED streetlighting fixtures. Rather, the utilities may hold their charges constant while delivering new, digitally-derived services such as broadband data or security monitoring as a part of the same poles and related streetlighting infrastructure.

Meanwhile, innovative project finance and regulatory approaches to LED conversions have been demonstrated in other states, as described throughout this report. These experiences can and should influence the evolution of LED streetlighting markets in Maryland and Virginia.

With a pending grant extension through January 2022, this program will continue providing technical assistance to municipalities, especially with regard to proposed tariff developments. Follow the program website at: https://energy.maryland.gov/govt/Pages/municipal-streetlight-grant.aspx.

Purpose of this Report

This report is part of the MEA Municipal LED Streetlight Program.[3] This program was created to enumerate and help overcome the apparent barriers to LED streetlight conversions. The Maryland Energy Administration (MEA), with a competitive grant award from the US Department of Energy (DOE), engaged Clean Energy Solutions, Inc. (CESI) as principal consultant for conducting this program. The Virginia Department of Mines, Minerals and Energy (DMME), the Northern Virginia Regional Commission (NVRC), the Metropolitan Washington Council of Government (MWCOG) and the National Association of State Energy Officials (NASEO) serve as program partners, conducting education and outreach to facilitate the adoption of LED streetlights by local governments. The major objectives and associated tasks of the program are to:

- educate local governments about the costs and benefits of LED streetlighting conversions;
- assist interested local governments[4] (including counties) in determining the specific cost-effectiveness of a project in their locality, given a rough inventory of their existing lighting;
- assist local governments (via model RFQs and customized adaptations) in solicitation of lighting contractors and financing for conversions, and to act as "owners' agents" in assisting their selection and implementation of conversions in Maryland, as well as in accessing the existing Dominion Energy (Dominion) program in Virginia;
- provide local governments, alone or in aggregate, with information about utilities' current LED streetlighting conversion programs, the benefits and challenges of conversion, and potential opportunities to work with utilities and public service commissions to update existing tariffs or facilitate the acquisition of utility-owned streetlights, where appropriate; and
- provide model state legislation, tariff guidance and additional educational materials on the efficacy of LED conversions, and to participate in meetings as needed with key stakeholders to move the conversion process forward.

The intent of this report is to illustrate the current conversion potential for LED streetlights in both Maryland and Virginia. The report describes the extent of LED streetlight conversions to date in both states, as well as current barriers apparent in current utility tariffs and regulations. By recognizing other states' successful experiences in overcoming such limitations, this report also suggests future legislative and regulatory precipitants for capturing full conversion potential.

See Appendix A for this study's research methodology and overall project management.

Benefits of LED Streetlights

Light-emitting diodes (LEDs) have been performing on the global market for more than 10 years. They are the technology of choice for street lighting due to their efficiency, improved quality of light, dimmability, and minimal maintenance requirements. The cost of LEDs has declined significantly in recent years, with some jurisdictions realizing payback periods of less than 5 years.

[3] The program's official title is "The Maryland and Virginia Program to Facilitate LED Streetlighting Conversions by Local Governments."

[4] This report will use the terms "municipality" or "municipalities" to refer collectively to local government entities. As such, the terms refer to counties as well as towns or cities which may or may not be incorporated.

The quality of fixture manufacture and operation have increased substantially. By late 2013, approximately 8% of municipalities in the U.S. had converted many of their streetlights to LEDs, according to a survey of 240 communities conducted by the U.S. Department of Energy's (DOE) Municipal Solid-State Lighting Consortium. As of mid-2016, approximately 28.3% of existing U.S. roadway and area lighting had been converted to LEDs.[5]

The primary benefit of LEDs is reduced energy consumption. LEDs use approximately 50-70% less energy than high-pressure sodium (HPS) or mercury vapor (MV) bulbs. LEDs also have longer useful lifetimes (10+ years) and require minimal maintenance. Other benefits include "instant-on" performance, dimmability, and "directional" lighting, which minimizes light loss, diffusion, and light pollution. LEDs also generate little to no infrared or ultraviolet emissions. Since LEDs are primarily made of solid-state components, some jurisdictions permit recycling of expired LED bulbs at the end of useful life.[6] Due to their directionality and superior light quality, LEDs have also been attributed with improved safety and greater security against vandalism and crime.

A growing area of interest is smart, connected LED streetlights. A recent Northeast Report estimated that by 2029 more than one-third of the streetlights in the U.S. will have a digital connection to information technologies.[7] Smart LED streetlights have the capability to offer additional energy and financial savings by providing dimming capabilities that includes dimming when few cars are present and brightening if traffic increases. Once installed, smart streetlights can act as a platform to enable other tools and services, such as gun-shot detection sensors, pollution monitors, and integration with storm-drain sensors.[8] Through increased automation and more accurate location data incorporated into smart LED streetlights, both utilities and municipalities experience lower installation costs as well as operation and maintenance costs through fast and accurate deployment of contractors and crews. For example, some contractors have realized a 20% increase in annual installation ability while reducing the labor cost of converting streetlights by 30-50%.[9] Additionally, during the recent Covid-19 pandemic, smart streetlights were used in Puerto Rico to indicate prohibited areas by changing to red in certain areas and at certain times.[10] LED streetlight conversions have continued during the pandemic in early 2020 with jurisdictions noting the real monetary savings provided by new LED fixtures to help fill budget shortfalls and the solitary nature of the conversion installs allowing continued work at a safe, social distance.[11,12]

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[5] Adoption of Light-Emitting Diodes in Common Lighting Applications. Prepared by Navigant for US Department of Energy Solid-State Lighting Program. July 2017. Page vii

[6] https://www.lighting.philips.com/main/support/support/faqs/the-environment/how-are-leds-disposed-recycled

[7] United States Smart Street Lighting & Smart Cities: Market Forecast (2020 – 2029). Northeast Group, LLC. report brochure. April 2020.

[8] Smart Cities Connect Webinar: An Integrated Approach to Smart Streetlight Deployment & Management: Lessons Learned from Chicago, London & More. May 20, 2020.

[9] Smart Cities Connect Webinar: An Integrated Approach to Smart Streetlight Deployment & Management: Lessons Learned from Chicago, London & More. May 20, 2020.

[10] Kevin Galligan personal report. April 2020. Original red capable fixtures were installed along coastal turtle habitat areas to avoid disorientation caused by white light since turtles do not see red light as well. https://pametriverbooks.com/blog/f/red-light-district

[11] City of Coral Gables moving forward April 29, 2020 and Utica, New York beginning conversion project June 15,2020. Internet search June 29, 2020.

[12] Smart Cities Connect Webinar: An Integrated Approach to Smart Streetlight Deployment & Management: Lessons Learned from Chicago, London & More. May 20, 2020.

Current Progress of LED Streetlight Conversions in MD & VA

All the major investor-owned utilities in both Virginia and Maryland have implemented, to varying degrees, tariffs and programs to facilitate LED streetlight adoption. The terms and conditions of these tariff vary significantly. In Virginia, Dominion offers a comprehensive LED streetlight program that provides both conversion support and design as well as significant financial savings.

Since 2012, BGE in Maryland has met with most of the governmental jurisdictions in their territory about LED streetlights, resulting in the successful conversion of over 72% of the utility-owned streetlights and 27% of customer-owned streetlights to LED. BGE's cost recovery for LED conversions are currently embedded in the tariff, so converting communities are not unduly burdened with up-front costs. BGE also has a GIS data sharing program[13] to help maintain accurate streetlight inventories and recently implemented a new customer lighting maintenance reporting tool to simplify the outage reporting process. PEPCO and Delmarva, both part of PEPCO Holdings Inc, have converted 4% of the utility-owned lights in their service territories but have indicated the release of a new LED streetlight program in August 2020 to begin replacing all utility-owned streetlights with LEDs that incorporate smart node technology.[14]

Key information for this study was provided by these major investor-owned electric utilities:

- IN MARYLAND:
  - PEPCO Holdings Inc. (PHI), the parent company of Potomac Electric Power Company [PEPCO] and Delmarva Power and Light (Delmarva);
  - Baltimore Gas and Electric (BGE); and
  - Potomac Edison (PE), a FirstEnergy Company.
- IN VIRGINIA:
  - Dominion Energy.

This report's pursuit of Maryland and Virginia streetlighting data began in the fall of 2019. Dominion Energy provided a summary of LED streetlight conversions in its service territory as of September 2019. Data from PEPCO, BGE, and Potomac Edison was not received until the summer of 2020. The current LED streetlight projects and conversion rates were assessed in November 2019 to attempt to get a baseline measure for this study.

The overall conversion numbers (both municipal- and utility-owned) are changing rapidly as the benefits of LED streetlights are becoming better understood and accepted both through municipal projects and utility efforts. Conversion tracking in Maryland after November 2019 is further obscured since the utility data did not distinguish between municipal- versus utility-owned fixtures. For the purpose of this report, updating the numbers further would add cost but little value to the information currently shown in Tables 1 (Maryland) and 2 (Virginia), below.

[13] Not all jurisdictions were able to engage this tool. The City of Bowie reports its repeated but unsuccessful attempts to obtain GIS-based streetlight data from BGE.

[14] As of September 2020, the details of PHI's LED streetlight program, the goals and timeline for release have not been provided.

Table 1:

Maryland LED Streetlight Conversion Summary *As of June 2020, unless otherwise noted*	
Approximate # of lights converted to LED or under contract as of November 2019[15]	113,951
Approximate # of lights converted[16]	106,662
MEA Municipal LED Streetlight Program participant # of lights considered for conversion	33,234
MD population 2018	6,042,718
Estimated total # of MD streetlights[17]	354,352
% of MD streetlights converted to LED to date	30%[18]

If the MEA Municipal LED program participants successfully negotiate favorable LED conversion projects, over 41.5% of Maryland's existing streetlights will be LED.

Table 2:

Virginia LED Streetlight Conversion Summary	
Approximate # of lights converted or under contract as of November 2019	23,045
MEA Municipal LED Streetlight Program participants: # of lights considered for conversion	75,057
VA population 2018	8,517,685
Estimated # of streetlights[19]	741,039
% of VA streetlights converted to LED to date	3%

If all the lights in current projects are successfully converted, approximately 10% of Virginia's streetlights will be LED.

[15] Information collected from June 2019 – November 2019. NOTE: some projects may be missing due to lack of response from municipalities.
[16] Total received from PHI and BGE in June 2020. This does not include lights in the Municipal or Cooperative utilities in Maryland. The investigation funded through the MEA Municipal LED Streetlight Program found 87,375 lights converted to LED as of November 2019.
[17] To reach this estimate the following information was used: streetlight totals provided by PHI (84,889) and BGE (223,367); the facility counts of lights from the 2018 PE PSC filing (13,882); and used the total number of customers from the PSC Ten Year Plan (2019-2028) to determine the % of MD customers serviced by the municipal and coop utilities (10%) as a proxy for number of lights. [322,138*1.1=354,352]. NOTE: this number is much lower than anticipated. NEEP estimated Maryland had 527,237 lights in 2015, from their report: LED Street Lighting Assessment and Strategies for the Northeast and Mid-Atlantic. Northeast Energy Efficiency Partnerships. January 2015. There are two potential possibilities for the range in estimates: (1) MD demonstrates lower lighting intensities than average states; (2) utilities systematically undercount customer-owned lights.
[18] Approximately 64% of the conversions are BGE conversions of utility owned lights at no up-front costs to local governments.
[19] To reach this number we used the following formula developed and utilized in the report: LED Street Lighting Assessment and Strategies for the Northeast and Mid-Atlantic. Northeast Energy Efficiency Partnerships. January 2015. The formula is [(total population/100)*8.7]. NOTE: This estimated number could be high. Based on information provided by the MD utilities, the MD estimated total number of streetlights, using this formula, was reduced by 33%.

Information from Dominion, received in late September 2019, revealed approximately 10,000 of the 327,000 utility-owned streetlights have been or are in process of being converted.[22] In 2018, Dominion adopted a favorable LED streetlight tariff and program with a 5-year goal to convert all utility-owned streetlights to LED and are actively increasing capacity to reach this goal.

