

**BEFORE THE  
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

Petition of PPL Electric Utilities Corporation :  
for Approval of Tariff Modifications and :  
Waivers of Regulations Necessary to : Docket No. P-2019-3010128  
Implement its Distributed Energy Resources :  
Management Plan :

**REJOINDER TESTIMONY OF  
KAREN MIU, PhD**

**PPL Electric Statement No. 3-RJ**

**August 26, 2020**

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Dr. Karen Miu, and my business address is Drexel University, 3141 Chestnut  
3 Street, Philadelphia, Pennsylvania 19104.<sup>1</sup>

4

5 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

6 A. I am a Professor of Electrical and Computer Engineering at Drexel University. In my  
7 position, I conduct extensive research in the areas on the planning and operation of electric  
8 distribution systems, including the impact of distributed energy resources (“DERs”) on  
9 those distribution systems.

10

11 **Q. HAVE YOU PREVIOUSLY SUBMITTED TESTIMONY IN THIS PROCEEDING?**

12 A. Yes. My direct testimony is set forth in PPL Electric Statement No. 3.

13

14 **Q. WHAT IS THE PURPOSE OF YOUR REJOINDER TESTIMONY?**

15 A. I will respond to some allegations made in NRDC Statement No. 1-SR, the Surrebuttal  
16 Testimony of Harry Warren submitted on behalf of the Natural Resources Defense Council  
17 (“NRDC”).

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19 **Q. ARE YOU SPONSORING ANY EXHIBITS WITH YOUR REJOINDER**  
20 **TESTIMONY?**

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<sup>1</sup> I am testifying in my personal capacity, not in my capacity as a Professor of Drexel University. My views and opinions set forth in this testimony are my own and should not be taken as reflecting the position of Drexel University.

1 A. Yes. Attached to my rejoinder testimony is HIGHLY CONFIDENTIAL PPL Electric  
2 Exhibit KM-1RJ, which summarizes studies that my team at Drexel University performed  
3 on PPL Electric’s select distribution circuits, using comparison of power flow results with  
4 and without DERs.

5  
6 **I. NRDC STATEMENT NO. 1-SR – SURREBUTTAL TESTIMONY OF HARRY**  
7 **WARREN**

8 **Q. NRDC WITNESS WARREN MAKES A PILOT PROGRAM**  
9 **RECOMMENDATION FOR THREE PRIMARY REASONS, ONE OF WHICH IS**  
10 **THAT REMOTE MANAGEMENT IS “NOT NECESSARY TO ASSURE THE**  
11 **SAFE AND RELIABLE OPERATION OF THE DISTRIBUTION SYSTEM OR**  
12 **THE BULK POWER SYSTEM”;** HOWEVER, IF PPL ELECTRIC UTILITIES  
13 **CORPORATION (“PPL ELECTRIC” OR THE “COMPANY”) WANTS TO DO**  
14 **THAT, IT “SHOULD DEMONSTRATE THAT INCREMENTAL ADVANTAGES**  
15 **WARRANT INCREMENTAL COSTS.” (NRDC STATEMENT NO. 1-SR, P. 4.)**  
16 **DO YOU AGREE WITH MR. WARREN?**

17 A. No. My team at Drexel University performed studies on PPL Electric’s select distribution  
18 circuits, using comparison of power flow results with and without DERs. These studies  
19 show that voltage impacts from the addition of new DERS, such as overvoltage, can occur  
20 in locations not within close vicinity of the DERs and that these issues cannot be addressed  
21 by autonomous Volt/VAR settings at the DERs. In addition, the studies have shown that  
22 the overvoltage issues cannot be addressed solely by existing, installed Volt/VAR control  
23 devices within the system. We also performed studies on the impact of Power Factor

1 (“PF”) inverter settings of the DERs to show how minor adjustment of PF from a  
2 centralized system, such as a Distributed Energy Resource Management System  
3 (“DERMS”), can mitigate the overvoltage and help prevent another part of the distribution  
4 system from being negatively impacted by such issues. The simulation demonstrated that  
5 the system is interconnected and coupled, and a centralized system that makes management  
6 decisions based on whole circuit data is needed versus an automated setting based on solely  
7 localized data from a prior point in time. Similar to how PPL Electric needs and has remote  
8 management capability of the capacitors and voltage regulators, it is clear from the studies  
9 that the Company must be able to remotely manage all voltage regulating assets, including  
10 smart inverters, in a coordinated way. Even though the studies were provided to PPL  
11 Electric in raw power flow data format, I have prepared a summary of those studies, which  
12 is attached as HIGHLY CONFIDENTIAL PPL Electric Exhibit KM-1RJ. In summary,  
13 PPL Electric is experiencing, and will continue to experience, issues on its distribution  
14 system stemming from existing and new DERs that cannot be addressed through  
15 autonomous settings on the smart inverters. The studies showed that coordinated control  
16 of inverters is necessary to address safety issues such as overvoltage. Thus, no need exists  
17 for a pilot program to further test and evaluate whether the Company should be permitted  
18 to remotely manage the grid support functions on the DERs’ smart inverters.

19  
20 **Q. DOES THIS CONCLUDE YOUR REJOINDER TESTIMONY AT THIS TIME?**

21 **A.** Yes, although I reserve the right to supplement my rejoinder testimony.