

**BEFORE THE  
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

|   |   |                       |
|---|---|-----------------------|
| <b>Pennsylvania Public Utility Commission</b> | : |                       |
|   | : | <b>R-2016-2537349</b> |
| <b>v.</b>                                     | : |                       |
|   | : |                       |
| <b>Metropolitan Edison Company</b>            | : |                       |

**ENVIRONMENTAL DEFENSE FUND &  
CITIZENS FOR PENNSYLVANIA'S FUTURE**

**DIRECT TESTIMONY OF PAUL ALVAREZ**

**DATE: JULY 21, 2016**

I INTRODUCTION

1  
2  
3 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

4 A. My name is Paul Alvarez. My business address is PO Box 150963, Lakewood, CO  
5 80215.

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

7 A. I am the President of the Wired Group, a consultancy specializing in the optimization of  
8 distribution utility businesses and operations as they relate to grid modernization, demand  
9 response, energy efficiency, and renewable generation.

10 **Q. ON WHOSE BEHALF ARE YOU SUBMITTING TESTIMONY?**

11 A. I am testifying on behalf of the Environmental Defense Fund (EDF).

12 **Q. PLEASE DESCRIBE YOUR WORK EXPERIENCE AND EDUCATIONAL  
13 BACKGROUND.**

14 A. My career began in 1984 in a series of finance and marketing roles of progressive  
15 responsibility for large corporations, including Motorola's Communications Division  
16 (now Android/Google), Baxter Healthcare, Searle Pharmaceuticals (now owned by  
17 Pfizer), and Option Care (now owned by Walgreens). My combined aptitude for finance  
18 and marketing were well suited for innovation and product development, leading to my  
19 first job in the utility industry in 2001 with Xcel Energy, one of the largest investor-  
20 owned utilities in the U.S. At Xcel Energy I served as product development manager,  
21 overseeing the development of new energy efficiency and demand response programs for  
22 residential, commercial, and industrial customers, as well as programs in support of  
23 voluntary renewable energy purchases and renewable portfolio standard compliance  
24 (including distributed solar incentive program design). As product development manager

1 I learned the economics of traditional monopoly ratemaking and associated utility  
2 economic incentives, as well as the impact of self-generation, energy efficiency, and  
3 demand response on utility shareholders and management decisions. I also learned a  
4 great deal about utility program impact measurement and verification (M & V).

5 I left Xcel Energy to lead the utility practice for boutique sustainability consulting  
6 firm MetaVu in 2008, where I utilized my M & V experience to lead two comprehensive,  
7 unbiased evaluations of smart grid deployment performance. To my knowledge these are  
8 the only two comprehensive, unbiased evaluations of smart grid deployment performance  
9 completed to date. The results of both were part of regulatory proceedings in the public  
10 domain and include an evaluation of the SmartGridCity™ deployment in Boulder,  
11 Colorado for Xcel Energy in 2010, and an evaluation of Duke Energy's Cincinnati  
12 deployment for the Ohio Public Utilities Commission in 2011.

13 In 2012 I started the Wired Group to focus exclusively on distribution utility  
14 businesses and operations as they relate to grid modernization, demand response, energy  
15 efficiency, and renewable generation. Wired Group clients include utilities, regulators,  
16 consumer and environmental advocates, and industry associations. In addition I serve as  
17 an adjunct professor at the University of Colorado's Global Energy Management  
18 Program, where I teach an elective graduate course on electric technologies, markets, and  
19 policy. I have also taught at Michigan State University's Institute for Public Utilities,  
20 where I educated new regulators and staff on grid modernization and distribution utility  
21 performance measurement.

1           Finally, I am the author of Smart Grid Hype & Reality: A Systems Approach to  
2 Maximizing Customer Return on Utility Investment, a book that helps laypersons  
3 understand smart grid capabilities, optimum designs, and post-deployment performance  
4 optimization. I received an undergraduate degree in Finance from Indiana University's  
5 Kelley School of Business in 1983, and a master's degree in Management from the  
6 Kellogg School at Northwestern University in 1991. My Curriculum Vitae is attached as  
7 Appendix A to this testimony.