In addition to the municipal LED streetlight conversions listed above, the Virginia Department of Transportation (VDOT) is converting approximately 10,000 of the 20,000 lights they maintain across VA to LED. The conversion is financed through an energy performance contract (EPC) and the LED lights will be installed in 2020-2021. The EPC includes lighting control systems to better manage lights and provide additional energy savings. Ultimately VDOT anticipates it will achieve $1.7 million in savings during the first year, and a cumulative net savings of $4.6 million by 2036. VDOT also anticipates an 11.3 million kWh per year reduction in energy consumption.[23] In February 2020, Maryland DOT agreed to initial discussions around LED streetlight conversion. While Washington, DC is not a party to this program, it is currently converting 75,000 streetlights to LED in a recently approved PEPCO project.

LESSONS LEARNED FROM LEGISLATIVE INITIATIVES IN NEW YORK STATE

New York's Streetlight Replacement and Savings Act was passed in 2015 to establish procedures for the transfer of ownership of streetlights and supporting infrastructure from a public utility to a municipality or other government entity. The NY Public Service Commission (NY PSC) was also directed to work with the New York State Energy Research and Development Authority (NYSERDA) to identify funding which would be available for municipalities. As of April 2019, the PSC has approved the sale of nearly 45,000 streetlights to 18 municipalities across New York State. Through the Smart Street Lighting NY program, the New York Power Authority (NYPA) is working with cities, towns, villages and counties throughout New York to fully manage and implement a customer's transition to LED streetlight technology. NYPA provides upfront financing for the project, with payments to NYPA made in the years following from the cost-savings created by the reduced energy use of the LED streetlights. NYPA has installed—or is in the process of installing—more than 117,500 LED streetlights at municipalities across the state.[20] New York City is replacing its 250,000 streetlights with high-efficiency LEDs.[21] The Smart Street Lighting NY program has a target of converting 500,000 streetlights to LED technology by 2025.

Included in both the Maryland and Virginia summary tables above are the MEA Municipal LED Streetlight Program participants as of June 2020. In Maryland, 22 jurisdictions indicated interest in the program and 12 jurisdictions are active participants. In Virginia, 10 jurisdictions indicated interest in the program and 7 are actively participating. A majority of the Virginia participants are moving forward with LED streetlight conversions, in large part due to the favorable Dominion LED tariff. In Maryland, interest in the MEA program and LED streetlight conversion is widespread. However, far fewer lights have been converted to date. While the Maryland utilities have LED tariffs, typically the utilities' estimated cost to convert to LED streetlights[24] makes the projects financially unfeasible with paybacks exceeding 10 years. Table 3 is a summary of the

[20] https://www.nypa.gov/news/press-releases/2019/20190418-smart-street-lighting-ny
[21] https://www.aceee.org/toolkit/2020/02/reducing-energy-use-public-outdoor-lighting
[22] email sent to Dominion 6/1/2020 for updated information.
[23] Email with Marc Lipschultz, Traffic Engineering Division, Virginia Dept of Transportation. December 12, 2019.
[24] Most of the participating MD municipalities are in PEPCO's territory and their conversion cost, based on current estimates, range from $1600-2500 per light, yielding an average payback of ~10 years. MEA program assessments have used the $275 per light conversion estimate, which was PEPCO's cost as applied to early conversion projects in Montgomery County and Takoma Park. The payback for these two early projects was less than 5 years.

results from both the Maryland and Virginia cost-benefit assessments provided to each participating municipality through the MEA program.

Table 3:

MEA Municipal LED Streetlight Program Summary Results	*Maryland*	*Virginia*	*TOTAL*
approximate # of lights assessed for conversion[25]	17,152	70,200	87,352
Estimated Annual Energy Savings (kWh)	5,577,553	28,823,160	34,400,713
Estimated Annual Bill Savings*	$1,022,673	$2,890,170	$3,912,843
Estimated Conversion Cost (before any rebates)[26]	$5,412,888	$11,349,708	$16,762,596
Approximate Payback (years)	5.3**	3.9	4.3

*"Savings" here are a composite of energy, demand charges, and O&M charges, as applicable to the municipality and utility tariff.
**Achieved with low costs per-fixture offered several years ago by PEPCO only to Montgomery County and Takoma Park. Current cost estimates are much higher (yielding a 10-year payback estimate).

The potential for reduced energy consumption and increased cost savings realized through LED streetlight conversion in both Maryland and Virginia is significant. For information about individual LED streetlight conversion projects, including MEA Municipal LED Streetlight Program participants in both Maryland and Virginia, please see Appendices B and C.

Barriers to Municipal LED Streetlight Conversion

The number of this program's respondents indicate widespread interest in municipal LED streetlight conversions. While utilities increasingly support LED streetlights, multiple barriers remain in Virginia and Maryland for increased conversion. Barriers, which vary in importance over time and across utility service territories, are as follows:

1. Insufficient outreach and education
2. Misinterpreting metrics: watts instead of lumens
3. Structure of LED streetlight tariffs
4. Clear and transparent process and cost structures for converting utility-owned lights
5. Clear and transparent process and cost structures for converting municipal-owned lights
6. Lack of accurate streetlight data/inventories
7. Streetlight ownership structure
8. Lack of financing options
9. Uncertain impacts on utility business models

[25] Not all program participants are included in the number of lights because program cost/ benefit assessment has not been provided.

[26] Assumes a conversion cost between $275 - $450 per light for typical cobra-head lights for MD municipalities based on Montgomery County Lighting Maintenance Conversion cost for most of the municipalities. A conversion cost of approximately $150 was used for VA municipalities based on the Dominion Energy LED tariff and streetlight program.

1. **Insufficient outreach and education**: As LED streetlight technology matures, it gains in efficiency and cost effectiveness. However, many people have "long memories" of early encounters with new technologies that have since evolved for the better. Such bias often instills resistance to subsequent change away from old and familiar technologies. For this reason, insufficient outreach and education around the true benefits of LED streetlight technology for municipalities are barriers to more widespread adoption. For example, when LED streetlights were first adopted, the standard color temperature being installed was ~5000 Kelvin (K). The illumination from these lights is bluish in hue and harsh compared to most traditional streetlights. Also, there was some concern from the American Medical Association (AMA) of medical issues stemming from this type of light, which impacted the adoption of LEDs. Additionally, at least one study of LED lighting's impact on wildlife has facilitated better lamp choices as needed.[27] However, as the technology and industry have matured, LED lamps with a color temperature of ~3000 K are the current recommendation. Additionally, the AMA has refined their statement and now supports the use of LED lights with color temperature ratings in that range.[28] From our work to date on the MEA LED municipal streetlight project and our conversations with jurisdictions across both states, it is clear that more education, outreach, and dissemination of best practices is needed to ensure successful LED streetlight conversions.

2. **Misinterpreting metrics: watts instead of lumens.** Many decision-makers display a preoccupation with lamp *wattage* as opposed to lighting efficacy, expressed as *lumens*. For example, when converting HPS streetlights to LED, a focus on wattage begets the potential to over-lamp or to have too much light. In residential areas, for example, the industry standard has become to replace 100-watt HPS streetlights with 30-watt LED streetlights. However, some utilities still recommend replacing 100-watt HPS streetlights with 70-watt LEDs even in residential areas, leading to complaints from homeowners and the perception that LED streetlights are not a viable option for residential neighborhoods. When 30-watt LEDs that operate in the 2700 – 3500 K range are equipped with light shields to direct light away from houses, the light provides better visibility than the HPS lights, saves significant energy and money and is favorable to most homeowners. Again, coordinated outreach and education around these issues, from utilities, governments, and other stakeholders, would help LED streetlights become the norm.

3. **Structure of LED streetlight tariffs:** An in-depth review of BGE, PE, PHI, and Dominion LED tariff structures was conducted and is included later in this report.

   Many of the electric utilities in Maryland and Virginia offer tariff structures that provide varying amounts of bill savings when converting utility-owned lights to LED. A customer's potential savings in monthly streetlighting rates may be dependent upon a range of factors, such as specific tariff, wattage, fixture type, and maintenance options, which a customer may select for their own lighting needs and circumstances.

   Current tariffs are sometimes outdated, as they reflect the capital and maintenance costs of older technologies. Municipal cost analyses often render the investment infeasible when

[27] Putting Animals in their Best Light: Some Shades of LED Lamps Threaten Wildlife. https://www.sciencedaily.com/releases/2018/06/180612090618.htm

[28] AMA Adopts Guidance to Reduce Harm from High Intensity Street Lights. https://www.ama-assn.org/press-center/press-releases/ama-adopts-guidance-reduce-harm-high-intensity-street-lights. Accessed Dec.11, 2019.

estimates are based on current tariffs. Municipalities that participate in the MEA program expressed displeasure with the five-plus years needed for LED conversions to achieve acceptable payback measures under the current terms and conditions offered by electric utilities.

Other utilities may not offer an LED service option. In some cases, converting to LED lights within the existing tariff structures would increase utility bill charges. For example, Appalachian Electric Power (AEP) in Virginia does not currently have an LED tariff and municipalities interested in converting AEP-owned streetlights to LED have reported costs that would be four times the current cost even though energy use and maintenance costs would significantly decrease.[29] Tariffs like this are structured using outdated assumptions about costs of LED fixtures and the perceived additional risk of utilizing new technology.

Municipalities should periodically consult with their utility to understand evolving tariff offerings and logistical considerations for LED streetlight conversions. The development pace and transparency of these offerings varies across utilities. Municipalities are encouraged to participate in the regulatory review process, petitioning for LED conversion programs and options that address some of the current challenges encountered when pursuing large-scale conversion efforts.

RETHINKING TARIFFS IN NEW HAMPSHIRE

Revisions of Eversource's LED Streetlight tariff in New Hampshire illustrate the importance of tariff design to accurately reflect costs savings achieved through LED streetlight conversion. Prior to 2013, Eversource's streetlight tariff weighted the fixed price per LED fixture more heavily than the monthly energy costs. A high fixed price prevents any energy savings achieved though LED conversions to be accurately translated into municipal cost savings. The updated tariff reduced the fixed costs and increased the per kWh energy charge – decreasing fixed costs as percentage of total cost from 95 to 69 percent. This enabled the city of Rochester to achieve a 45 percent reduction in energy bills through an LED streetlight conversion.[30]

4. **Clear and transparent process and cost structures for converting utility-owned lights:** Jurisdictions are faced with multiple challenges when attempting to be proactive and allocate scarce time and money to undertake an LED streetlight conversion. The benefits are well documented, but financing and negotiations with utilities present significant hurdles. If utilities develop tariffs and programs that support LED streetlight conversion, projects can be completed in 1-2 years. Utilities should provide a clear and transparent process for converting utility-owned lights in order to avoid project delays and accelerate municipalities' consideration of streetlighting program options.

   Currently, jurisdictions may face an extended process[31] to convert streetlights to LEDs, which may push potential energy savings to future years. Delays may require additional

[29] Information according to Blacksburg, Virginia

[30] https://www.nhenergy.org/utility-streetlight-tariffs/understanding-utility-streetlight-economics-challenges-of-rate-design-and-stranded-costs

[31] Participants in the MEA Municipal LED Streetlight program reported a 5-10 year timeframe for achieving prior streetlighting conversion projects.

investments of municipal time and money. Financing may be challenging as jurisdictions must work within their annual budget cycles, potentially causing additional delays if deadlines are missed. On-bill financing is an important tool that utilities could offer as part of streetlighting program to address some of those challenges. Municipalities may also pursue energy performance contracts[32] or Energy-as-a-Service[33] business models.

