

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

**PETITION OF PECO ENERGY COMPANY
FOR APPROVAL OF ITS
SMART METER TECHNOLOGY PROCUREMENT AND
INSTALLATION PLAN**

DOCKET NO. M- 2009-2123944

DIRECT TESTIMONY

WITNESS: JEFFREY T. BUXTON

**SUBJECT: OVERVIEW OF SMART METER MARKET,
DEVELOPMENT AND REASONABLENESS
OF SMART METER PLAN**

DATED: AUGUST 14, 2009

TABLE OF CONTENTS

	Page
I. INTRODUCTION AND PURPOSE OF TESTIMONY	1
II. SUMMARY OF TESTIMONY	4
III. STATE OF THE SMART METER MARKET AND TECHNOLOGIES.....	4
IV. DEVELOPMENT OF THE SMART METER PLAN	9
V. REASONABLENESS OF THE SMART METER PLAN.....	12
VI. CONCLUSION	13
APPENDIX A: LIST OF CURRENT, SIGNIFICANT UTILITY DEPLOYMENTS OF SMART METER TECHNOLOGY	

1 **4. Q. Please summarize your prior professional experience.**

2 A. Prior to joining Enspira, I was CIO at Strategic Energy, located in Pittsburgh,
3 Pennsylvania. Strategic Energy was one of the largest electricity retailers in the
4 country and was very involved in the Pennsylvania electricity market prior to being
5 sold to Direct Energy in June 2008. While CIO at Strategic Energy, I was responsible
6 for all data systems development and maintenance, including: (i) electronic data
7 interchange (“EDI”) data flows; (ii) meter data acquisition, validation and editing;
8 (iii) pricing and billing systems; (iv) customer care and relationship management
9 systems; (v) load forecasting systems; (vi) wholesale trade capture and risk
10 management systems; (vii) Independent System Operator (“ISO”) settlement and
11 reporting systems; and (viii) financial and accounting systems.

12 Prior to my role as CIO, I was Executive Vice President of Marketing at Strategic
13 Energy. I was responsible for all product development, customer care, billing and
14 pricing activities. My work included interpreting how regulatory and legislative
15 activities in eleven states (covering six ISOs) would impact retail and wholesale
16 markets and electricity supplier operations.

17 In addition, I served as General Manager of the PECO Energy Company (“PECO”)
18 data services program for Schlumberger Resource Management Services Group
19 (“RMS”) and Cellnet Data Systems. While in this role, I was responsible for the
20 successful planning and deployment of PECO’s current automated meter reading
21 (“AMR”) system. My work included: (i) contract negotiations and contract
22 administration; (ii) staffing and facilities setup – crossdock, customer service, field

1 contractors; (iii) process and workflow development; (iv) systems integration and
2 data delivery; (v) scheduling and planning; (vi) health, safety, and Total Quality
3 Management; and (vii) performance reporting.

4 Finally, I spent 17 years with Schlumberger Industries, Inc., the largest manufacturer
5 of meters and metering systems in the world, in a number of product development,
6 program management, marketing, and executive management roles within their RMS
7 group. While Vice President of Business Segments, I was responsible for the
8 worldwide marketing and product development of all Schlumberger electric, gas, and
9 water metering products as well as all metering system software applications.

10 **5. Q. What is your educational background?**

11 A. I earned my Bachelor of Science degree in Electrical Engineering from Pennsylvania
12 State University in 1978. I earned my Masters of Business Administration from the
13 University of Cincinnati in 1986.

14 **6. Q. What is the purpose of your testimony?**

15 A. The purpose of my testimony is to describe the development of PECO's Smart Meter
16 Technology Procurement and Installation Plan ("Smart Meter Plan" or "Plan") and
17 explain how PECO's Plan is a reasonable and prudent approach to Act 129's
18 requirements.