8 **Q.   WHAT IS YOUR EXPERIENCE TESTIFYING BEFORE STATE UTILITY**  
9 **REGULATORY COMMISSIONS?**

10 A.   I have testified before state utility regulatory commissions on the issues of grid  
11 modernization, demand response, energy efficiency, and renewable generation in  
12 California, Colorado, Kansas, Kentucky, Maryland, and Ohio.

13 **Q.   WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?**

14 A.   The purpose of my testimony is to make recommendations relating to grid modernization  
15 for the Company's distribution rate case. Specifically, I recommend actions related to 1)  
16 integrated Volt/VAR control and 2) integrated resource planning.

17                           **II.   INTEGRATED VOLT/VAR CONTROL**

18 **Q.   PLEASE EXPLAIN WHAT INTEGRATED VOLT/VAR CONTROL ("IVVC") IS.**

19 A.   IVVC involves the management of various electric distribution system assets and  
20 advanced control technologies to "right-size" the voltage delivered to end-use electric  
21 customers. IVVC can be used to reduce overall voltage levels, while ensuring these  
22 voltages remain within acceptable standards for electric distribution. Reductions in  
23 distribution system voltage have been demonstrated to result in reductions in energy

1 consumption across the electric circuits on which these are applied. For example, a  
2 September 2014 report published by the U.S. Department of Energy (“U.S. DOE”) on  
3 Duke Energy’s smart grid investments entitled “Integrated Smart Grid Provides Wide  
4 Range of Benefits in Ohio and the Carolinas” found that it consistently achieved “2%  
5 voltage reduction” on over 200 Ohio distribution circuits where IVVC was deployed,  
6 “reducing system losses and fuel costs for Duke’s power generation.” Electric customers  
7 across circuits with active IVVC management and lower voltage levels, typically  
8 consume less energy without needing to make changes to their individual consumption  
9 behavior. Investments in IVVC technology and grid modernization can result not only in  
10 energy reductions, but also may provide additional visibility and operational flexibility in  
11 responding to a variety of dynamic system conditions.

12 **Q. ARE ANY PENNSYLVANIA UTILITIES IMPLEMENTING IVVC PROJECTS?**

13 A. Yes, but on a limited scale. A September 2014 project description published by the U.S.  
14 Department of Energy (“U.S. DOE”) on First Energy’s smart grid investments entitled  
15 “FirstEnergy Services Corporation Smart Grid Modernization Initiative” outlines the  
16 Company’s approach to smart grid investments, including distribution automation and  
17 volt/VAR optimization systems. The report highlights the FirstEnergy’s grid  
18 modernization initiative and future plans including evaluating the “scalability of all tested  
19 smart grid technologies to larger customer populations” and substantiating the “operating  
20 impacts”, including “reduced carbon emissions.”

21 In addition, my understanding is that PPL implemented a small test of IVVC as  
22 part of its \$38 million smart grid investment grant. The project is described in a report  
23 entitled “Case Study – PPL Electric Utilities Corporation Smart Grid Investment Grant –

1 Building a Smarter Electric Distribution System in Pennsylvania.” This report is publicly  
2 available on the U.S. Department of Energy’s website at:

3 [http://energy.gov/sites/prod/files/Case%20Study%20-](http://energy.gov/sites/prod/files/Case%20Study%20-%20PPL%20Electric%20Utilities%20Corporation%20-%20Building%20a%20Smarter%20Distribution%20System%20in%20PA%20-%20January%202012.pdf)  
4 [%20PPL%20Electric%20Utilities%20Corporation%20-](http://energy.gov/sites/prod/files/Case%20Study%20-%20PPL%20Electric%20Utilities%20Corporation%20-%20Building%20a%20Smarter%20Distribution%20System%20in%20PA%20-%20January%202012.pdf)  
5 [%20Building%20a%20Smarter%20Distribution%20System%20in%20PA%20-%20January%202012.pdf](http://energy.gov/sites/prod/files/Case%20Study%20-%20PPL%20Electric%20Utilities%20Corporation%20-%20Building%20a%20Smarter%20Distribution%20System%20in%20PA%20-%20January%202012.pdf)  
6

