

**Michael Shafer**  
Senior Counsel

**PPL**  
Two North Ninth Street  
Allentown, PA 18101-1179  
Tel. 610.774.2599  
Fax 610.774.4102  
[MJShafer@pplweb.com](mailto:MJShafer@pplweb.com)



**E-File**

August 30, 2019

Rosemary Chiavetta, Secretary  
Pennsylvania Public Utility Commission  
Commonwealth Keystone Building  
400 North Street  
Harrisburg, Pennsylvania 17120

**RE: Petition of PPL Electric for Approval of its Smart Meter Technology  
Procurement and Installation Plan  
Docket No. M-2014-2430781**

Dear Ms. Chiavetta:

Enclosed for filing on behalf of PPL Electric Utilities Corporation (“PPL Electric”) is PPL Electric’s Annual Smart Meter Progress Report. This report is being filed pursuant to the Implementation Order issued on June 24, 2019 at Docket No. M-2009-2092655.

Pursuant to 52 Pa. Code § 1.11, the enclosed document is to be deemed filed on August 30, 2019, which is the date it was filed electronically using the Commission’s E-Filing System.

If you have any questions regarding the enclosed report, please call me at (610) 774-2599 or Philip S. Walnock, Director – CS Project Management for PPL Electric at (610) 774-3228.

Very truly yours,

Michael Shafer

Enclosures

cc: Lori Burger  
Daniel Searfoorce  
Certificate of Service

**PPL Electric Utilities Corporation**  
**2019 Annual Progress Report**  
**Smart Meter Implementation Plan**  
**(Results to July 31<sup>st</sup>, 2019)**  
**Docket No. M-2014-2430781**

**August 31, 2019**

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## Introduction

On September 3, 2015, the Pennsylvania Public Utility Commission (Commission) approved PPL Electric Utilities Corporation's (PPL Electric or Company) Smart Meter Implementation Plan (SMIP) at Docket No. M-2014-2430781. Pursuant to the Implementation Order entered by the Commission on June 24, 2009, at Docket No. M-2009-2092655, PPL Electric submits this smart meter progress report for the third period, August 1, 2018 to July 31, 2019 (current reporting period).

To date, the program is on target with planned functionality schedule, meter installs, and projected cost.

PPL Electric oversees a team of program vendors to assist with the planning and implementation of all aspects of the program. Black & Veatch's role on the project is to provide PPL Electric with program management services and system integration services. Black & Veatch replaced IBM in August 2017.

The Company's technology supplier and meter vendor is Landis + Gyr. They are providing the radio frequency network, Automated Metering Infrastructure (AMI) head end, meter data management system (MDMS), meters and installation services. They are supported by Grid One and Riggs-Distler for network installation, meter installation and meter base repairs. Tesco Services performs quality auditing of work performed.

GE Digital is providing Mix Director, the primary software system that the Company will use to monitor the AMI network during deployment and in future operations.

Watt-hour Engineering Company (WECO) is providing the new meter asset management (MAM) system and test boards that is used to test and track meters and network devices.



**Black & Veatch** is providing project management and end-to-end systems integration services.



**Landis + Gyr (L+G)** is our vendor for the AMI network devices, AMI meters, meter and network deployment, AMI Head End system and Meter Data Management System (MDMS).



**GE Digital** is providing **Mix Director**, the primary system that Advanced Metering Operations (AMO) will use to monitor the AMI network.



**WECO** is providing the new **Meter Asset Management (MAM)** system and test boards that will be used to test and track meters and network devices.



**Grid One**, an authorized sub-contractor of L+G, is installing the AMI RF meters, performing the meter inspection activities, and hosting a call center.



**Riggs Distler**, an authorized sub-contractor of L+G, is completing meter base repairs and installing high-end meters.



**Tesco**, an authorized sub-contractor of L+G, is auditing the AMI RF meter installs.

## Program Scope

PPL Electric's Smart Meter Implementation Plan (SMIP) is designed to meet the Act 129 requirements by first deploying the systems and infrastructure required to enable the new AMI technology. This will be followed by the deployment of radio frequency (RF) meters replacing PPL Electric's existing 1.4 million power line carrier (PLC) meters over a four-year period.