In Maryland, the MEA Municipal LED Streetlight program currently has 13 jurisdictions participating in the program. Nine of them are located in PEPCO territory. Despite program members' active pursuit of LED streetlight conversions, no utility-owned lights have been converted by members in the PEPCO territory as of the date of this report. A longer conversion process is potentially tied to the fact that the initial cost estimates provided by PEPCO for converting the lights are between $1,600 - $2,500 per light, depending on the specifics of each project. For example, when Takoma Park began the LED streetlight conversion project the price estimates fluctuated between $1,200-2,300 per light. Ultimately, PEPCO converted 1,530 streetlights in Takoma Park for roughly $250 per light.[34] Takoma Park's example is not isolated: unclear cost structures still occur among interested communities in PEPCO territory. As stated above, PEPCO has indicated that it is working on a new proposal to file with the MD PSC to enhance its conversion process across its Maryland service territory, but the details and timeline are unknown at the time of this report.

5. **Clear and transparent process and cost structures for converting municipal-owned lights:** There are also challenges specific to the conversion of municipal-owned lights. The lack of transparency and cost structures create undo confusion which may ultimately lead to delays and increased project costs. Specific examples are utility contractor and installation requirements. While utilities will more than likely require a contractor to conduct the installation work on the utility-owned lights, it is less clear for municipal-owned lights. Because municipalities are connected to the utility's wires and power-grid, the utilities provide oversight to conduct the installation work. In Maryland, a PSC regulation requires a utility representative be onsite to de-energize and re-energize all streetlights for conversion unless there is a disconnect on the existing light. The regulation is to ensure safety at the interface between the utilities' electrical wires and the customer-owned lights. However, many states and utilities do not require utility representatives to be present if a qualified contractor is conducting the work. In Massachusetts, for example, the replacement of a streetlight does not require the supervision of a licensed contractor. While most municipalities use outside contractors for installation and maintenance, this labor can also be provided by in-house municipal workers in Massachusetts.[35]

   An example of how a utility's terms and conditions impact customer-owned streetlight conversion is BGE's requirement that a BGE contractor/representative be present at each municipal-owned LED streetlight conversion to de-energize and re-energize the light. The BGE representative is deployed in addition to the qualified third-party contractor hired to do the work. The cost of the BGE labor is passed on to the customer, effectively doubling the labor cost for the conversion of each light. Because of this requirement, utilizing a third-party installation contractor is not feasible. If the municipality would like BGE to

[32] https://www.energy.gov/eere/slsc/energy-savings-performance-contracting
[33] https://www.aceee.org/sites/default/files/eo-energy-as-service.pdf
[34] Information from Takoma Park website: https://takomaparkmd.gov/initiatives/project-directory/streetlight-update-project/. Accessed June 3, 2020.
[35] http://www.mapc.org/wp-content/uploads/2017/09/Buy-Back-Streetlights-from-Utility.pdf

handle installation, BGE will use its existing contractors or bid-out the work, but does not share the details of the bids with the municipality.[36] The MD PSC regulation and the subsequent BGE policy requiring utility representatives to be present for deenergizing lights creates unnecessary, duplicative labor charges for streetlight conversion, reducing the potential financial savings and rates of return on investment. To improve the process, qualified third-party contractors, approved by the utility, should be allowed to complete LED streetlight conversions on customer-owned lights from de-energizing through installation and re-energizing lights.

6. **Lack of accurate streetlight data/inventories:** Most streetlights are not metered. As the utility installs lights, their location and type of lamp should be mapped and inventoried. Municipalities then receive utility bills per light that are based on the existing utility streetlight tariff. Sometimes, lights that were slated for installation were never installed, and lights that were once installed may be removed. Yet this information is not always recorded by the municipality or the utility. Audit results show that erroneous utility billing for these discrepancies can happen.

   As municipalities begin the process to convert streetlights to LED, one of the initial steps is to obtain an accurate streetlight inventory. If the streetlights are owned by the municipality, an inventory should be readily available through existing municipal information. If the streetlights are owned by the utility, the information should be provided by the utility.

   When municipalities participating in the MEA program requested the data for the existing utility-owned streetlights, this utility information was sometimes not readily available for distribution. When information is provided by the utilities, the inventories are sometimes incomplete. An accurate, field-audited inventory can make estimating cost and energy savings of LED streetlight conversions more easily achievable. The cost of inventory compilation can be folded into project finance.

7. **Streetlight ownership structure:** In both Maryland and Virginia most of the streetlights in the investor-owned utility service territories are owned by the utilities. Since the utilities own the lights, they operate and maintain them, leasing the lights to the municipality through monthly utility charges. Utility-ownership of streetlights is not inherently a barrier to conversion. Utility ownership usually carries benefits for the customer, as the utility is responsible for operational administration, liability, and maintenance of streetlights on behalf of municipalities. Some municipalities may seek greater control over streetlight management and have the resources to operate the streetlights in their communities. In those cases, a municipality should have a transparent, predictable process to purchase the streetlights, if desired. Streetlight costs can be a significant municipal cost, potentially accounting for as much as 40% of the monthly municipal electric bill. The ability to reduce those costs through LED streetlight conversion is beneficial.[37]

   Municipalities may benefit from the ability to purchase the streetlights from the utilities for a fair price. Legislation passed in Massachusetts and Rhode Island and discussed in

[36] Information gathered during MEA, BGE, CESI conference call May 22,2020.
[37] http://www.dec.ny.gov/energy/64089.html

more detail later in the report describe a possible solution to addressing barriers to LED streetlight conversion attributable to a lack of municipal ownership. In both Maryland and Virginia, there are laws that require utilities to sell streetlights to municipalities if interested. When municipalities have approached utilities to purchase the existing lights, the cost has been prohibitively high in some cases. For example, Middletown, Maryland attempted to utilize an energy performance contract (EPC) to purchase 7,000 streetlights from PE in 2014 to accomplish LED conversions. The project fell through because of the extremely high price PE wanted for the existing lights, in some cases quoting prices in the $1000's for what seem to be fully depreciated utility assets.[38]

8. **Lack of financing options:** Regardless of ownership of the streetlights, up-front capital is needed in most cases to undertake an LED streetlight conversion. For smaller municipalities, the up-front capital for the conversion is an insurmountable challenge. Many municipalities slowly convert lights over multiple years as capital improvement program (CIP) funds can be allocated. An efficient, cost-effective remedy for the up-front cost hurdle is to use an energy performance contract (EPC). This arrangement allows an energy services company (ESCO) to finance and install a project.

   Several features of the EPC business model are particularly attractive: (1) it relieves the municipality of capital investment responsibility because the ESCO carries the debt on behalf of its customer; (2) it is budget-neutral in that debt repayment is structured to draw only from the cash flow generated by energy savings; and (3) EPC contracts can guarantee cash flow results by way of a surety bond.

   NO UP-FRONT COST, NO DEBT

   Yonkers was the first municipality in New York to convert all its streetlights to LED. The city used a unique financing structure that resulted in no upfront cost to the city. The project is being repaid by the energy savings through a municipal lease and the net savings of the project. Once the 10-year lease has expired, the city will acquire the assets and all of the anticipated annual energy savings. Similar models have also been used in Massachusetts and Rhode Island and allow the municipalities to undertake LED streetlight conversions with no upfront investment, even if the municipality acquires the streetlights from the utility.[39] An additional benefit is that a tax-exempt municipal lease does not affect a municipal credit rating or debt levy.[40]

   Some alternative contract models are used when the municipality seeks energy savings from assets that it does not own. While not yet demonstrated with streetlights, an innovative option to utilize energy performance contracting for utility-owned streetlighting fixtures is known as "Substitution of Collateral." This concept is utilized today in California for a number of energy projects in which the local governments do not own the equipment. The collateral for a utility-owned streetlighting conversion is provided by an asset that the local government does own, such as its City Hall, or another building whose value equals or exceeds the value of the streetlighting project. As long as there are no other liens on the property, and the anticipated remaining life of the building exceeds the term of the financing, a local government can pledge a building it owns as collateral for an energy

[38] Information from Drew Bowen, Middletown Town Administrator, Sept 30, 2019.
[39] http://courtneystrong.com/2017/10/common-sense-guide-local-governments-mid-hudson-region/
[40] http://www.mapc.org/wp-content/uploads/2017/09/Buy-Back-Streetlights-from-Utility.pdf

performance contract for streetlighting. Two local governments in Maryland have indicated initial interest in this option.

Another solution, as discussed at length later in the report, is for utilities to offer On-Bill financing. If On-Bill is available, municipalities can work with the utilities to convert the utility-owned lights to LED and pay the utility for the cost of the conversion through monthly bill payments over an agreed upon length of time. While the savings from the LED streetlights would not be realized immediately, the municipality would not need much, or any, up-front capital to convert lights to LED. Meanwhile, energy savings and greenhouse gas reductions would begin as soon as the conversion was complete. More recently, another option has presented itself: On-Bill financing as a tariff option, which PEPCO has recently indicated may be under consideration for 2020.[41]

9. **Uncertain impacts on utility business models.** Utilities are currently formulating new tariffs that propose revised terms for LED streetlight conversions. However, that process for some utilities may also be contingent on deploying other assets and services that reside in the same streetlighting poles and infrastructure. Broadband data and security monitoring are among the new service options. A blending of such technologies may have ripple effects on a regulated utility's investment and cost recovery, which are ultimately reflected in tariff structures. In other words, a utility's costs and terms for LED streetlighting are likely to be achieved not in isolation, but in the larger context of coincident technology and service deployment. LED streetlighting offers demonstrably lower costs of operations, which translate into lower reduced revenues for the utility. Accordingly, utilities are currently developing tariff proposals that strike an economic balance among all stakeholders. Equity demands that cost reductions for one ratepayer class not be offset by increased revenue extracted from others. An alternative utility business model may provide additional services along with LED streetlighting while holding ratepayers' monthly expenses constant.

The Utility Landscape in Both VA and MD

Each utility tariff has different nuances and may present different challenges to the governmental jurisdictions striving to implement an LED conversion. Variant features include term lengths and up-front cost requirements. The utilities' proposed tariff and program offerings are dynamic, with the potential to change the calculus for LED conversions. Table 4 (below) illustrates the LED streetlight conversion variability between utilities.

[41] Information received on a call with PHI. The details and timeline for this are unknown at the time of this report.

Table 4:

2020 Maryland Investor-Owned Streetlight Inventory[42]			
	TOTAL STREETLIGHTS	LED	% LED
PEPCO			
utility-owned	64,487	1,837	3%
customer-owned	(not provided)	(not provided)	(not provided)
DELMARVA			
utility-owned	17,275	1,340	8%
customer-owned	(not provided)	(not provided)	(not provided)
BGE			
utility-owned	95,784	68,651	72%
customer-owned	127,583	34,834	27%
POTOMAC EDISON			
utility-owned	(90% utility owned lights but total unknown)	(not provided)	(not provided)
customer-owned	(not provided)	1701	(not provided)

It is also useful to compare these current MD streetlighting tariffs to the Dominion tariff, which was amended to facilitate LED streetlight conversions, as negotiated by the Virginia Energy Purchases Governmental Association (VEPGA) on behalf of its association of VA political subdivisions. The agreement is an example of how a strong, standardized tariff has aided in LED conversions that could serve as a model for tariff improvements in MD.

Maryland LED Tariff Structure

For context, the typical structural components relevant and common to all current MD streetlight tariffs are:

1. **Eligibility Basis** is indicated by the utility's applicable streetlighting Schedule(s);
2. **Permissible Fixture Types and Pole Styles for either Underground-fed or Overhead applications.** Each utility has its own fixture eligibility list that is further defined as either "Basic" or "Premium" (sometimes referred to as "Ornamental" or other designations).
3. **Equipment Ownership** by either utility or customer. The tariff may include the option for the customer/municipality to buy out the remaining depreciable basis of the existing utility-owned fixtures as part of the LED conversion project. A tariff will also determine whether customer-owned equipment can be installed on utility owned poles.
4. **Operations and Maintenance (O&M),** which varies by utility regarding cost per fixture and services included (may cover both preventative and reactive maintenance). The tariff may determine whether the customer can take over some or all of those obligations from the utility as part of the LED conversion project, and if the utility is willing to maintain customer-owned equipment on an on-going basis.

