BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF DELAWARE

In the Matter of the Application of Delmarva Power and Light Company, Exelon Corporation, Pepco Holdings, Inc., Purple Acquisition Corporation, Exelon Energy Delivery Company, LLC and New Special Purpose Entity, LLC for Approvals Under the Provision of *26 Del. C. §§* 215 and 1016 (Filed June 18, 2014)	PSC Docket No. 14-193

DIRECT TESTIMONY

of

Maximilian Chang

on behalf of

THE DNREC DIVISION OF ENERGY & CLIMATE

DECEMBER 12, 2014

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I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Maximilian Chang. I am a Principal Associate with Synapse Energy Economics, an energy consulting company located at 485 Massachusetts Avenue, Cambridge, Massachusetts.

Q. On whose behalf are you submitting testimony in this proceeding?

A. I am submitting testimony on behalf of the Delaware Department of Natural Resources and Environmental Control.

Q. Please describe your professional background at synapse energy economics.

A. My experience is summarized in my resume, which is attached as **Exhibit___MPC_1**. I am an environmental engineer and energy economics analyst who has analyzed energy industry issues for more than six years. In my current position at Synapse, I focus on many aspects of the electric power industry, including assessment and implementation of energy efficiency and demand response alternatives, as well as economic and technical analysis of nuclear power, wholesale and retail electricity markets, and renewable resource alternatives. I have been an author and project coordinator for the last two biennial New England Avoided Energy Supply Component reports used by energy efficiency program administrators in the six New England states to evaluate energy efficiency programs.

Q. Please describe your professional experience before beginning your current position at Synapse Energy Economics.

A. Before joining Synapse Energy Economics, I worked at Environmental Health and

Engineering, managing indoor air quality environmental projects, at the Penobscot Group analyzing real estate investment trusts on behalf of institutional investors, and at Brigham and Women's Hospital conducting cancer research. I hold an M.S. degree from the Harvard School of Public Health in Environmental Health and Engineering Studies, and a B.S. degree from Cornell University in Biology and Classical Civilizations.

Q. Have you previously testified before utility regulatory agencies?

A. Yes. I have previously testified at the Massachusetts Department of Public Utilities, and the Maine Public Utilities Commission. I have filed testimony before the New Jersey Board of Public Utilities and the United States District Court District of Maine. I have filed testimony on this merger case before the Public Service Commission of the District of Columbia and New Jersey Board of Public Utilities.

Q. Have you previously testified before the Delaware Public Service Commission?

A. No, I have not.

Q. Who prepared this testimony and the exhibits sponsored through it?

A. This pre-filed testimony was prepared by me or under my direct supervision and control. Likewise, the exhibits that I reference and sponsor were prepared by me and under my direct supervision and control, unless I am obviously referring to someone else's exhibit.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to evaluate whether the proposed merger ("the Merger") by Exelon Corporation and Pepco Holdings Incorporated ("the Joint

Applicants") is consistent with the public interest for the following issues:

a) Future nuclear decommissioning costs

b) Location of Exelon's Renewable Energy Resources

c) Comprehensive assessment of distributed energy resources and the Delmarva distribution system

Q. What is your understanding of the statutory standard for approving the merger in this docket?

A. I understand that 26 *Del. C.* §§ 215 establishes the standard for the PSC in reviewing a proposed merger:

> The Commission shall approve any such proposed merger, mortgage, transfer, issue, assumption or acquisition when it finds that the same is to be made in accordance with law, for a proper purpose and is consistent with the public interest.

Q. Please summarize your findings and recommendations

A. My findings and recommendations are summarized as:

1. The Joint Applicants will face future nuclear decommissioning costs that may extend well beyond the five year ring-fencing commitments made to the PSC with uncertain impacts to Delmarva ratepayers.
2. The Joint Applicants' commitment to renewable resources is comprised of resources generally located outside of the PJM footprint.
3. The Joint Applicants have not conducted or made any commitment to conduct a comprehensive study of the costs and benefits associated with a high penetration

of distributed energy resources on the Delmarva distribution system that could assist in achieving Delaware Solar RPS goals of 3.5 percent by 2025.

4. In short, the merger as proposed does not produce a direct and tangible benefit to ratepayers in connection with the aspects of the Merger application that I have analyzed.