The following items will either be impacted or deployed as part of the program:

- **Customer Web Portal** – The portal was updated to display the customer's interval usage
- **Electric Meters** – Use two-way communication to collect electricity usage and related information from customers and to deliver information to customers
- **Local Area Network (LAN) Collectors and Routers** – Devices used to relay and collect meter data from all meters in a local area and transmit to the head end through a wide area network
- **Wide Area Network (WAN) Fiber and Cellular Backhaul** – Communications infrastructure responsible for transmitting the meter data to the head end
- **AMI Head End** – Systems that receive the stream of meter data from the field making the data available for other systems
- **Meter Data Management System (MDMS)** – System that collects and stores meter data from the head end system and processes that data into information that can be used by other applications including network operations, customer information system, analytics and asset management
- **Meter Asset Management Tool** – Tool used to store the meter and network components information and manages the life cycle of the asset
- **Mix Director** – Tool used to track and perform analysis and analytics on meter and network information, along with deployment and operations
- **Home Area Network (HAN) Devices** - Customer-owned devices that connect via Zigbee to the meter and display energy usage information

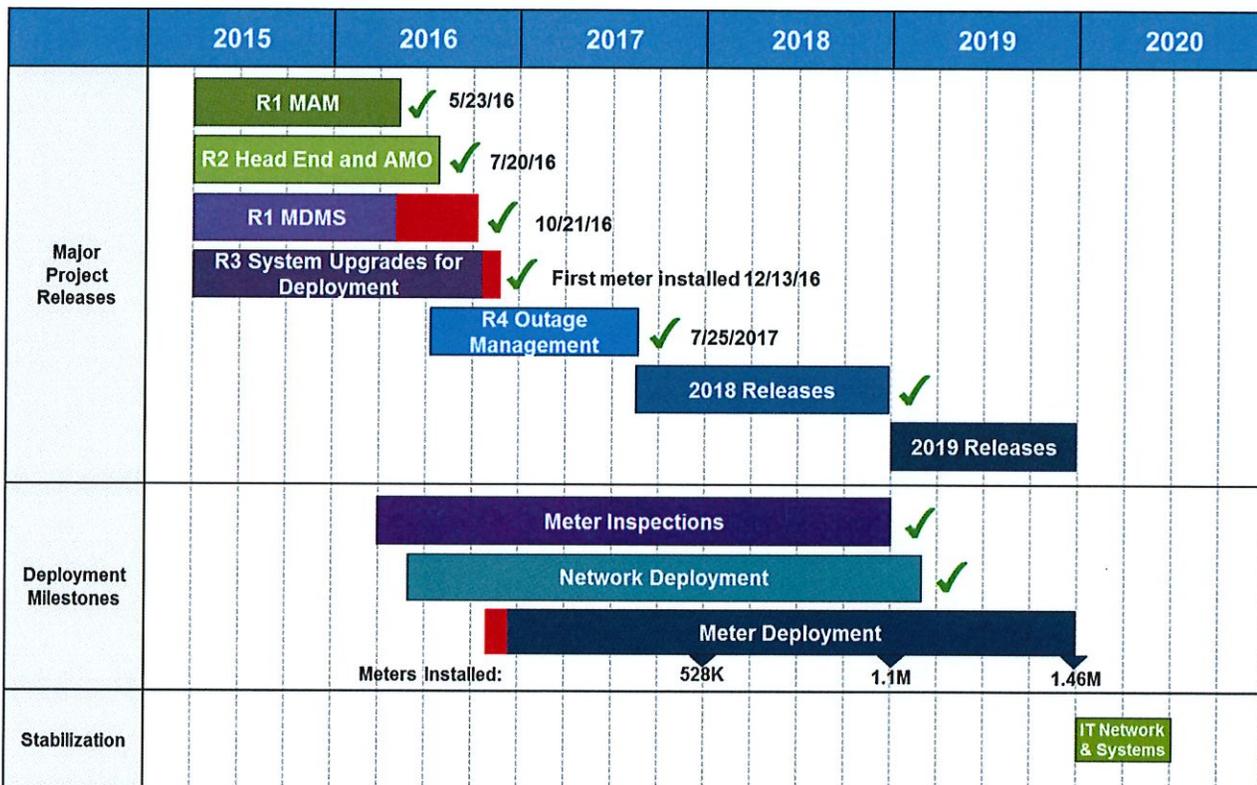
## Project Schedule

The Smart Meter Implementation Plan can be broken down into three areas: major project releases, deployment, and stabilization.

The information technology release schedule below covers the initial deployment of the systems followed by releases of additional capabilities. Releases 1 through 3, completed in 2016, were foundational to enable functionality for the deployment of the RF meters. Subsequent releases enable advanced capabilities.

The deployment milestones schedule below provides a breakdown of deployment activities, including meter inspections, network deployment, and meter deployment. More information on deployment can be found in the *Deployment* section of this report.

Stabilization will take place during the first half of 2020. During this time, management of IT network and systems will be transitioned to steady-state operations management to support the close of the project.