[42] Information received from PHI (May 2020), BGE (May 2020) and PE (June 2020). Note: "not provided" means information was not received from the utility as of June 2020. Information about LED streetlights in Delmarva's territory is included in the table because it was provided by PHI, the parent company. An in-depth examination of the Delmarva LED tariff is not included in this report.

By utility, the current (as of December 2019) structural tariff landscape is summarized in Table 5 below:[43]

Table 5:
MD Structural Tariff Landscape (current as of December 2019)

Utility	LED Eligibility/ Schedule	Eligible Fixtures; Pole Types	Ownership	O&M
PEPCO	**Yes:** SL; SSL-OH-LED; SSL-UG-LED	Only 50,70,100, 150 and 250 watts. Utility grade (Basic) & Decorative (Premium); Under- and Over Pole Types	Company will own overhead only; Customer may own overhead and must own underground fed posts.	Fixed Charge / fixture (regardless of wattage) based on Ownership
BGE	**Yes:** SL.2.(b) &(D); SL.3.(f) for O&M	Pendant, Post Top, Premiere, Tear Drop, Floodlight, "Customized" control available; Under- and Over Pole Types	For Company owned, no min. "Change Out" (conversion) group size stated in tariff. Customer may own subject to BG&E pre-approval and based on list of BGE approved fixtures	For Company owned, Reactive & Preventive or Reactive only (per lamp); For Customer owned, Company will provide as above for same cost or on T&M basis
Potomac Edison	**Yes:** EMU, MU, EM, effective 3,23,19 as approved in Case No. 9490)	Cobra Head only (Basic); Acorn and Colonial only (Premium) where customer owns the poles	For Company owned, will convert a group of 12 or more; For Customer owned, cannot use Company poles; Company charges for disconnection /removal of Company-owned equipment.	For Company Owned only. Cost is included in Dist. Charge

Maryland LED Tariff Costs

The typical relevant cost components of the current MD streetlight tariffs are:

1. **Distribution (or Delivery) charge**, which varies for each Schedule (both HPS/MV and LED) and is a charge per fixture for each category of fixture/lamp. Charges may vary by pole height and type (wood, metal, etc.), how the power is fed (overhead/underground), quantity of fixtures on each pole, and fixture type (Basic or Premium). These charges can be a major subject of LED tariff negotiations. Distribution charges are based on cost per utility-calculated (wattage and hours of operation) kWh consumed per month. The wattage and hours formula vary across utilities.
2. **Overhead pole and underground-fed pole tariff charges** may be assessed per pole. The utility charge to install a new LED fixture will vary, in most cases, depending on the type of pole to which the existing fixture is currently affixed.
3. **Utility-owned underground cable may also be assessed a charge** per linear foot, but this charge is typically the same for all lamp types.
4. **O&M charges** by the utility to provide those services depending on the luminaire type and what is included in O&M (preventative and/or reactive), and who owns the fixtures or poles. Due to longer LED lamp life, O&M costs are, or should be, significantly less for LED fixtures compared to HPS/MV, etc.[44]
5. **Monetary Incentives or Rebates** are not a tariff component per se, but the utility may have financial incentive programs (typically a monetary rebate per fixture type/watts/lumen level and control type), and usually dependent on the customer's prior agreement to pay for the applicable energy efficiency tariff rider(s). All MD investor-owned utilities are mandated by the Public Service Commission (PSC) to participate in the

[43] PEPCO anticipates a rate-case filing with MD-PSC for an updated LED tariff in August 2020. Potomac Edison also has indicated they will be updating the LED tariff but has not provided a timeline as of June 2020.
[44] See https://rosap.ntl.bts.gov/view/dot/28524

EmPOWER Program,[45] although the incentives may not be available if the customer has either not initially been included by the utility in some aspect of the program or has opted-out of any monthly contributions necessary to participate in the program.

6. **Utility Financing options** for those customers who contract with the utility for LED fixture installation and/or the other costs incurred by the utility (connection to the distribution system, new poles, etc.), but often not available if the customer decides to purchase, install and own the new LED fixtures.

By utility, the current (as of December 2019) LED tariff cost landscape is summarized in Table 6 below:

Table 6:

MD Tariff Cost Landscape (current as of December 2019)
[H = Overhead feed; UG = Underground feed]

Utility	Distribution	Pole/Cable	O&M	Rebates	Financing
Pepco	Company: $.055/fixture OH regardless of size/type; plus Service Charge $0.02304kWh; Customer: $2.08/fixture UG regardless of size/type. Service Charge $0.02304kWh	No separate Pole or Cable Charge	Company: $0.87/fixture/month; Customer: Company will provide at $1.90/fixture/month	Included in the Energy Efficient Community Program (For accounts with at least 60kW of peak demand at some point during last 12 months. Accounts with less than 60kW are eligible for the Small Business Program. Pepco must approve fixtures and contractors; Terms and Conditions provide a formula for calculating the exact rebate per fixture type.)	Potential to negotiate financing of OH and UG with Company monthly or over specific term
BGE	Company: OH & UG Varies from $7.67 to $23.32 (non-decorative) depending on fixture size (includes per lamp/watt charge); Customer: $0.00186/lamp watt based on IESNA LM-79 manufacturers' Test Reports	Company: OH - $3.10 each pole; UG - Varies from $4.11 to $15.35 depending on pole type fed; Customer: Can install pole and Buy-out fixture "rental" fee due for term of contract.	Company and Customer, for OH and UG: Reactive & Preventive= $1.06/lamp; Reactive only = $0.93/lamp (100-1000watts); Not available for Customer Owned Lamp Poles.	Customers are encouraged to participate in the Custom and /or Prescriptive programs. However, these programs are currently not available to those customers on the SL tariff Schedule.	Customer-owned equipment financing not available from Company.
Potomac Edison	Company: $6.87 to $14.31/Cobra Fixture (includes per kWh charge), $0.50/fixture reduction for 10-year contract, then Yr. to Yr.; Customer: $0.03065/kWh; Company charges for connection of new equipment and removal of Company-owned equipment no longer needed by Customer	Company: OH and UG - No separate charge; No separate charge for pole as long as pole exists at time of LED fixture conversion. At Customer's expense, Company will install new equipment requested by Customer. The Company will then own such equipment. Customer: Customer must own all equipment and poles.	Company: Included in Distribution Charge per Fixture, but only during regular business hours. Work performed at other hours is direct billed to the Customer. Customer: Company will respond to call for maintenance; reimbursed on a Time & Material basis.	Company: EmPower charge is not collected for company owned lighting so no rebate available. Customer: $200 per fixture.	Customer-owned equipment financing not available from Company.

[45] The Maryland General Assembly's EmPOWER Maryland Energy Efficiency Act of 2008 (updated in 2017) was enacted to establish goals and utility resource programs to reduce excess electricity consumption, thus alleviating the consumer impact of volatile energy markets. Key features of the EmPOWER program include utility resources in the form of rebates and incentives to consumers for purchasing energy-efficient equipment options. See https://www.psc.state.md.us/electricity/empower-maryland/

Tariff Issues and Challenges Faced by Maryland Jurisdictions

If fixtures are currently utility-owned and are to remain utility-owned upon conversion, the following questions remain:

- What is the percent reduction in distribution cost per fixture from the original lamp to an equivalent LED?
- Do the proposed LED O&M charges reflect the actual cost reduction differential?
- Are any municipalities' predominant fixture styles, both Basic and Premium, approved (or approvable) by the utility and are they available?
- Does the tariff allow for a CCT / Kelvin level from 3000K to 4000K or only a greater level which may create health concerns as have been documented in other installations?
- What are the minimum years of owner contractual commitment to the utility?
- What is the minimum required replacement scope – minimum number of fixtures that the utility will allow a customer to replace to qualify for LED rate?
- What is the age/depreciation basis/contract term of the municipality's existing utility-owned equipment? If this basis must be "bought out", what is the cost relative to the potential tariff cost reductions?

If equipment is currently utility-owned and the municipality takes ownership upon conversion, the following questions will have to be considered:

- Does the utility or municipality have an accurate inventory of existing equipment? If not, what effort and cost is necessary to create an accurate inventory?
- What is the age/depreciation basis/contract term of the municipality's existing utility owned equipment? If this basis must be "bought out," what is the cost relative to the potential tariff cost reductions?
- What are the pole charges, if any, under LED tariff compared to present? Will the utility agree to still own and maintain the poles once converted?
- Can the municipality capture some or all O&M cost reductions resulting from the conversion?
- Will the utility agree to offer and provide O&M service on the new equipment and at what cost? Will the utility discount O&M costs if the municipality assumes responsibility for O&M to the pole and fixture?
- Are EmPOWER or other rebates available? Does the municipality pay into the EmPOWER program? What are the rebates? How much longer will they be available?
- Does the municipality want to incorporate wireless control / dimming capability which may provide additional monetary, safety and resiliency benefits? Does the tariff permit dimming cost savings based on customer-provided lighting control system data?[46]
- Does the tariff provide for utility financing that is permissible by statute?

If equipment is currently municipality owned and will remain so, these questions require answers:

- Does the municipality have an accurate inventory of existing equipment? What effort and cost are necessary to create an accurate inventory?
- What is the true differential of O&M costs (when costs are assumed by the municipality versus costs when O&M remains contracted to the utility)?

[46] MA street control tariff S-2. NSTAR Electric Company d/b/a Eversource Energy D.P.U 17-05 – Street Light Working Group Filing. October 2, 2018.

- What is the magnitude of reduction in distribution cost per fixture from the original lamp to an equivalent LED?
- Who currently owns and maintains the poles? What are the pole charges, if any, under LED tariff compared to present? Will the utility agree to still own the poles once converted?
- Does the municipality want to incorporate wireless control / dimming capability which may provide additional monetary, safety and resiliency benefits? Does the tariff permit cost savings on that basis?
- Are EmPOWER or other rebates available? Does the municipality pay into the EmPOWER program? What are the rebates? How much longer will they be available?
- What are the predominant fixture styles in use– Basic or Premium? Does the cost of Premium fixtures adversely impact conversion economics?
- Does the tariff provide for utility financing that is permissible by statute?

Virginia: The Dominion - VEPGA Tariff

As noted above, in Virginia, an agreement[47] amendment that included an LED conversion streetlighting tariff was recently negotiated and executed between Dominion and VEPGA, a joint powers association of VA political subdivisions.[48]

Some of the benefits of this innovative tariff for LED streetlight conversion are:

1. The agreement covers utility-owned fixtures, for both overhead and underground feeds.
2. Distribution charges per fixture were negotiated in advance based on schedules and tiers and average wattage ranges.
3. O&M costs reflect reduced cost of LED maintenance and are included in distribution since all equipment covered under the agreement are owned and maintained by Dominion.
4. Fixed installation cost per eligible fixture either Basic (Type 1) at either $130 each or Premium (Type 2) at $386 each, regardless of style or wattage.
5. "Customer" must use a Dominion electrical contractor and must install equipment to Dominion specifications.
6. Expanded availability of fixture types/styles, distribution patterns and housing colors and agreement to continue to expand as necessary, all with 7-pin capability.
7. Agreement terms cover conversions of both existing installations and new LED installations (new poles and lamps)
8. Dominion set up an accessible web database listing all available LED fixtures and specifications.
9. 3000K availability for all fixtures
10. Participating customers agree to purchase supply from Dominion (waive right to direct commodity purchase from other suppliers)
11. The Dominion's Non-Residential Lighting Rebate Program expired at the end of 2018 and has not been renewed for 2019. However, the negotiated tariff's conversion costs do not require an incentive to generate a favorable payback in most cases.

[47] Original Agreement was signed in 2011 and has been amended several times since.
[48] Unlike Maryland, Virginia's regulators do not address streetlighting service.

As a testament to the effectiveness of the Dominion tariff, the municipal demand for streetlight conversion has driven Dominion to ramp up dedicated field resources for converting existing streetlights to LED. While the Maryland investor-owned utilities may improve streetlight tariffs to generate additional demand for LED streetlight conversion, Dominion needs to ensure capacity is equal or greater than the increasing installation demand. The exception to the Maryland pattern is the utility owned lights of BGE, 72% of which have been converted. The primary reason is the absence of any requirement for up-front capital from the local governments—the utility capital recovery costs are embedded in the current LED tariff. Conversely, Dominion has an additional challenge once it improves its contractor capacity: the absence of an on-bill or tariff recovery option for recapturing a community's LED conversion costs. This could be a stumbling block for communities that are prohibited from using debt finance.