II. NUCLEAR DECOMMISSIONING RISKS

Q. Please summarize your assessment of possible nuclear decommissioning cost risks.

A. The Joint Applicants have identified several nuclear units that may be at risk of premature retirement that I describe in detail below. In summary, and, assuming a merger, the Commission should ensure that Joint Applicants' proposed ring-fencing measures ensure that Delmarva ratepayers will be protected from the entirety of future nuclear decommissioning costs for even one unit, since the decommissioning process for any one unit may last up to 60 years.[1]

Q. Please summarize Exelon's nuclear generation fleet capacity and location of Exelon's nuclear units.

A. As stated in the Exelon corporate website, Exelon has one of the largest nuclear generation fleets in the country.[2] The nuclear fleet as of 12/31/2013 represented approximately 55 percent of Exelon's generation capacity and approximately 81

[1] See 10 CFR Part 50.82(a)(3). Available at http://www.nrc.gov/reading-rm/doc-collections/cfr/part050/part050-0082.html. Accessed December 9, 2014.
[2] http://www.exeloncorp.com/energy/generation/nuclear.aspx. Accessed October 23, 2014

percent of generation output.[3] Exelon's 23 nuclear reactors are in six states: Illinois, Maryland, Nebraska, New Jersey, New York, and Pennsylvania.[4]

Q. How long does it take to decommission the size nuclear plants that Exelon owns and operates?

A. As indicated by the Nuclear Regulatory Commission, the decommissioning process is allowed to take up to 60 years for any one unit.[5]

Q. Has Exelon publically highlighted concerns regarding nuclear generation operations?

A. Yes, in Exelon's 2013 Sustainability Report, Exelon noted that:[6]

> Due to a variety of factors, such as low natural gas prices and the unintended consequences of government subsidies for certain types of new generation, there is the potential for premature nuclear unit retirements in the United States.

Specifically, Exelon has suggested that three of its nuclear plants (Bryon Units 1 and 2, Clinton, and Quad City Units 1 and 2) in Illinois are not competitive.[7] In New York, Exelon has sought to negotiate a power purchase agreement for its R.E. Ginna plant.[8] Furthermore, in the 2014 PJM Capacity Market auction, Quad City 1 and 2, Bryon Units 1 and 2, and Oyster Creek in New Jersey did not clear the auction.[9]

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[3] Exelon Corporation. 2013 Exelon Corporation Sustainability Report. Page 16 of 106. Available at: http://www.exeloncorp.com/assets/newsroom/downloads/docs/dwnld_Exelon_CSR.pdf

[4] Available at http://www.exeloncorp.com/energy/generation/generation.aspx. Accessed October 23, 2014

[5] See 10 CFR Part 50.82(a)(3). Available at http://www.nrc.gov/reading-rm/doc-collections/cfr/part050/part050-0082.html. Accessed December 9, 2014.

[6] Exelon. 2013. Page 4 of 106

[7] https://nuclearstreet.com/nuclear_power_industry_news/b/nuclear_power_news/archive/2014/08/01/exelon-envisions-state-support-for-illinois-nuclear-plants-080101.aspx

[8] http://www.chicagobusiness.com/article/20140714/NEWS11/140719924/exelon-petitions-new-york-to-

For any unit, a "premature retirement" would be the end of commercial operation at a date in advance of the expiration of the nuclear Regulatory Commission (NRC) license.

Q. What would be the result of earlier than expected retirement of any of the eight nuclear units?

A. A premature unit retirement would impact accumulated decommissioning funds, since expenditures associated with decommissioning would occur sooner than planned. Because decommissioning is not merely a technical or safety matter, but also a financial one, the robustness of each plant's decommissioning savings, the decommissioning fund, is important. The current status of Exelon's decommissioning fund for each unit is provided in response to DC PSC Case 1119 DCG 2-41.[10] The Joint Applicants have indicated that it has provided "limited guarantees" for future decommissioning costs associated with Limerick Unit One and that "the guarantee is expected to be terminated when the NRC license for Limerick Unit 1 is extended."[11]

Q. Do you have concerns?

A. Yes, I do. Although it is not known whether or when any of the identified units will retire prematurely, and that the Joint Applicants in the District of Columbia assert that Pepco ratepayers will not bear any liability for decommissioning costs, the

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rescue-ailing-nuclear-plant
[9] http://www.nei.org/News-Media/News/News-Archives/Exelon-on-the-2014-PJM-Capacity-Market-Auction
[10] DC PSC Case 1119. DCG 2-41.
[11] PSC-FN-16.

decommissioning process is allowed to take up to 60 years for any one unit. This 60-year time period extends well beyond the five-year ring fencing commitments made by the Joint Applicants.

Q. What are your recommendations?

A. I recommend that the Commission require the strongest protections for Delmava ratepayers from the effects of Exelon nuclear plant retirement, premature or otherwise Also, due to the time periods involved, I recommend that the protections extend as far as the potential end to decommissioning of each of Joint Applicants' nuclear plants.

III. EXELON'S RENEWABLE GENERATION RESOURCES

Q. What is your understanding of the Delaware's approach to renewables and distributed generation?

A. Witnesses Noyes discusses the issue in more detail in his testimony. My comments should be taken within the context of his explanation of Delaware's objectives.