The following is an overview of major project releases that have been or are being deployed to support PPL's SMIP.

2017 Releases	2018 Releases	2019 Releases	2020 Releases
<p><i>Support for functionality to enable the deployment of the radio frequency (RF) meters</i></p> <ul style="list-style-type: none"> <li>▪ Remote Connect / Remote Disconnect</li> <li>▪ Last Gasp Alerts in Outage Management System (OMS)</li> <li>▪ Meter Measurements and Alerts to Distribution Management System (DMS)</li> </ul>	<p><i>Support for a subset of enhanced RF functionality and operational efficiencies</i></p> <ul style="list-style-type: none"> <li>▪ AMI to OMS – Restoration (Power Up) messages for restored customers and Customer Service IVR ping capability</li> <li>▪ Command Center 7.1 MR3 – Production Upgrade</li> <li>▪ Home Area Network (HAN) Pilot</li> <li>▪ Priority Meter Alerts to Automated Filed Ticket Creation</li> <li>▪ Inventory Badge Scanning</li> <li>▪ Added Service Delivery Point (SDP) to Electric Facilities Database (EFD)</li> <li>▪ Enhance Analytics Mix Director Work Bench</li> </ul>	<p><i>Support for a subset of enhanced RF functionality and operational efficiencies</i></p> <p><b>Delivered</b></p> <ul style="list-style-type: none"> <li>▪ Network Model Validator – Identifying meter to transformer mismatches (AMI to OMS improvements)</li> <li>▪ Mix Director Upgrade</li> <li>▪ Polyphase Meter Diagnostic Notifications</li> <li>▪ MDMS Enhancements <ul style="list-style-type: none"> <li>- Estimates to CSS for Billing</li> </ul> </li> <li>▪ Nominal Voltage</li> <li>▪ Command Center 7.3 MR2 – Production Upgrade</li> <li>▪ Meter Asset Management updates to support Return Merchandise Authorization (RMA) process and improved inventory tracking</li> </ul> <p><b>In Progress</b></p> <ul style="list-style-type: none"> <li>▪ Home Area Network Program</li> <li>▪ Begin transition of RF Network Management to PPL</li> </ul>	<p><i>Support for a subset of enhanced RF functionality and operational efficiencies</i></p> <ul style="list-style-type: none"> <li>▪ Systems Stabilization</li> <li>▪ RF Network Management transition to PPL</li> <li>▪ Production Defect Releases</li> </ul>

## Deployment

The Company's deployment plan continues to be executed in accordance with the SMIP. The full-scale deployment of RF meters began in December 2016 and full deployment is scheduled to be completed end of 2019.

Deployment was broken into three distinct phases:

- Meter inspections, or pre-sweeps, are performed to identify issues or barriers to be resolved prior to physical meter deployment. An example is the identification of meter bases that need repair or replacement for a successful meter exchange.
- Network deployment is the build-out of the AMI network infrastructure of collectors and routers to transmit data and information from the meter to the AMI head-end system.
- Meter deployment is the physical replacement of the Company's existing PLC meters to new RF meters.

The three deployment phases occurred on a regional basis sequentially through PPL Electric's six major operating regions: Harrisburg; Lancaster; Lehigh; Northeast; Central; and Susquehanna.

## Meter Inspections

PPL Electric preceded physical meter deployment with a meter inspection phase. This work began in October 2015 and occurred approximately six to eight months prior to meter installations in a given region. Meter inspections concluded in December 2018 with a total of 1.39 million inspections completed across PPL Electric's service territory.

These inspections identified any Rules for Electric Meter Service Installation (REMSI) violations; REMSIs are the Company's standards for meter installations. As stated earlier, PPL Electric was also able to anticipate meter base repairs that will be required for the safe and efficient installation of an RF meter.

## Network Deployment

Deployment of the radio frequency network preceded meter installation by approximately five months. Planned RF network build out was completed in January 2019. After the initial deployment of the network components, additional work remains to optimize the network and provide support for maximum effectiveness. RF network optimization will continue through stabilization.

Collectors are installed to form the backbone of the radio frequency network. These collectors are the "take out points" for all network data and they communicate back to the AMI Head End via cellular communications or optical fiber. As of July 31, 2019, 243 collectors have been installed.

Routers will support collectors as a part of the RF Network. Routers are radio frequency devices that intercede between meters and other routers to ensure a fully formed radio mesh network allowing for a variety of communication paths from meter to collector. As of July 31, 2019, 5,083 routers have been installed.

## Meter Deployment

RF meter exchanges began in the Harrisburg region in December 2016, the Lancaster region in July 2017, the Lehigh region in November 2017, the Northeast Region in May 2018, the Central Region in Oct 2018, and the Susquehanna Region in March 2019.