Exemplary Legislative Changes

Below are examples of states – Massachusetts and Rhode Island - that have successfully regulated municipal streetlight purchase through legislation, as well as an example timeline for working with a utility for a streetlight upgrade. In California, Bill AB719 would require utilities to provide on-bill financing for streetlight conversions. The bills for all three examples can be found on the MEA municipal streetlight program website.[49] These examples suggest how other states can successfully overcome barriers to streetlight conversion through regulatory and legislative initiatives.

Massachusetts | M.G.L. Chapter 164 Section 34A | Municipal Streetlighting Service

Massachusetts General Law Chapter 164 Section 34A allows municipalities to purchase streetlights from their utility. It was adopted as part of the 1997 Restructuring Act. The law provides for the following:

1. Provides any municipality receiving street lighting service from an electric utility the right to acquire municipal streetlights from the electric company;
2. Street lighting service is defined to include space on any pole or lamp post and the fixture, arm, feeder wire to the lamp from the distribution connection, and mounting hardware;
3. Requires the electric company to provide an alternative tariff for the delivery service specific to municipal-owned streetlights;
4. Sets a 60-day schedule upon notice by the municipality to the electric company and the department of public utilities to effect this purchase and sale, and gives authority to the department (not to arbitration or the utility) to settle any dispute the parties may have within the 60-day limit; and
5. Provides compensation to the electric company for the lighting equipment for its unamortized investment, net of any salvage value, as of the date the electric company receives notice the municipality wishes to exercise this right.

An Example Timeline:

[49] https://energy.maryland.gov/govt/Pages/municipal-streetlight-grant.aspx. Accessed December 2019.

- January 1 – **Municipality provides notice to the electric company**, and the public utility commission or department, that it intends to purchase its street lighting equipment from the utility pursuant to M.G.L. c. 164, §34A. This Notice further requests that the electric company notify the municipality of the purchase price net of depreciation, typically set at $1.00 (one dollar) if all equipment is fully depreciated.
- March 1 (on or about) - **Electric company tenders a purchase and sale agreement** regarding municipal streetlights that includes an inventory of lights (typically as a "Description of Facilities" exhibit) by pole no., type, wattage, lumens and location; a **license agreement** that calls out the rights and responsibilities of the municipality to locate its street lighting equipment on the pole or lamp post of the electric company.
- After March 1 – Municipality provides payment, insurance binder and signed purchase and sale agreement and license agreement to the electric company who then fully executes the agreements and revises the utility bill to reflect the change of ownership to the municipal owned-service.

As of 2019, nearly all Massachusetts cities and towns in the Eversource Energy service territory (including greater Boston, the South Coast and Western Massachusetts) have purchased their streetlights from the electric utility. The municipalities have then procured third-party services to perform LED conversions and other operations and maintenance functions.

Rhode Island | Title 39 Public Utilities and Carriers | Chapter 39-30 | Municipal Streetlight Investment Act | section 39-30-3

Rhode Island's Municipal Streetlight Investment Act creates a utility tariff so municipalities may purchase their streetlights. The champions of the bill estimated over $3,000,000 in annual savings from maintenance and operations if all Rhode Island municipalities upgraded their streetlights.[50] The bill was passed in 2013 and does two things to facilitate the purchase of streetlights from the utility:

1. It sets the purchase price of the lights from the utility. The price is what the utility originally paid for the lights minus any depreciation.
2. It requires the resulting utility tariff to include reduced consumption from streetlighting controls, such as dimmers for LED lights, for ALL municipal customers.
3. Sets a 60-day schedule upon notice by the municipality to the electric company and the department of public utilities to affect this purchase and sale, and gives authority to the department (not to arbitration or the utility) to settle any dispute the parties may have within a 90-day limit.

As of 2018, 16 Rhode Island municipalities had successfully purchased their streetlights with more currently working through the process. One of the cornerstones of Rhode Islands' success was the development of a state-level program supporting the LED

[50] http://www.rilin.state.ri.us/pressrelease/Lists/oped/DispForm.aspx?ID=15. Accessed December 2019.

conversion of street lightening, which provided additional incentives of $0.40 per watt reduced and $20.00 for each remotely-programmable dimming control installed.[51]

California | Assembly Bill No. 719 | An act to add Section 384.5 to the Public Utilities Code

California's AB 719 was passed in 2013 and requires electrical corporations (utilities) to:

1. Submit a tariff to fund energy efficiency improvements on streetlight poles, such as LED lights;
2. Design the tariff to allow local governments to remit the cost of the improvement through the tariff;
3. Ensure that any improvement performed is eligible for rebates or incentives available through ratepayer-funded programs.

The tariff is used at the discretion of the local governments. At the time of the bill's adoption it was estimated that it could result in the replacement of 857,000 utility-owned streetlights with more energy efficient lights, such as LEDs, if all local governments took advantage of the tariff. A recent internet search shows that several jurisdictions have taken advantage of the tariffs and on-bill financing to convert to LED streetlights.

The Basic Elements Needed for LED Streetlight Conversion

LED streetlights save energy and money, however, undertaking a streetlight conversion is not a simple process. There are multiple factors that impact the ease or even feasibility of LED streetlight conversion. Below are elements that are most imperative to success.

Relationship with utility: First and foremost, a municipality should engage with its local utility to determine the utility's interest in facilitating a LED conversion and/or their flexibility in terms of tariff modifications to reflect LEDs' reduced energy use and lower maintenance requirements. A utility's flexibility and engagement in this process can bring much of the economic value that a locality can derive from converting to LEDs.

Streetlight Inventory: Municipalities may or may not know exactly how many streetlights they have, whether municipal- or utility-owned. Utilities should have an inventory of the streetlights that are being billed to the municipality. Many times, the utility's inventory needs to be field-audited. The field-audit may be conducted directly by municipality staff, a third-party contractor retained for this purpose, or by an ESCO if the municipality is exploring the potential of an energy performance contract (EPC). This process can be time-consuming and costly depending on the number of streetlights and the method of recording, such as staff vs. contractor and simple spreadsheet vs. GIS. The field audit will provide valuable information as the utility's inventory may need to be updated to ensure accurate billing. Inventories must also be maintained over time to account for net changes due to additions, retirements, or "knockdowns" etc.

[51] https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/DOE_OLA_Final_Report.pdf

Feasibility Study: Once a municipality has a good understanding of its existing streetlight inventory, it can conduct a feasibility study to create a clear projection of the costs and benefits of an LED streetlight conversion. Based on the existing lights, the utility's LED tariff, and any available rebates and available financing, a feasibility study may be conducted to determine the potential energy savings as well as the estimated return on investment and payback. The feasibility study can help municipal staff and elected officials evaluate a proposed streetlight conversion, especially when competing projects are vying for limited resources.

Financing: Even if the payback for a municipal LED streetlight conversion is favorable, significant up-front capital is needed to finance the project. Municipalities may decide to use capital improvement project (CIP) funds. However, these funds may be scarce, reserved for statutory obligations, or subject to competing priorities and municipal debt limits. To lower the impact of a large project on budgets or debt limits, a project must be cashflow-positive inclusive of financing to enable any debt financing to be serviced by the "revenue" derived from expense savings. If the streetlights are owned and maintained by the municipality, then undertaking an energy performance contract (EPC) through a competitively bid ESCO is an option, subject to utility approval. (In California it is required for utilities to offer on-bill financing for streetlight improvements).

Utility on-bill financing is a viable method for reducing or eliminating the hurdle of up-front capital needs for LED streetlight conversion of utility owned lights. See the text box (right) for more details and examples.

ON-BILL FINANCE SUCCESS STORIES

With on-bill financing, the cost of upgraded streetlights is covered by the utility and paid back by the municipality through a line-item on their monthly utility bill. The savings from the conversion are prioritized to repay the cost of the conversion, meaning the municipality might not see an immediate decrease (or may see a minimal increase) in their monthly expenses. The typical arrangement returns all monthly cost savings to the municipality after the cost of the LED conversion is repaid.

Foster City, located between San Francisco and Palo Alto, used PG&Es on-bill financing program (at a zero-percent interest rate) to complete its LED streetlight conversion project. The city will repay the loan amount of $196,000 from the energy savings achieved through the LED conversion.[52]

Several utilities in New York State also offer on-bill financing to municipalities. Central Hudson Gas & Electric, Orange & Rockland Utilities, Inc., and the New York State Electric & Gas Company, for example, offer municipalities in New York State's Mid-Hudson region the option to finance any upfront costs through on bill-financing. However, utilizing on-bill financing through NYSEG, for example, requires the municipality to pay an interest rate.[53]

Project Team: A successful LED streetlight conversion will engage numerous municipal staff:

- The person(s) responsible for maintaining the locality's streetlight system (Transportation Director, Streets Division Director, or Public Works Director),
- The Chief Financial Officer and the Director of Procurement or Purchasing are critical to involve in the process from early on to navigate financing and the RFP process.
- In jurisdictions with these offices, the Director of Sustainability or Energy Manager can be instrumental for ushering a project to completion to help make both the environmental and financial case for the conversion.

[52] https://www.fostercity.org/publicworks/page/led-street-lights-and-retrofit-project
[53] http://courtneystrong.com/2017/10/common-sense-guide-local-governments-mid-hudson-region/

- The municipal executive, manager, and/or legislature generally must make the final decision for a capital outlay that exceeds a certain dollar amount.

Project Champion: In addition to the project team listed above, localities with a project "champion" or single project manager who can devote significant resources to the process can help ensure success and potentially accelerate the timeline. Where there is a Sustainability Director or Energy Manager present, they could likely be the project champion. The project champion could be anyone on municipal staff who can dedicate significant time to working with the utility, the various departments that maintain and fund the streetlight system, and elected officials. The ideal project champion is an individual who can can re-articulate the benefits of LED streetlight conversion to various municipal decision-makers, each of whom has different professional interests, expectations, and perceptions of "success."

The market for LED lights is at a critical juncture such that the efficiencies of conversion have been well-demonstrated and demand is high. Utilities must adjust to keep pace with that demand. Critical success factors, as listed immediately above, can foster widespread conversion efforts across multiple jurisdictions through cost economies for implementation. This should result in faster realization of the benefits conferred by LED technologies.

Conclusions

In late 2020, the economic environment has never been more conducive to converting streetlights to proven, cost-effective LED technologies. Conversion efforts would not only reduce energy waste and carbon emissions, they would also generate employment opportunities which – by their outdoor nature – are largely removed from COVID-19 health threats.

LED light fixtures provide superior lighting services while consuming less wattage, compared to earlier generations of technology. They incur lower costs of operation and maintenance. At the same time, barriers to conversion abound for municipalities attempting to assemble accurate inventories of light fixtures, conduct cost-benefit analyses, and pursue practical project finance and procurement models. A two-year, two-state program sponsored by the U.S. Department of Energy addresses these issues in Maryland and Virginia.

No one disputes that LED technologies will yield savings. The challenge comes instead with assigning the savings between the regulated electric utility and its municipal customer. Effective streetlighting is inextricably dependent on terms and conditions established in utility tariffs. Most Virginia municipalities enjoy reasonably clear and cost-effective conversion opportunities, notably when served by Dominion Energy. The Maryland market lacks similar clarity as of the date of this report. Electricity tariffs are often outdated and provide unfavorable economics for conversion, although resolutions are underway. Meanwhile, municipal demand for conversions in Maryland is high. Anticipated projects are mostly on hold for want of terms and conditions that have yet to be announced.

Uncertainty regarding proposed tariff updates in Maryland will linger until late 2020 or early 2021, when utility rate cases presented to the Maryland Public Utility Commission for deliberation are settled. Meanwhile, LED streetlight conversions are being pursued successfully elsewhere in the U.S. Examples cited in this report can and should influence the continuing evolution of LED streetlighting markets in Maryland and Virginia.