7 However, I can locate no further reference to IVVC expansion at PPL.

8 In addition, two Pennsylvania IOUs, PECO and West Penn Power, pursued IVVC  
9 as part of their Phase 1 Act 129 energy efficiency and demand response compliance  
10 plans. In the Plan Year 4 reports from these utilities, and from the Statewide Evaluator,  
11 IVVC (also known as Conservation Voltage Reduction, or CVR) was praised for its cost-  
12 effectiveness.<sup>1</sup>

13 **Q. WHAT RECOMMENDATIONS DO YOU HAVE REGARDING FURTHER IVVC**  
14 **DEPLOYMENT?**

15 A. Realizing and accounting for peak demand reductions across select, locally constrained  
16 areas of the system could be used to defer capital investments planned in future years -  
17 investments which would otherwise be required to meet the projected demand for energy,  
18 given the constraints. IVVC could also reduce energy usage and greenhouse gas  
19 emissions. It is possible that the reduced greenhouse gas emissions could be used as a  
20 compliance tool for the U.S. EPA’s Clean Power Plan. The Company should evaluate as  
21 part of its distribution system planning process, whether the implementation of IVVC  
22 throughout its service territory would provide lower energy usage, lower peak demand,  
23 defer capital investments and reduce greenhouse gas emissions, ultimately benefiting  
24 customers and the environment. I recommend that the Company: submit a report to the

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<sup>1</sup> Final Annual Report: Phase 1, June 1 2009 to May 31 2013. Report by the Statewide Evaluator Team. Pages 87-88; 118-119; 148-149; 184-185; 204; and 240. March 4, 2014.

1 Commission and the stakeholders in this case describing: (1) the cost of the IVVC  
2 equipment it has installed to date and the resulting energy reductions, peak demand  
3 reductions, deferred capital investments and reduced greenhouse gas emissions; and (2) a  
4 cost/benefit analysis and implementation plan for installing IVVC equipment on the  
5 Company's remaining circuits and substations, with a view toward fully using IVVC for  
6 peak demand reduction and for energy savings. Also, in the event the Company's plan is  
7 approved by the Commission, I believe it is important that average voltage and power  
8 factor be reported by treated circuit annually. This will allow the Commission to verify  
9 continuous voltage reductions and power factor improvements resulting from the IVVC  
10 investment over time, and would also be helpful for emissions reduction and Act 129  
11 compliance calculations.

12 In addition, I encourage the Commission to take steps to continue to address the  
13 utility throughput incentive. A 2-3% reduction in voltage that could be achieved through  
14 IVVC, for instance, could result in a 1-2% reduction in energy sales volumes. This  
15 harms IOU's revenues and profits between rate cases, and could result in a disincentive  
16 for utilities to embrace measures that result in energy conservation and potential savings  
17 to customers.

18 I support the Commission's interest in addressing this problem, as evidenced by  
19 the recent En Banc hearing on alternative ratemaking, for which the Environmental  
20 Defense Fund submitted testimony.<sup>2</sup> Several methods are available to remove economic  
21 penalties to IOUs who exceed Act 129 goals, and I encourage the Commission to act  
22 upon its learnings to date on this issue.

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<sup>2</sup> Comments of the Environmental Defense Fund in M-2015-2518883. Prepared testimony of John Finnigan. March 16, 2016.

1 **III. INTEGRATED RESOURCE PLANNING**

2 **Q. PLEASE EXPLAIN THE INTEGRATED RESOURCE PLANNING (“IRP”)**  
3 **PROCESS.**

4 A. The Regulatory Assistance Project (“RAP”) defines an integrated resource plan as a  
5 “utility plan for meeting forecasted annual peak and energy demand, plus some  
6 established reserve margin, through a combination of supply-side and demand-side  
7 resources over a specified future period.” RAP issued a June 2013 RAP report entitled  
8 “Best Practices in Electric Utility Integrated Resource Planning” that further explores this  
9 concept. In essence, integrated resource planning explores the business case of a broad  
10 portfolio of supply and demand side resources in meeting long-range energy needs, while  
11 ensuring that the selection of these resources is in alignment with desired policy  
12 outcomes.