As of July 31, 2019, 1,455,052 RF meter exchanges have been completed. Mass meter deployment is complete in the Harrisburg, Lancaster, Lehigh, Northeast, and Central regions with more than 99.8% of meters exchanged. The Susquehanna region is 99.32% complete. with approximately 1,700 RF meter installations remaining. Mass deployment for the Susquehanna region is targeted for completion in September 2019.

Deployment efforts will continue through 2019 year-end to exchange meters that were not completed through mass deployment efforts.

(as of 7/31/2019)



Region	Pre-Sweep Inspections	Network Installations	Mass Meter Deployment	PPL UTC Clean Up
1. Harrisburg	Complete	Complete	Complete	99.99%
2. Lancaster	Complete	Complete	Complete	99.98%
3. Lehigh	Complete	Complete	Complete	99.98%
4. Northeast	Complete	Complete	Complete	99.94%
5. Central	Complete	Complete	Complete	99.82%
6. Susquehanna	Complete	Complete	99.32%	Start Sep 2019

## Meter Base Repairs

**PPL Electric is repairing meter bases in instances where the meter base conditions are not conducive to a safe meter exchange. Approximately 10,300 meter base repairs have been completed since project inception. Repairs are being conducted at a rate of 0.7% on premises where meters have been installed. Approximately 20 additional repairs are expected to facilitate the 1,700 remaining meter exchanges. Progress on the End-to-End Solution**

PPL Electric has delivered strong meter reading performance with its legacy PLC based AMI system. Meter read performance of the new RF based system is also performing at a very high level, exceeding the industry standard read rate of 99.5%.

Metric	2017 Total	2018 Total	2019 Total*
Interval	99.89%	99.82%	99.85%
Billing Register	99.90%	99.79%	99.85%

\* 2019 Results through July 31, 2019

## Customer Interaction

Consistent with the approved communication plan, all customers are notified of pending meter replacements in several separate contact attempts. Each customer receives a letter six weeks and three weeks prior to the meter exchange. Customers also receive an automated phone call the day before their planned meter exchange. On the day of the installation, the installer knocks on the customer's door prior to the meter exchange. A door hanger is left at the premise to conclude the visit.

PPL Electric has additional online resources for customers who want more information about the program:

- [www.pplelectric.com/newmeters](http://www.pplelectric.com/newmeters)
- Meter inspection information: <https://www.pplelectric.com/at-your-service/investing-in-your-service/new-electric-meters/meter-verification.aspx>

PPL Electric also has a tri-fold brochure that is available through our employees and contractors when a customer requests mailed information.

To date, the PPL Electric SMIP program team has received 3,008 customer inquiries regarding the program out of 1,455,052 installations, or for 0.21% of the installations. The primary topics of these inquiries include:

- Questions regarding field work to be performed or completed
- Questions about scheduling an appointment for a meter exchange
- Statements regarding not wanting a new meter due to health and/or privacy concerns

## Remote Connect / Remote Disconnect

Remotely connecting or disconnecting service (RCRD) went live on April 1, 2017. The matrix below outlines transaction success rate by process and overall.

### RCRD Performance

		2017 Total	2018 Total	2019 Total *	Project To Date
Cut-Ins	Total Cut-Ins Attempts	8,833	33,798	20,362	62,993
	Total # of Successful Cut-Ins	8,618	33,473	20,297	62,388
	<b>% Successful Cut-Ins</b>	<b>97.6%</b>	<b>99.0%</b>	<b>99.7%</b>	<b>99.0%</b>
Cut-Outs	Total Cut-Outs Attempts	11,222	43,809	28,737	83,768
	Total # of Successful Cut-Outs	11,013	43,239	28,653	82,905
	<b>% Successful Cut-Outs</b>	<b>98.1%</b>	<b>98.7%</b>	<b>99.7%</b>	<b>99.0%</b>
Move-In	Total Move-In Attempts	10,475	48,725	33,621	92,821
	Total # of Successful Move-Ins	10,370	48,513	33,540	92,423
	<b>% Successful Move-Ins</b>	<b>99.0%</b>	<b>99.6%</b>	<b>99.8%</b>	<b>99.6%</b>
Move-Out	Total Move-Out Attempts	8,312	38,355	26,186	72,853
	Total # of Successful Move-Outs	7,990	37,710	26,128	71,828
	<b>% Successful Move-Outs</b>	<b>96.1%</b>	<b>98.3%</b>	<b>99.8%</b>	<b>98.6%</b>
Total	<b>Total Transactions</b>	<b>38,842</b>	<b>164,687</b>	<b>108,906</b>	<b>312,435</b>
	<b>Total Successful Transactions</b>	<b>37,991</b>	<b>162,935</b>	<b>108,618</b>	<b>309,544</b>
	<b>% Successful Total Transactions</b>	<b>97.8%</b>	<b>98.9%</b>	<b>99.7%</b>	<b>99.1%</b>

\* 2019 Results through July 31, 2019

## Financial Analysis / Cost Recovery

The financial analysis below shows actual costs per year and split between capital and operational and maintenance costs. This view shows the actual costs since project inception along with future cost projections.