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1 **II. SUMMARY OF TESTIMONY**

2 **7. Q. Please summarize your testimony.**

3 A. My testimony is divided into three parts. I first provide an introduction to the current
4 state of the “smart meter” market, identifying some significant deployments of smart
5 metering technology around the country and some industry developments affecting
6 commercial offerings. I then discuss the development of PECO’s Plan and the ways
7 in which Enspiria assisted PECO. Finally, I review the key features of PECO’s Plan
8 in light of the state of the smart meter industry and explain why the Plan’s principal
9 features, including its proposed multi-phase deployment, are appropriate, cost-
10 effective and consistent with industry implementations of AMI technology.

11 **III. STATE OF THE SMART METER MARKET AND TECHNOLOGIES**

12 **8. Q. Please define “Smart Meter” for purposes of your testimony.**

13 A. As Mr. Pritchard explains in his testimony, PECO’s AMR network is already “smart”
14 and delivers significant benefits. It also includes capabilities to support some
15 advanced rates, including time-of-use rates. However, Act 129 envisions a smart
16 meter network that has “two-way” (or bidirectional) information flow in which usage,
17 pricing, outage, and other information can be exchanged and updated on a more real-
18 time basis.

19 For purposes of my testimony, I base my understanding of the term “Smart Meter” on
20 the definitions provided by the Federal Energy Regulatory Commission (“FERC”),
21 Act 129, and the Implementation Order issued by the Pennsylvania Public Utility

1 Commission (“Commission”) in June 2009. FERC defines “Advanced or Smart
2 Metering” as “[a] system including measurement devices and a communication
3 network, public and/or private, that records customer consumption [and possibly
4 other parameters] hourly or more frequently and that provides for daily or more
5 frequent transmittal of measurements to a central collection point.” See Glossary for
6 FERC-727 and FERC-728 available at <http://www.ferc.gov/industries/electric/industry-act/demand-response/2008/survey/glossary.pdf>. Act 129 states that “‘Smart Meter
7 Technology’ means technology, including metering technology and network
8 communications technology capable of bidirectional communication, that records
9 electricity usage on at least an hourly basis, including related electric distribution
10 system upgrades to enable the technology.” 66 Pa. C.S. § 2807(g). The
11 Implementation Order provides additional depth to the definition of “Smart Meter” by
12 detailing specific functional requirements for smart meters. Implementation Order,
13 pp. 16-17. Thus, when using the term “Smart Meter,” I am referring to a system,
14 consistent with the FERC definition, Act 129 and the functionality requirements of
15 the Commission’s Implementation Order.
16

17 **9. Q. Please provide an overview of the current “smart meter” market.**

18 A. Utilities in North America have been implementing large-scale automated and fixed-
19 network meter reading technologies for more than ten years. As these technologies
20 have evolved, they have expanded beyond simple meter reading and status
21 capabilities into systems with the smart meter capabilities described in the
22 Commission’s Implementation Order. Utility deployments of this type of Smart
23 Meter technology are more recent in nature. While some deployments are growing

1 in size, the implementation of these systems in utility, full-scale quantities are limited,
2 and the actual use of some advanced Smart Meter functionality is even less
3 comprehensive. The evolving development of smart metering technology and the
4 lack of significant experience with full-scale deployments properly suggests a
5 disciplined and conscientious deployment plan – like PECO’s two-phase approach.
6 In Appendix A, I have provided a list of some of the significant utility commitments
7 and deployments of smart meter technology currently under contract in the United
8 States. This list was compiled by the research firm Chartwell Inc. (“Chartwell”) on
9 behalf of PECO.

10 According to a report issued by FERC in December 2008, advanced meters account
11 for approximately 4.7 percent of all installed meters, up from less than 1 percent in
12 2006. In addition, according to Chartwell’s 2008 AMI survey, twenty percent of
13 North American utilities say they are planning to deploy AMI in one to three years.
14 Finally, President Obama has called for the installation of 40 million Smart Meters
15 and has allocated \$3.4 billion in federal funds for investment in the smart grid.