Appendix A - Methodology

About the program. This report is an intermediate deliverable per the scope of work of grant DE-EE0008616, issued by the U.S. Department of Energy (DOE) to the Maryland Energy Administration (MEA). This grant, entitled "The Maryland and Virginia Program to Facilitate LED Streetlighting Conversions by Local Governments," became effective on February 1, 2019, with an original termination date of January 31, 2021. MEA was the award's prime recipient, with the Virginia Department of Mines, Minerals & Energy serving as sub-recipient. MEA engaged four additional partner organizations, listed below, via subgrant awards. DOE funding was supplemented by in-kind contributions (mostly labor) from the sub-recipient and most of the partners. The total grant capacity extended by DOE is $430,400. The total value of all partners' in-kind contributions is budgeted at $147,008.

Our program partner organizations are tasked with either technical support, advocacy support, or outreach to engage eligible municipalities. MEA and its partner organizations are shown in Table 7.

Table 7:

ORGANIZATION	CONTRACTUAL POSITION	ROLE
Maryland Energy Administration	Prime recipient	Program fiscal and partner management, reporting, milestone coordination, website maintenance
Virginia Department of Mines, Minerals & Energy	Sub-recipient	Liaison and communications, content review and commentary
Clean Energy Solutions, Inc. a.k.a. "CESI"	Sub-grantee	Lead technical consultant: outreach and communications, content development, fixture inventory assistance, investment modeling, guidance for procurement, regulatory, and legislative strategies
Metropolitan Washington Council of Governments	Sub-grantee	Outreach and liaison to MWCOG members, coordination of legislative and regulatory strategies in Maryland, electric utility liaison
Northern Virginia Regional Committee	Sub-grantee	Outreach and liaison to NVRC members and Virginia planning districts, coordination of legislative and regulatory strategies in Virginia, electric utility liaison
National Association of State Energy Officials	Sub-grantee	Liaison with the remaining states and territories, documenting their best-practices. Communication of MD/VA results to other states.

The goal of the grant is to accelerate the implementation of LED streetlighting in both Maryland and Virginia. A successful outcome for the grant is to empower municipalities in pursuing their future conversion efforts. This effort begins with the premise that streetlight conversions pose various technical, financial, procurement, and regulatory hurdles that are too burdensome for

municipalities[54] to overcome on their own. The grant therefore provides resources to help municipalities to inventory their existing light fixtures, calculate cost-benefit analyses, consider procurement and project finance options, and inform any legislative or regulatory initiatives that municipalities may undertake. Note that the grant does not provide capital to purchase or install light fixtures.

Budget and timeline limitations restricted the scope of this effort. There are simply not enough resources to contact, engage, and serve all cities, towns, and counties in Maryland and Virginia. Our program recognized from the onset that successful outreach to all eligible municipalities (over 150 in Maryland alone) was highly unlikely. Extending technical assistance to all would be impossible. The award's scope, approved by DOE, set forth an objective for securing a range of ten to 15 municipalities for technical assistance. Any municipality wishing to participate in the program did so by ratifying a non-fiduciary letter of commitment with MEA. Municipal entities secured in this manner are considered "active participants" by the program. An active participant is eligible to receive no-cost technical support from the program, while still reserving the right to proceed (or not proceed) with actual implementation of new fixtures. The program exceeded its goal for securing active participants within a few months. Appendices B (Maryland) and C (Virginia) are tables listing the municipalities known to this program to have at least considered LED lighting retrofits. The left-most column in each table indicates participant status.

In Maryland, market investigation began with MEA's Maryland Smart Energy Communities (MSEC) Grant Program awardees. Inquiries were sent to communities that had previously been awarded funding via the MSEC program and indicated they were undertaking some sort of lighting efficiency project. In conjunction with inquiries, MEA conducted internet searches for localities that were featured in the media for LED conversion projects. The general searches were complemented with leads provided by program partners and a systematic internet search of Maryland and Virginia municipalities with populations above 30,000 in VA and 5,000 in MD, per 2018 census numbers with any LED streetlight activity. The program team also engaged the Maryland Municipal League (MML) to promote this grant program at their 2019 summer conference. MML also published an article about the program in their August 2019 member publication. Of all the Maryland communities contacted, less than 50 percent responded – including those that opted not to participate.

In Virginia, investigation of LED conversion projects began by contacting the executive directors of each of the Planning District Commissions (PDC). Eight out of 21 PDCs responded. Several executive directors passed on information about LED conversions from localities within their respective territories. Others provided contact information for the Public Works Departments of localities in their respective territories. An email was sent to contacts for each Public Works Department, which yielded some responses, but many emails went unanswered. Additionally, CESI attended the Virginia Municipal League's annual conference and sought information from attendees about current streetlight projects in Virginia.

Electric utility feedback was crucial to this report. In general, the utility tariffs set forth the terms and conditions by which LED streetlights can be procured, installed, and maintained. Accordingly, the electric tariffs determine the cost-benefit profile of any municipal conversion proposal. We contacted the investor-owned, co-op, and municipal utilities in Maryland and

[54] In this report, the term "municipality" makes collective reference to cities, towns, and counties.

Virginia to gather additional information about LED streetlight conversions within their respective service territories. The following investor-owned utilities in Maryland agreed to provide input for this study:

- PEPCO Holdings Inc. (PHI), the parent company of Potomac Electric Power Company [PEPCO] and Delmarva Power and Light (Delmarva);
- Baltimore Gas and Electric (BGE); and
- Potomac Edison (PE), a FirstEnergy Company.

Dominion, a Virginia investor-owned utility, represents the majority of customers served in that state, and was the sole utility from which Virginia information was sought.

From its inception, this program intended to outline the quickest, easiest, and most cost-effective approach to LED streetlight conversions. At the time of this report's completion (September 2020), that outcome is not yet within reach because favorable electric utility tariffs have yet to fully emerge – and may not do so until late 2020 or early 2021. Some utilities are more advanced than others in this regard. Extensive communication with the utilities through this program finds that they are aware of the demand for LED streetlight technology, but they remain focused through the end of 2020 on developing new tariff proposals based on business models that deploy not only LED streetlighting, but other digital information technologies through the same poles and related infrastructure.

About this report. Compilation of this report proceeded in three phases: (1) background research, (2) utility input, and (3) municipality input. By starting with the utilities, we generated substance suitable for review and comment by active participants. The draft would then have critical mass for eliciting additional reaction from other interested municipalities.

As an intermediate deliverable, this report does not provide a definitive reckoning of LED streetlight costs and procedures. In anticipation of electric utility tariff proposals yet to emerge, this report compiles a description of market and regulatory hurdles that should be addressed in upcoming tariff promulgation.

Appendix B - Maryland LED Conversions

[NOTE: Municipalities that responded to our inquiries but are not currently converting to LED streetlights have been included.]

MEA LED Program	Municipality	Contact Name	Contact Position	Contact E-mail (NOTE: Some addresses appear word-wrapped below due to length)	2018 population (Amer. Fact Finder)	Utility	Number of Lights (Total Project Numbers)	Number of Lights Converted (as of Nov. 2019)	Notes
	Aberdeen	Kyle Torster	Director of Public Works	https://www.aberdeenmd.gov/users/ktorster/contact	16053	BGE	1500	300	1
	Annapolis	David Jarrell	Director of Public Works	pubworks@annapolis.gov	39174	BGE	3000	2064	2
	Anne Arundel County	Bo Zhou	Traffic Engineering Division	pwzhou10@aacounty.org	576031	BGE	40000	21000	3
	Baltimore City	Cary Blake	LED Conversion Project Manager	cary.blake@baltimorecity.gov	602495	BGE	76900	46308	4
Yes	Barnesville	Audrey Morris	Commissioner	amorris9331@yahoo.com	180	Potomac Edison	34	0	5
Yes	Bowie	George Stephanos	Director of Public Works	gstephanos@cityofbowie.org	58682	BGE	5839	12	6
	Chevy Chase Village	Michael Younes	Director of Municipal Operations	michael.younes@montgomerycountymd.gov	2060	PEPCO	21	21	7
	College Park	Scott Somers	Public Works, City Manager	publicworks@collegeparkmd.gov , citymanager@collegeparkmd.gov	32196	PEPCO	16	16	8
	Denton	Donald Mulrine	Town Administrator	DMulrine@dentonmaryland.com	4493	Choptank Electric Coop	110	110	9
	Easton	Kelly Simonsen and Jackie Knopp	Marketing & Communications Manager	ksimonsen@eucmail.com jknopp@town-eastonmd.com	16494	Easton Utilities	115	115	10
Yes	Forest Heights	Stanley Mosley	Circuit Rider/ Town Manager	smosley@forestheightsmd.gov	2573	PEPCO	282	0	
Yes	Frederick	Jenny Willoughby	Sustainability Manager	jwilloughby@cityoffrederick.com	72146	Potomac Edison	9899	1000	11
Yes	Gaithersburg	Deborah Moran	Sustainability Coordinator	deborah.moran@gaithersburgmd.gov	68289	PEPCO	4122	35	12
Yes	Glen Echo	Beth Boa	Town Manager	townhall@glenecho.org	325	PEPCO	53	0	

MEA LED Program	Municipality	Contact Name	Contact Position	Contact E-mail (NOTE: Some addresses appear word-wrapped below due to length)	2018 population (Amer. Fact Finder)	Utility	Number of Lights (Total Project Numbers)	Number of Lights Converted (as of Nov. 2019)	Notes
Yes	Greenbelt	Jim Sterling	Public Works Director	jsterling@greenbeltmd.gov	23280	PEPCO	997	44	13
	Hagerstown	Nathan Fridinger	Electric Operations Manager	NFridinger@hagerstownlight.org	40205	Hagerstown Light Department	0	0	14
	Harford County	Douglas Klein	Department of Public Works Traffic Planning	dpklein@harfordcountymd.gov	100968	BGE, DPL	274	274	15
Yes	Howard County	Leah Miller	Energy Manager	lemiller@howardcountymd.gov	287085	BGE	9576	2000	16
	Laurel	Rob Ferree	Public Works Director	rferree@laurel.md.us	25723	BGE	604	604	17
	Middleton	Bruce Charbagh	Director of Public Works	bcarbaugh@ci.Middletown.md.us	4688	Potomac Edison	0	0	18
	Montgomery County	Chris Weatherly; Maureen McNulty	Energy Program Manager; Strategic Communications Manager, DOT	Christopher.Weatherly@ montgomerycountymd.gov; maureen.mcnulty@ montgomerycountymd.gov	1052567	PEPCO, BGE	26000	10000	19
	New Carrollton	Joe Nagro	Interim Public Works Director	jnagro@newcarrolltonmd.gov	12964	PEPCO, BGE	0	0	20
	Oakland	Keith Artice	Engineer	kartice@firstenergycorp.com	1825	Potomac Edison	283	75	21
	Ocean City	Kathy Yates	Public Works	kyost@oceancitymd.gov	7102	Delmarva	2318	997	22
	Poolesville	Wade Yost	Town Manager	wyost@poolesvillemd.gov	4883	Potomac Edison	50	50	23
Yes	Riverdale Park	Ivy Lewis	Director of Public Projects and Services	ilewis@riverdaleparkmd.gov	7225	PEPCO	147	94	24
	Rock Hall	Meg Parry	Grants Office	mparry@rockhallmd.gov	1269	Delmarva Power	10	10	25
Yes	Rockville	Erica Shingara	Sustainability Coordinator	eshingara@rockvillemd.gov	68268	PEPCO	6210	210	26
	Salisbury	Amanda Pollack	Director, Department of Infrastructure and Development	Apollack@salisbury.md	32809	Delmarva Light and Power	122	67	27
Yes	Somerset	Matthew Trollinger	Town Manager	trollingersomerset@gmail.com	1,216 (2010)	PEPCO	173	0	28

MEA LED Program	Municipality	Contact Name	Contact Position	Contact E-mail (NOTE: Some addresses appear word-wrapped below due to length)	2018 population (Amer. Fact Finder)	Utility	Number of Lights (Total Project Numbers)	Number of Lights Converted (as of Nov. 2019)	Notes
	Takoma Park	Daryl Braithwaite	Special Projects Coordinator	DarylB@takomaparkmd.gov	17768	PEPCO	1531	1531	29
	Taneytown	Kevin Smeak	Director of Public Works	ksmeak@taneytown.org	6816	Potomac Edison	262	188	30
	Thurmont	James Humerick	Chief Administrative Officer	JHumerick@thurmontstaff.com	6752	The Town of Thurmont Municipal Light Company	250	250	31
Yes	University Park	Michael Beall	Public Works Director	mbeall@upmd.org	2641	PEPCO	237	0	32
Yes	Village of North Chevy Chase	Dana Peterson	Town Manager	nccinfo@northchevychase.org	597	PEPCO	51	0	
					Total Number of Lights Converted (as of Nov. 2019): 87375				

[1] Aberdeen - Municipality has relationship with BGE. City has 1500 lights; about 300 are city-owned lights. Municipality has started conversion. The original intent was to see if BGE would upgrade the lights for no expense to the municipality. The 300 city-owned streetlights have been converted via city financing. They cost $90-100,000 a year and are in the 3rd year of upgrades. 90 - 100 lights have been converted per year and are paid for outright. (approximately $333 per light converted).