13 **Q. HOW SHOULD THE COMPANY UTILIZE CLEAN ENERGY RESOURCES IN**  
14 **ITS DISTRIBUTION SYSTEM PLANNING?**

15 A. The Company should employ a combination of supply-side and demand-side resources,  
16 including clean energy resources, in meeting forecasted annual peak and energy demand  
17 in its distribution expansion planning practices. Consideration for these resources could  
18 expand the portfolio of cost-effective solutions used to meet the on-going demand for  
19 energy, as well as a number of possible policy objectives. States like New York,  
20 California, Washington, and Vermont have been and are continuing to explore  
21 incorporating a combination of supply and demand-side resources in meeting future  
22 energy needs.



1 **Q. PLEASE DESCRIBE THE CALIFORNIA LAW RELATING TO DISTRIBUTION**  
2 **RESOURCE PLANNING.**

3 A. In 2013, California enacted Public Utilities Code § 769, which requires utilities to submit  
4 comprehensive distribution resources plans to optimize their distribution systems. The  
5 law states:

6 769. (a) For purposes of this section, "distributed resources"  
7 means distributed renewable generation resources, energy  
8 efficiency, energy storage, electric vehicles, and demand response  
9 technologies.

10  
11 (b) Not later than July 1, 2015, each electrical corporation shall  
12 submit to the commission a distribution resources plan proposal to  
13 identify optimal locations for the deployment of distributed  
14 resources. Each proposal shall do all of the following:

15  
16 (1) Evaluate locational benefits and costs of distributed resources  
17 located on the distribution system. This evaluation shall be based  
18 on reductions or increases in local generation capacity  
19 needs, avoided or increased investments in distribution  
20 infrastructure, safety benefits, reliability benefits, and any other  
21 savings the distributed resources provides to the electric grid or  
22 costs to ratepayers of the electrical corporation.

23  
24 (2) Propose or identify standard tariffs, contracts, or other  
25 mechanisms for the deployment of cost-effective distributed  
26 resources that satisfy distribution planning objectives.

27  
28 (3) Propose cost-effective methods of effectively coordinating  
29 existing commission-approved programs, incentives, and tariffs to  
30 maximize the locational benefits and minimize the incremental  
31 costs of distributed resources.

32  
33 (4) Identify any additional utility spending necessary to integrate  
34 cost-effective distributed resources into distribution planning  
35 consistent with the goal of yielding net benefits to ratepayers.

36  
37 (5) Identify barriers to the deployment of distributed resources,  
38 including, but not limited to, safety standards related to technology  
39 or operation of the distribution circuit in a manner that ensures  
40 reliable service.

1 (c) The commission shall review each distribution resources plan  
2 proposal submitted by an electrical corporation and approve, or  
3 modify and approve, a distribution resources plan for the  
4 corporation. The commission may modify any plan as appropriate  
5 to minimize overall system costs and maximize ratepayer benefit  
6 from investments in distributed resources.  
7

8 (d) Any electrical corporation spending on distribution  
9 infrastructure necessary to accomplish the distribution resources  
10 plan shall be proposed and considered as part of the next general  
11 rate case for the corporation. The commission may approve  
12 proposed spending if it concludes that ratepayers would realize net  
13 benefits and the associated costs are just and reasonable. The  
14 commission may also adopt criteria, benchmarks, and  
15 accountability mechanisms to evaluate the success of any  
16 investment authorized pursuant to a distribution resources plan.  
17

18 **Q. PLEASE EXPLAIN THE NEW YORK REGULATORY PROCEEDING**  
19 **RELATING TO DISTRIBUTION RESOURCE PLANNING.**

20 A. The New York regulatory proceeding is known as “Reforming Energy Vision” and was  
21 opened in April by the New York Department of Public Service and the case number is  
22 14-M-0101. The Commission’s objective is to transform the utility business model to  
23 make electric service more efficient, sustainable, and reliable while increasing the  
24 services provided to customers. Distribution resource planning is one element of this  
25 proceeding. The Commission Staff issued a report in this case on August 22, 2014  
26 entitled: “Developing the REV Market in New York: DPS Staff Straw Proposal on Track  
27 One Issues.” At page 10, the Staff Report discusses distribution resource planning  
28 projects in New York and other states:

29  
30 Distribution investments: there are numerous examples of DER  
31 [distributed energy resources] being proposed to defer distribution  
32 investment. The Petition of Consolidated Edison, Inc. related to its  
33 Brooklyn/Queens Demand Management (BQDM) Program and the  
34 PSEG Long Island Utility 2.0 Long Range Plan filed July 1, 2014  
35 illustrate both the potential benefits and the achievability of non-wires

1 alternatives. Consolidated Edison proposes to acquire 52 MW of  
2 distributed resources to address overloaded distribution facilities.  
3 PSEG Long Island proposes to spend up to \$200 million on  
4 distributed resources to, among other things, target two areas of  
5 congestion. Non-wires alternatives are being proposed to improve  
6 reliability and defer investments in other jurisdictions, as well. For  
7 example, Vermont plans to defer \$400 million in traditional T&D  
8 investment through integration of energy efficiency programs into  
9 transmission planning. In Washington, the Bonneville Power  
10 Administration identified a package of demand response, direct load  
11 control, distributed generation and energy efficiency to defer a 50  
12 MW traditional investment.

13  
14 An example of the IRP concept in practice is demonstrated in a transmission deferral  
15 project implemented by Central Maine Power (“CMP”) in the Boothbay Harbor region,  
16 as explained in a March 4, 2014 report entitled “Interim Report: Boothbay Sub-Region  
17 Smart Grid Reliability Project.”

18 In addition, Consolidated Edison, Inc.’s long running Targeted Demand Side  
19 Management program has demonstrated that demand side resources could be leveraged to  
20 defer capital investments and meet the customers’ demand for energy. In its approval of  
21 the Demand Management (DM) program, the New York State Public Service  
22 Commission noted that “the general goal of fostering the use of DM resources to offset  
23 projected peak load growth is very important given the numerous public benefits DM alone  
24 can provide in comparison with typical alternatives. Those benefits include reduced energy  
25 consumption, reduced air pollution, avoidance of the environmental impacts associated with  
26 construction of electric generation, transmission, and distribution facilities, increased supply  
27 diversity, and increased economic growth.”

28 **Q. DO YOU HAVE ANY RECOMMENDATIONS RELATING TO INTEGRATED**  
29 **SYSTEM PLANNING?**

1 A. The Company should explore including a broad portfolio of supply-side and demand-side  
2 solutions in meeting the future energy needs of its customers. A statewide market  
3 potential study has already been conducted and could be useful in this analysis. The  
4 Company should submit a report to the Commission and the stakeholders in this case  
5 describing: (1) what practices the Company currently follows to implement demand-side  
6 resources to meet its customers' energy needs; and (2) what additional practices the  
7 Company will implement, in light of the best practices I have described in my testimony,  
8 to expand its use of demand-side resources to meet its customers' energy needs.

9 **Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?**

10 **A.** Yes.

**VERIFICATION**

I hereby verify under the penalties of perjury that the foregoing representations are true to the best of my knowledge, information and belief.

Signed: [Signature]

Dated: 7/13/16

**AFFIDAVIT**

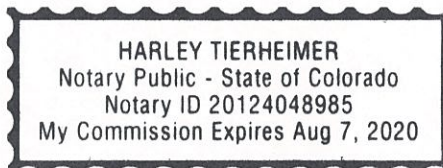
STATE OF COLORADO )  
 ) SS:  
COUNTY OF Jefferson )

Paul Alvarez, being first duly sworn, deposes and says that he is President of the Wired Group and is testifying on behalf of the Environmental Defense Fund, an Intervenor in this proceeding; that as such he has executed the foregoing Verification and has authority to do so; that he has read said Verification and knows the contents thereof; and that the statements therein contained are true to the best of his knowledge, information and belief.

[Signature]  
Paul Alvarez

Subscribed and sworn to before me,  
This 13<sup>th</sup> day of July, 2016.

[Signature]  
Notary Public



My Commission Expires: 8-7-20

My County of Residence: Jefferson