16 Current commercial vendors and utility stakeholders are working through several
17 industry and governmental bodies (including the American National Standards
18 Institute (“ANSI”) and National Institute of Standards and Technology (“NIST”)) to
19 develop common standards for expected smart grid communications. NIST has been
20 tasked by Congress to coordinate the development of a framework of protocols and
21 model standards for the Smart Grid. In May 2009, NIST convened a stakeholders’
22 summit to engage utilities, suppliers, consumers, standards developers and other
23 stakeholders. By the fall of this year, the collaborative process is expected to deliver:

1 (1) a Smart Grid architecture; (2) priorities for interoperability and cybersecurity
2 standards, and an initial set of standards to support implementation; and (3) plans to
3 address outstanding standards. After issuing the initial set of priorities, standards and
4 action plans, NIST is expected to initiate a partnership to facilitate development of
5 additional standards to address remaining gaps, integrate new technologies and
6 complete a testing-and-certification plan by the end of 2009. PECO's Smart Meter
7 Plan (Section 2.8, Table 3) provides a list of standards that NIST is currently
8 considering. As indicated in the Plan at Section 2.8, PECO supports the NIST effort
9 to establish standards and will incorporate those requirements in its vendor selection.

10 Finally, the current commercial market for smart meter technology is robust, with
11 several major suppliers and a number of new vendors offering innovative products.
12 The marketplace for AMI technology should offer sufficient variability and choices to
13 encourage a competitive procurement process.

14 **10. Q. Are there federal initiatives relating to smart meters?**

15 A. Yes. The federal government has a significant number of initiatives relating to smart
16 meters, including substantial funds available to utilities under the American Recovery
17 and Reinvestment Act of 2009 ("ARRA"). Specifically, the federal government has
18 allocated over \$3.4 billion for utility investment in "smart grid" infrastructure and an
19 additional \$615 million for demonstration projects, which likely will impact the
20 future market for smart meters nationwide.

1 In addition, FERC recently issued policy guidance regarding the development of a
2 smart grid for the interstate electric transmission system, focusing on the development
3 of key standards to achieve the interoperability and functionality of smart grid
4 systems and devices. FERC also adopted an interim rate policy to encourage
5 investment in smart grid systems until interoperability standards are adopted.

6 **11. Q. In light of these market developments, is there a specific smart meter solution**
7 **that PECO should be adopting in its Plan?**

8 A. Not at this time. A wide range of smart meter communication technologies are
9 available in the marketplace today, each with its own advantages and disadvantages.
10 In order to select the appropriate technology and smart meter solution for Act 129
11 compliance, it is important to understand the full spectrum of functional and technical
12 requirements and conduct the type of procurement process proposed by PECO for
13 evaluation and selection of possible vendors.

14 In this case, the use and incorporation of “open” standards will be an important
15 evaluation criterion for PECO. In its Implementation Order, the Commission directed
16 that Smart Meters comply with open standards for radio technology. Implementation
17 Order, p. 16 (identifying open standard IEEE 802.15.4). The Commission also
18 encouraged electric distribution companies to adopt other open protocols and
19 standards that facilitate interoperability. Implementation Order, p. 21.

20 PECO has developed its Plan consistent with the Commission’s requirements for
21 open standards, and PECO will incorporate the latest standards in its vendor selection
22 and contracting process. Interoperability standards are important to ensure that

1 different software and hardware components integrate appropriately, while cyber
2 security standards help guard a multi-system network against natural or human-
3 caused disruptions. These standards are driven by the NIST collaborative process
4 described earlier in this testimony.

5 IV. DEVELOPMENT OF THE SMART METER PLAN

6 12. Q. Please describe the process employed in developing PECO's Plan.

7 A. PECO examined numerous technology and deployment scenarios that might
8 accomplish the requirements of Act 129. PECO considered a range of options, from
9 adaptation of the AMR system currently in use by PECO to a complete replacement
10 of PECO's AMR system with new AMI technology.