<b>Actual Spend</b>	<b>Capital</b>	<b>Expense</b>	<b>Total</b>
12/31/2015	\$ 24,896,798	\$ 2,535,621	\$ 27,432,419
12/31/2016	\$ 70,874,632	\$ 2,426,326	\$ 73,300,958
12/31/2017	\$ 133,869,041	\$ 8,149,909	\$ 142,018,950
12/31/2018	\$ 118,216,208	\$ 8,346,431	\$ 126,562,639
7/31/2019	\$ 42,854,181	\$ 3,958,900	\$ 46,813,081
Total Project to Date	\$ 390,710,860	\$ 25,417,187	\$ 416,128,047
<b>Projected Spend</b>			
8/1/19-12/31/19	\$ 29,093,576	\$ 3,169,201	\$ 32,262,777
12/31/2020	\$ 20,172,227	\$ 2,352,100	\$ 22,524,327
Total Projected	\$ 49,265,803	\$ 5,521,301	\$ 54,787,104
Total Actual + Projected	\$ 439,976,663	\$ 30,938,488	\$ 470,915,151

## **Look Ahead**

With meter installations completed for 99.88% of the Company's customers, PPL Electric is preparing for deployment wrap up and stabilization. The Company anticipates that mass RF meter deployment will be completed in September 2019 with wrap up activities ending in December 2019 followed by network and systems stabilization through the summer of 2020.

## **Conclusion**

In summary, PPL Electric is following its approved SMIP without the need for any material modifications. The number of RF meters installed to date, along with the scope, schedule, and cost of the program, is in direct alignment with its plan.

## CERTIFICATE OF SERVICE

(Docket No. M-2009-2123945 and M-2014-2430781)

I hereby certify that a true and correct copy of the foregoing has been served upon the following persons, in the manner indicated, in accordance with the requirements of § 1.54 (relating to service by a participant).

### VIA FIRST CLASS MAIL

Christy M. Appleby, Esquire  
Hobart J. Webster, Esquire  
Office of Consumer Advocate  
555 Walnut Street  
Forum Place, 5th Floor  
Harrisburg, PA 17101-1923

Steven C. Gray, Esquire  
Office of Small Business Advocate  
Commerce Building  
300 North Second Street, Suite 202  
Harrisburg, PA 17101

Pamela C. Polacek, Esquire  
Adeolu A. Bakare, Esquire  
McNees, Wallace & Nurick  
100 Pine Street  
PO Box 1166  
Harrisburg, PA 17108-1166  
*Counsel for PPLICA*

Harry S. Geller, Esquire  
Elizabeth R. Marx, Esquire  
PA Utility Law Project  
118 Locust Street  
Harrisburg, PA 17101-1414  
*Counsel for CAUSE-PA*

Scott J. Rubin, Esquire  
Public Utility Consulting  
333 Oak Lane  
Bloomsburg, PA 17815  
*Counsel for International Brotherhood  
Of Electrical Workers, Local 1600*

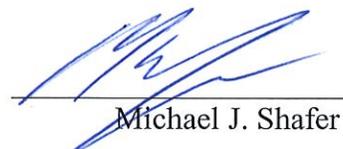
Thomas S. Catlin  
Christina R. Mudd  
Exeter Associates, Inc.  
10480 Little Patuxent Parkway  
Suite 300  
Columbia, MD 21044  
*Consultant for Office of Consumer Advocate*

Nancy Brockway  
10 Allen Street  
Boston, MA 02131  
*Consultant for Office of Consumer Advocate*

Robert D. Knecht  
Industrial Economics Incorporated  
2067 Massachusetts Avenue  
Cambridge, MA 02140  
*Consultant for Office of Small Business  
Advocate*

Robert A. Reiley, Esquire  
Department of Environmental Protection  
400 Market Street – 9<sup>th</sup> Floor  
Harrisburg, PA 17105  
*Counsel for Department of Environmental  
Protection*

Date: August 30, 2019



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Michael J. Shafer