[2] Annapolis - Working with BGE to convert 3000 streetlights.

Reference: https://patch.com/maryland/annapolis/city-replace-street-lights-led-lights

[3] Anne Arundel County - County is working on conversion of approximately 19,000 county-owned streetlights to be finished 5-10 years from 2019. BG&E is working on conversion of approximately 21,000 utility-owned streetlights, to be finished by end of 2019. The county owned conversion is funded via a capital project that allocates yearly funds for conversion.

[4] Baltimore City - The conversion began in 2011. It's a 3-phase project so far. The initial conversion phase was 11,000 city owned lights. The second phase was 6,000 city owned lights. The third phase, in 2016-2017 was 10,000 lights. These numbers are approximate. The city owns 2/3 of the streetlights in the city and BGE owns the other 1/3. BGE converted most of their 1/3 while these city-owned lights were being converted. About 2/3 of the streetlights in the city have been converted (as of 11/19/19). The city owned lights were converted via funding from energy savings. The project is on hold (as of 11/19/19) because the previous mayor championed the project initially. The thinking is that the current mayor or next mayor will have to push for the city to finish the project to get it rolling again. Phase one was funded via an energy savings performance contract. Phase two was funded via a capital project. Phase three was funded via energy savings from BGE-owned lights that the city leases being converted to LED; savings amounted to $1.34 million.

Reference: https://baltimorefishbowl.com/stories/baltimore-to-pay-bge-3-5-million-to-install-new-6000-lights-across-the-city-upgrade-existing-ones/

https://transportation.baltimorecity.gov/news/press-releases/2019-11-07-mayor-bernard-c-%E2%80%9Cjack%E2%80%9D-young-and-department-transportation-director

[5] Barnesville - 10-year agreement with Potomac Edison (PE) is up. Municipality is interested in converting but worried about the lights proposed by PE. They have requested help with SPECs and navigating process with PE to ensure the right quality of light for the Town - i.e., light directed and warm enough. Municipality conducted an inventory audit and found PE was over-charging the Town for lights that do not exist.

[6] Bowie - Interested in converting lights but, based on information received from BGE, thinks it is too expensive. Already conducted a 12-light pilot project.

[7] Chevy Chase Village - Pilot project of 21 lights in 2012. Re-assessed cost to convert all lights in 2016. Estimate was $290,000 and Town decided not to pursue.

[8] College Park - Pilot project of 16 utility owned lights. City paid for fixtures and install.

[9] Denton - The town of Denton has replaced at least 110 of their HID lights with LED. (via Choptank Electric Coop, 8/26/19)

[10] Easton - As of December 10, 2018, Easton Utilities (EU) completed the upgrade of 115 HPS Streetlights to LED. The cost was $22,425.00 and EU donated the labor valued at $16,940. These lights are town owned. They are not pursuing additional funding for future conversions. (as of 8/19/19.) $45.09/light = $5,185.35 total annual savings. (ShorePower Project Report states Easton converted 420 lights.)

[11] Frederick - They have not received funds for the past two cycles of MEA's Maryland Smart Energy Communities grant funding but continue to upgrade their lights as they have funding and staff resources to do so. They have converted 34 street segments (it's based on circuits, which may split a street) and 3 entire neighborhoods to LED streetlights. They have a CIP dedicated for the upgrades. They own their poles and the lights.

[12] Gaithersburg – As of November 18, 2019, Gaithersburg has installed 35 LED Streetlights with 136 New LED Streetlight installs and 125 planned for a future development. They are working to convert all existing streetlights to LED.

[13] Greenbelt - Currently working on 2 pilot projects with PEPCO: 27 and 17 lights respectively. They started negotiating with PEPCO at the same time as Takoma Park. Currently they do not have the funds to continue the conversion.

[14] Hagerstown - No feasibility study, no pilot project, no conversion. Exploring replacement of HPS options; 150W LED replacement for HPS is cost effective, but not for 250W.

[15] Harford County - No feasibility study has been conducted, but municipality met with vendors at an expo to explore pricing options. Pilot project in Joppatowne, MD; a 14' pole and fixture conversion to LED, 89 have been replaced in 2019. Funds for this project were obtained and will be used each year to reinvest through savings from pendant light conversion to LED which reduced their energy consumption and bill. All leased pendant lights (185±) through BGE have been upgraded to LED. County-owned lights are being converted as funds become available.

[16] Howard County - 7200 county-owned streetlights to convert to LED by 2024; another 2000 BGE-owned lights to convert but BGE is converting on their own; seeking a simple payback of 10 years or less; have funds allocated for the project but feel they can get a better price with a bulk purchase of lights.

[17] Laurel - 100 municipal owned lights converted 5 years ago. BGE is converting 264 - overhead cobra head lights - for $5000, as well as 204 colonial lights for $680 per light; using CIP money for these conversions. All new lights will be LED moving forward. Estimated savings of $3500 per month on utility bill.

[18] Middleton - In 2014 worked with Johnson Controls to purchase 7000 streetlights from PE to convert. The town decided not to move forward with the purchase because working with PE is a challenge. The town updated their standards and all new town-owned lights are LED.

[19] Montgomery County - Montgomery County has completed LED conversion of approximately 10,000 of 26,000 lights in the County. They are slated to complete the conversion of all streetlights in 2020 and are currently ahead of schedule (as of 8/27/19). The streetlights are county-owned, and the project is financed through an energy savings performance contract (EPC).

[20] New Carrollton - Municipality has not completed a feasibility study or pilot project. They are interested in conversion and have done initial investigation into feasibility.

[21] Oakland - Potomac Edison is currently replacing all streetlights in town with LEDs following a feasibility study. There is no fee to Oakland for this conversion.

[22] Ocean City - Used an Energy Performance Contract through ESG to replace all city-owned streetlights, then worked with DPL on a study to replace all DPL-owned streetlights. The city-owned project was completed in 2017 and the DPL retrofit is in progress (as of 8/20/19). City-owned lights were replaced via an Energy Performance Contract. The project was financed via a lease purchase agreement where the annual savings were used to pay for the loan to retrofit to LED and other energy saving projects. Energy Savings were guaranteed by the Energy Performance Contractor. Also received rebates from DPL through the EMPOWER program. For the DPL retrofits, DPL gave the city two options: either replace 5% of the DPL-owned lights each year at no cost. or replace all the lights at once over two years for cost of DPL labor. Based on calculated savings, elected to replace all the lights at once and are using fund balance to pay for the DPL labor. By the end of 2020 100% of their streetlights both city owned (997 lights) and DPL (1,321 lights) owned will be converted to LED.

[23] Poolesville - LED Pilot Project of 50 town-owned streetlights, funded by general revenue (as of 8/27/19).

[24] Riverdale Park - 2016 MSEC Grant funded pilot project of 31 lights. 94 out of 147 town-owned lights have been converted (as of 11/20/19), with 10 more to be completed by end of FY2019. Town Capital Improvement Program budget is funding conversion after pilot project. The remaining lights should be converted in 4 more years (as of 11/12/19).

[25] Rock Hall - Rock Hall completed the replacement of 10 streetlights with LEDs, thanks to an MSEC award (as of 8/26/19).

[26] Rockville – Received an EECB grant around 2013 and converted about 200 lights. About half of these are metered lights so able to see direct benefits right away in the bill. The other 90 or so are located on W. Gude Drive to see a continuous roadway lit with LED. A few others have been converted that were knocked down or inoperable. Interested in converting all streetlights to LED. Struggling with current PEPCO quoted conversion cost of $2000 per light.

[27] Salisbury - FY17 is complete and was to replace 67 (400w to 106w) lights along with associated infrastructure (primarily changing from tariffed service to metered service). FY18 is underway (as of 8/14/19) and is replacing 20 (400w to 106w) lights and 35 (250w to 89w) lights. The city has only been pursuing MEA grants to facilitate conversion projects. The local electric utility Delmarva Performance & Lighting (DP&L) has in the past offered consumer-oriented initiatives to switch to energy efficient equipment.

[28] Somerset has 173 utility-owned streetlights. In April 2010 Somerset was the second municipality in Maryland to participate in a LED streetlight pilot conversion with PEPCO to test LED streetlights. The lights have remained in place with little to no maintenance since installation over 10 years ago. In 2019, Somerset tested 5 different LED fixtures on loan from the manufacturers to determine the best fit for the municipality and convert the remaining lights. Those test lights have since been removed and PEPCO reinstalled the old fixtures. To

date, Somerset residents have expressed their preference among the test fixtures and the town has been working with PEPCO to complete the conversion to LED but due to conversion cost estimates of $2000-2500 per light provided by PEPCO, they have not proceeded.

[29] Takoma Park - Utility retrofit option: minimum wattage, 3000K, dark sky compliant, remotely controlled. Conversion began Dec. 2018 and was completed June 2019. Negotiated a $170 per light EmPOWER rebate through PEPCO with a payback of less than 2 years.

[30] Taneytown - In FY2015 municipality converted 46 streetlights. They have one development (approximately 50 lights) that they took over this past year and another 46 lights on their main street that still need to be converted (as of 8/13/19). They have worked with Philips Hadco, their fixture supplier, on a conversion kit for the main streetlights. All the lights that the City owns have been converted to LED. The City has also revised their specifications manual for street lighting to require all new lights that are installed to be LED. Lights that were converted are owned by the City.

[31] Thurmont - FY2017 Award completed. Municipality converted approximately 200 subdivision lights over to LED and approximately another 50 cobra head fixtures over to LED. All are owned by the Town of Thurmont Municipal Light Company.

[32] University Park – Interested in converting all streetlights. Municipality conducted an inventory field-audit and found more lights than reported by PEPCO.

Appendix C - Virginia LED Conversions

[NOTE: Municipalities that responded to our inquiries but are not currently converting to LED streetlights have been included.]