11 Deployment timeframes were considered to accommodate Act 129's stated
12 requirement to provide smart metering technology to customers within 15 years.
13 PECO also considered the deployment of new smart metering technology to support
14 its energy efficiency and demand response program.

15 Ultimately, the examination of these scenarios revealed certain common elements,
16 which then formed the core of PECO's Plan. These core elements included the
17 deployment of a new AMI network, the IT systems to support the network and
18 increased data flow, and the new smart meters required for initial customer
19 deployment. In addition, the Plan addresses future technology, vendor selection, and
20 deployment decisions, which will be supported by a disciplined vendor selection
21 process and technology acceptance testing.

1 13. Q. **Did PECO review some of the available technologies you described earlier?**

2 A. Yes, PECO conducted a review of available technologies. This examination provided
3 a valuable reference for the technical and commercial opportunities to implement
4 smart metering capabilities. It also provided insight into the available options, the
5 maturity of the current technology, the technology risks associated with both
6 obsolescence and new technology adoption, and any indirect technology and IT
7 requirements that PECO might need to address.

8 14. Q. **Did PECO's review of available technologies involve meetings with vendors?**

9 A. Yes. In order to ensure that PECO had a proper understanding of the smart meter
10 vendor marketplace, workshops were held in early June 2009 with a selection of key
11 smart meter providers. The content of the workshops included technical and
12 commercial discussions, in addition to high-level cost estimates for the
13 implementation of a complete smart meter solution compliant with Act 129. The
14 AMI and Smart Meter vendors provided detailed information about their technology
15 solutions and preferred commercial terms.

16 The workshops provided PECO with a good overview of the marketplace and
17 demonstrated that the smart meter vendor community can support PECO's Smart
18 Meter requirements.

1 15. Q. How did Enspiria help PECO evaluate its options for addressing the smart
2 meter requirements of Act 129 and the Implementation Order?

3 A. As part of PECO’s analysis of the options available for Smart Meter systems,
4 Enspiria provided a high-level review of the market-leading and commercially
5 available technologies. The intent of the examination was to provide an indication of
6 the available solutions that represent the state of the industry and those which PECO
7 should include in its expected AMI technology vendor analysis or RFP process.
8 Evolving but unproven or un-established vendors were not included in the
9 examination. In addition, no attempt was made by Enspiria to rank or order the
10 vendor offerings or suggest which may be best applicable to PECO.

11 16. Q. Did PECO’s Plan development process also include discussions with
12 stakeholders?

13 A. Yes. In addition to the vendor workshops described above, PECO conducted a series
14 of meetings with industry stakeholders to share information and collaborate on Plan
15 alternatives. Some of these meetings were combined with stakeholder meetings about
16 PECO’s Energy Efficiency and Conservation (“EE&C”) Program, while others were
17 dedicated solely to the Smart Meter Plan.

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1 **V. REASONABLENESS OF THE SMART METER PLAN**

2 **17. Q. PECO has proposed a two-phase deployment of smart meters for its customers,**
3 **leveraging common MDMS, Middleware and System Integration vendors**
4 **currently supporting the development of Exelon’s AMI program, and**
5 **subsequent vendor selection and contracting process for smart meter technology.**
6 **Do you believe this is a reasonable and prudent approach to implementing Act**
7 **129’s smart meter requirements in light of the state of the market and existing**
8 **technologies?**

9 A. Yes. First, PECO’s two-phase approach is multi-faceted, involving a sequenced
10 technology selection and vendor contracting process and extensive collaboration with
11 stakeholders. The use of an initial deployment period is realistic and enables the
12 proper technology and acceptance testing to ensure appropriate risk mitigation.
13 Particularly in the absence of significant examples of fully deployed utility-scale
14 smart meter programs, a careful and measured planning process is important.
15 Second, as discussed in the testimony of Mr. Pritchard and in Section 5.2 of the Plan,
16 PECO’s use of direct, competitive negotiations with existing Exelon MDMS,
17 Middleware and Systems Integration vendors will enable expanded deployment
18 schedules while leveraging established volume-based cost discounts.
19 Finally, PECO’s procurement of smart meters during both phases of its deployment
20 will be based upon a competitive vendor selection and contracting process, which will
21 result in prudent costs.

1 **18. Q. Do you believe PECO's projected use of federal monies to support its**
2 **procurement of smart meters is appropriate?**

3 A. Yes. While there is no assurance that PECO will be successful in obtaining federal
4 funds, PECO's Plan has appropriately and realistically addressed the possible receipt
5 of such funding, as described in the testimony of Mr. Pritchard and Ms. Kelly. An
6 award of monies will significantly increase the scope and speed of deployment of
7 smart meters within PECO's service territory. However, I believe that PECO's base
8 plan to develop a MDMS, AMI network, and initial procurement of smart meters in
9 the absence of Stimulus funds will provide a sound foundation for later universal
10 deployment, in accordance with Act 129 and the Implementation Order.

11 **VI. CONCLUSION**

12 **19. Q. Does this conclude your direct testimony?**

13 A. Yes.

Appendix A

List of Current, Significant Utility Deployments of Smart Meter Technology

1. *Alabama Power* – installing 1.3 million Sensus endpoints as part of larger Southern Co. agreement
2. *Salt River Project* – has installed more than 300,000 Elster EnergyAxis (mesh) smart meters and likely will deploy more. It is also under contract with Landis+Gyr to deploy an additional 300,000 credit/prepay meters
3. *Pacific Gas & Electric* – PG&E in 2008 contracted with Silver Spring Networks to install about 4 million to 5 million electric smart meter endpoints. However, PG&E has already installed nearly 400,000 Aclara electric endpoints, most of which use power line communication.
4. *Southern California Edison* – SCE is under contract with Itron to install 5 million OpenWay smart meters.
5. *San Diego Gas & Electric* –contracted with Itron to install 1.4 million electric smart meters and about 840,000 gas units.
6. *Pepco Holdings Inc.* - awarded a contract to Silver Spring Networks to automate all 1.9 million meters.
7. *Florida Power & Light* – FPL has deployed 100,000 Silver Spring Networks smart meters, and is expected to expand that to cover all of its customers, about 4.3 million.
8. *Lee County Electric Co-op* – Lee County, one of the nation’s largest cooperatives, reads its 200,000 customers with Aclara’s two-way PLC network.
9. *Georgia Power* – the largest subsidiary of Southern Co., is currently installing Sensus smart meters to its 2 million-plus customers.
10. *Hawaiian Electric Co.* – HECO contracted with Sensus for the installation of 430,000 smart meters.
11. *Idaho Power* – Idaho Power contracted with Aclara for the rollout of more than 500,000 PLC smart meters.
12. *Alliant Energy* – is currently deploying Sensus smart meters to all of its 530,000 customers in Iowa, and will also upgrade its 460,000 customers in Wisconsin and Minnesota.
13. *Bangor Hydro* – Bangor Hydro has deployed more than 110,000 Aclara TWACS AMI meters.

14. *DTE Energy* – DTE has contracted with Itron to provide smart meter technology for its 2.6 million electric endpoints and its 700,000 gas endpoints.
15. *Portland General Electric* – PGE is currently installing more than 800,000 Sensus smart meters.
16. *Oncor* – Oncor is currently deploying Landis+Gyr’s AMI product to 3 million end users.
17. *CenterPoint Energy Houston* – CenterPoint is under contract with Itron to install more than 200,000 OpenWay smart metering endpoints.
18. *Wisconsin Public Service* – WPS has installed about 455,000 Aclara TWACS AMI endpoints, and is using AMR for its remaining 320,000 customers.