MEA LED Program	Municipality	Contact Name	Contact Position	Contact E-mail (NOTE: Some addresses appear word-wrapped below due to length)	2018 population (Amer. Fact Finder)	Utility	Number of Lights (Total Project Numbers)	Number of Lights Converted (as of Nov. 2019)	Notes
Yes	Alexandria	Bill Eger	Energy Manager	Bill.Eger@alexandriava.gov	160530	Dominion	10501	100	32
	Arlington County	Santosh Neupane	Project Manager	sneupane@arlingtonva.us	237521	Dominion	7350	6248	33
	Berryville	Keith Dalton	Town Manager	townmanager@berryvilleva.gov	4342	Rappahannock Electric Cooperative	3	3	34
	Blacksburg	Will Lattea	Energy and Environmental Specialist	wlattea@blacksburg.gov	44678	Virginia Tech Electrical Service and AEP	1760	1200	35
	Culpeper	Mike Stover	Director of Light & Power	mstover@culpeperva.gov	18619	Culpeper-Light & Power, Rappahannock Electric Cooperative, Dominion	1200	1200	36
	Danville	Jason Grey	Director of Utilities	greyjc@danvilleva.gov	40693	Danville Utilities	8250	3000	37
	Edinburg	Daniel J Harshman	Town Manager	town@shentel.net	1068	Dominion	100	12	38
Yes	Fairfax	Stefanie Kupka	Sustainability Coordinator	stefanie.kupka@fairfaxva.gov	24574	Dominion	2399	0	39
Yes	Fairfax County	Wayne Kotter	Public Works, Director Utilities Design and Construction Division	Wayne.kotter@fairfaxcounty.gov	1150795	Dominion	56421	133	40
Yes	Falls Church	Zak Bradley	Senior Engineer	zbradley@fallschurchva.gov	14772	Dominion	1259	139	41
	Franklin	Mark Bly	Director Power & Light	mbly@franklinva.com	24574	Franklin Municipal Power and Light	2000	666	42
	Front Royal	Carey Saffelle	Electric Operations Manager	csaffelle@frontroyalva.com	15221	Town of Front Royal Energy Services	2100	1000	43

MEA LED Program	Municipality	Contact Name	Contact Position	Contact E-mail (NOTE: Some addresses appear word-wrapped below due to length)	2018 population (Amer. Fact Finder)	Utility	Number of Lights (Total Project Numbers)	Number of Lights Converted (as of Nov. 2019)	Notes
	Harrisonburg	Zach Nyce	Manager of Engineering	znyce@hbgelec.com	54033	Harrisonburg Electric Commission	400	40	44
	Lawrenceville	Lisa McGee	Executive Director, Southside PDC	lmcgee@southsidepdc.org	1034	Dominion	96	48	45
Yes	Leesburg	Calvin Grow	Transportation Engineer	CGrow@leesburgva.gov	53917	Dominion	2819	0	46
Yes	Loudoun County	Najib Salehi	Energy Manager	Najib.Salehi@loudoun.gov	406850	Dominion, NOVEC	1658	0	47
	Luray	Bryan Chrisman	Assistant Town Manager	bchrisman@townofluray.com	4858	Shenandoah Valley Electric Cooperative	730	5	48
	Manassas	Ben Field, Tony Dawood	Utility Department, Director of Utilities	bfield@ci.manassas.va.us , tdawood@ci.manassas.va.us	41641	City of Manassas Utilities	2300	750	49
	Martinsville	Caitlin Westmore-land	Administrative Assistant to the Electric Director	cwestmoreland@ci.martinsville.va.us	12902	Martinsville Electric Department	3800	3800	50
	Newport News	Randy Cooper	Transportation, Senior Engineering Specialist	rcooper@nnva.gov	178626	Dominion	20000	2500	51
	Radford	Tim Logwood	Director of Electric Utilities	Tim.Logwood@radfordva.gov	18339	City of Radford Electric Department	1500	200	52
	Round Hill	Rob Lohr	Project Manager	rlohr@roundhillva.org	664	Dominion	67	67	53
	South Boston	Lisa McGee	Executive Director, Southside PDC	lmcgee@southsidepdc.org	7659	Dominion	1288	150	54
	Staunton	Tom Sliwoski	Public Works Director	SliwoskiTC@ci.staunton.va.us	24922	Shenandoah Valley Electric Cooperative, Dominion	2168	36	55
	VDOT	Marc Lipschultz	Traffic Engineering Division	marc.lipschultz@vdot.virginia.gov	N/A	N/A	10000	0	56
	Wakefield	Jimmy Stephenson	Maintenance Department	wakefieldtown4@verizon.net	830	Town of Wakefield	100	100	57

MEA LED Program	Municipality	Contact Name	Contact Position	Contact E-mail (NOTE: Some addresses appear word-wrapped below due to length)	2018 population (Amer. Fact Finder)	Utility	Number of Lights (Total Project Numbers)	Number of Lights Converted (as of Nov. 2019)	Notes
	Winchester	Perry Eisenach, Andy Dunn	Public Services Director, Traffic Operations Manager	Perry.Eisenach@winchesterva.gov Andrew.Dunn@winchesterva.gov	28108	Shenandoah Valley Electric Cooperative	2010	1648	59
					Total Number of Lights Converted (as of Nov. 2019): 23,045				

[32] Alexandria - Municipality conducted a 44 streetlight Pilot Project in 2011. Approximately 150 more streetlights will be converted in 3 projects scheduled for 7/1/2019 - 6/30/2020. Municipality is working with Dominion to convert all 10501 lights.

[33] Arlington County - The county is in the process of converting all municipality-owned streetlights to LED. 85% are completed to date.

Reference: https://transportation.arlingtonva.us/streets/street-lights/; https://www.arlnow.com/2019/07/24/arlington-warms-up-to-new-streetlight-standards/

[34] Berryville - Municipality is undertaking a pilot project in conjunction with the electric coop.

Reference: https://www.winchesterstar.com/winchester_star/pilot-project-to-improve-berryville-lighting-ok-d/article_d598a95a-056d-5f7f-a5a9-3fdb026b354b.html

[35] Blacksburg - VA Tech Electric Service is keeping the per light charge the same but is paying for LED lamps. Blacksburg is not changing out the 560 AEP lights at this time because of added expense. The LED tariff is currently 4 times as high as the HPS tariff.

[36] Culpeper - $120,000 in funds allocated in FY2014 – 2018. Additional funds allocated through FY2021 to continue conversion, including replacement of rotting poles where necessary.

[37] Danville - From the RFP for the project: Year one will consist of installation of approximately 3,000 250W HPS equivalent LED luminaires along major thoroughfares on controlled circuits. Subsequent years will consist of 1,000 to 1,250 100W and 150W HPS equivalent LED luminaires individually controlled on secondary streets and in neighborhoods. Conversion of decorative post top luminaires is undetermined at this time but will occur in the latter years of the project. All subsequent years will depend on funding from Danville Utilities' governing bodies. Expected completion 10/31/19.

[38] Edinburg - Municipality has over 100 historic style streetlights. They are changing to LED as ballasts fail. 12 have been changed (as of 8/14/19). All new fixtures are required to be ordered as LED. Historic style streetlights in all new developments must be LED. 16 lights to be installed in Edinburg Sq. Subdivision (as of 8/14/19).

[39] Fairfax – Working to convert all streetlights to LED. Has the funds allocated for the streetlight conversion through Dominion but is working on the phasing in terms of the most beneficial location to begin the conversion.

[40] Fairfax County – County has submitted work orders to Dominion for 5000 lights since 4/2019. As of 10/30/2019 Dominion had converted 133. As of 8/6/2020, Dominion has converted almost 8000 streetlights to LED as evidence of their increased field capacity.

[41] Falls Church - Municipality has converted at least 139 municipal owned lights.

[42] Franklin - No feasibility study because the town feels it's a no brainer to pursue LED conversion. They installed various manufacturers' samples and chose what they liked best. Lighting is utility owned. Financed through Power and Light Fund with some assistance from Public Works. They have converted approximately 1/3 of 2000 fixtures.

[43] Front Royal - No feasibility study conducted. Approximately 1000 utility owned lights have been converted. As lights fail they will be replaced with LED fixtures. Financing built into the Annual Budget Cycle. A guesstimate of 15% of 2100 total streetlights in town have been converted.

[44] Harrisonburg - Municipality is converting to more efficient HPS (as of 2018). They have not conducted a formal feasibility study. They have conducted a pilot project, comparing 200W HPS to equivalent LED fixtures. The pilot project consisted of 30 total fixtures, 6 fixtures from 5 different manufacturers. The fixtures are utility owned and the project was financed via budgeted funds. The municipality has started their full conversion and have converted approximately 40 lights out of approximately 400 total (as of 10/4/19). These lights are utility owned and were financed via budgeted funds.

[45] Lawrenceville - 48 of 96 municipality owned lights were converted to LED (as of 10/2/19). None of the utility owned lights have been converted. Their last sidewalk project utilized LED lights that are town owned. All new streetlights in town are required to be LED.

[46] Leesburg - Municipality is converting streetlights to LED as funds allow.

[47] Loudoun County – Currently assessing complete LED streetlight conversion with Dominion.

[48] Luray - They have asked SVEC to install a few utility owned LEDs to evaluate the differences. A full conversion is scheduled for Fall 2019. The municipality will pay an increased amount for the conversion but will save money on monthly electric bills.

[49] Manassas - From the solicitation: The City of Manassas is seeking bids from qualified bidders for an estimated annual quantity ranging from 400 to 750 LED fixtures as specified below during the City's five-year transition program from approximately 2,300 High Pressure Sodium (HPS) street lights to LED street lights, including additional quantities for annual inventory stock.

[50] Martinsville - Municipality completed a feasibility study as well as a utility-owned pilot project. 100% of 3800 total streetlights have been converted to LED. Financed via a performance contract with vendor.

[51] Newport News - LED is the standard for new lights and is the standard replacement when lights fail. 20,000 Dominion-owned lights to be converted over the next 5 years using CIP funds. In the first year of project and 800-1000 lights have been converted. Newport News is concerned about Dominion's capacity to convert lights in a timely fashion. 1500 municipal-owned lights have been replaced using stimulus money.

[52] Radford - The municipality has not conducted a feasibility study or a pilot project. Some initial evaluation has been done on several manufacturers. Existing cobra head roadway lights are being converted to LEDs on major roadways. Some residential public lights are being replaced with LED fixtures. 200 lights installed. Budgeted and paid for by electric rate payers. No state money has been allocated for these projects. The conversion will continue over the next few years, replacing lights as needed.

[53] Round Hill - Municipality is converting all their streetlights to LED fixtures via a 2-phase program following a 3 light pilot project. Phase 1 was completed on 8/15/19. Phase 2 will be completed 11/1/19. Total project cost was less than $10,000 with Dominion Power's LED Program. Cost was financed via town council under CIP program. First community in VA to have all LED Lights. The lights are utility owned.

[54] South Boston - Municipality converted town-owned downtown streetlights to LED and found a 40% savings. According to Dominion, in November 2019 the Town met with Dominion to discuss a conversion strategy for the remaining 1138 streetlights to LED. As of 8/6/2020, the Town has not initiated any conversion work requests.

[55] Staunton - The Staunton Downtown Development Association raised $25,000 to convert 36 lights to LED in the downtown corridor as part of the Bright Lights Project. The town donated time to help select and order the appropriate lights.

Reference: https://augustafreepress.com/staunton-downtown-development-association-celebrates-completion-of-bright-lights-project/

[56] VDOT - ~10,000 lights to be converted in Fredericksburg, Richmond, Hampton Roads, and Northern Virginia Districts on highways and interchanges, park and rides, and rest areas at weigh stations. Savings estimated at $4.1 million over 15 years. Any new lighting across the state will be LED. VDOT maintains around 20,000 lights. Contract with Trane Inc. Conversion to begin in 2020.

References: https://wtop.com/dc-transit/2019/07/virginia-to-implement-streetlight-changes-introduce-warm-leds/

https://wamu.org/story/19/07/16/virginia-set-to-switch-interstate-streetlights-to-cost-saving-leds/

[57] Wakefield - Municipality is converting streetlights as they fail. Approximately 100 out of 300-400 total lights in town have been converted (as of 10/8/19).

[58] Washington, DC - LED conversion project in design phase (as of 7/15/2019). This will be a public and private partnership. The private contractor will maintain the lights.

References: https://thedcline.org/2018/12/18/dc-aims-to-finalize-public-private-partnership-for-led-streetlights-by-late-2019/

https://wamu.org/story/18/12/12/the-changing-glow-of-d-c-as-streetlights-make-the-switch-to-leds/

[59] Winchester - Municipality maintains approximately 10% of the 2010 total streetlights in the city. These city-owned lights have been converted to LED. The remaining 90% of the streetlights are maintained by Shenandoah Valley Electric. They have already converted approximately 80% of the lights to LED and they expect to have the remaining lights converted within the next two years.