Q. Please summarize your concerns regarding the Joint Applicants' commitment to renewable energy generation?

A. The Joint Applicants' renewable energy resources are located, in general, outside of the PJM footprint. Thus, they provide fewer direct electric and capacity benefits to the Delaware since resources outside of PJM are not part of the PJM System Mix.[12] In addition, the Joint Applicants should assist Delaware's distributed energy resource penetration goals by starting with comprehensive studies of the effect of distributed

[12] Firestone 3-3.

energy resources on the distribution system to assess all costs and benefits.

Q. Does Exelon provide the general location of its renewable energy resources?

A. Yes.

Q. Where are these renewable resources located?

A. None in Delaware, and mostly not near it. A summary of Exelon's renewable resources is shown below:[13, 14, 15]

	Exelon (MW)	PJM (MW)	Delaware	Location
Wind	1,300	78	0	Maryland, Illinois
Solar Utility	240	10	0	Illinois
Distributed Generation	173	56.9	0	Ohio, New Jersey, Maryland, DC

Q. How many are located in Delaware?

A. None of Exelon's 1,713 MW of renewable generation capacity is located in Delaware.

Q. How many are located within the PJM footprint?

A. Overall not much. Only 56.9 MW of distributed generation out of Exelon's 173 MW are physically located in the PJM footprint. Of the wind resources, 78 MW of the 1,300 MW of wind are located in the PJM footprint. Of the solar utility-scale resources, 10 MW of the 240 MW of solar utility resources are located in the PJM footprint.

[13] Christopher Crane. Direct Testimony. June 18, 2014. 22:8-13
[14] DC PSC Case 1119. DCG 1-62.
[15] DCG 5-41.

Q. Does Exelon own coal, oil, and natural gas generation?

A. Yes, as of December 31, 2013 Exelon owns 1,298 MW of coal-fired capacity, 1,006 MW of oil-fired, and approximately 9,900 MW of natural gas and oil/natural gas fired generation.[16] The approximately 12,204 MW of fossil-fueled generation resources is much larger than the approximately 1,700 MW of renewable resources owned by Exelon. (Please note that Exelon's 3rd Q 2014 press release announced that Exelon had entered into a sales agreement to sell its share of two coal-fired plants in Western Pennsylvania.)[17]

Q. Have the Joint Applicants conducted studies to evaluate the impact of distributed generation within the distribution utility service territories?

A. The Joint Applicants have not conducted or commissioned studies that have investigated the amount of distributed energy resources (DER) that will be installed in the future or larger system studies should DER be a larger part of their distribution system.[18, 19]

Q. Are these studies important to conduct?

A. Yes. These studies, if conducted properly, would provide very important information to stakeholders interested in understanding the potential for distributed generation within Delaware. Here are some areas that merit such work:

[16] Exelon. 2013. Page 16 of 106
[17] http://www.exeloncorp.com/Newsroom/pr_20141029_EXC_Q3Earnings.aspx
[18] DC PSC Case 1119. DC Sun 1-6.
[19] DC PSC Case 1119. DC Sun 1-5.

- Delaware has established a solar PV target of 3.5% cumulative by 2025.[20]
- A comprehensive study can provide a general framework to streamline and aggregate projects by identifying specific circuits where high penetration of DER may be acceptable or unacceptable.
- In the District of Columbia, Pepco[21] also notes that utilities are not realizing the full value of DER.[22] A more comprehensive study of all of the benefits and costs of DER on the distribution system would be valuable for stakeholders.
- Such studies would be valuable to identify possible opportunities and challenges with other capital spending initiatives, like meeting reliability needs with locally reliable distributed generation, notwithstanding any of Delmarva's concerns that may be similar to Pepco.[23]
- Studies may help frame and prioritize ongoing and future efforts to integrate distributed energy resources that are currently contemplated, and that would be valuable to stakeholders.[24]

Q. Have the Joint Applicants expressed support for distributed generation?

A. They appear to have, in response to discovery, with "Exelon supports customer choice and competitive markets, including customers' use of distributed generation to

[20] 26 *Del.C.* § 354(a). Available at http://delcode.delaware.gov/title26/c001/sc03a/.
[21] DC PSC Case 1119. DC Sun 1-4. Attachment Q.(page 14 of 28)
[22] DC PSC Case 1119. DC Sun 1-4. Attachment Q.(page 2 of 28)
[23] DC PSC Case 1119. DC Sun 1-4. Attachment Q. (page 14 of 28)
[24] DC PSC Case 1119. DC Sun 1-4. Attachment Q. (pages 25, 27 of 28)

meet their energy needs."[25]

Q. Do you have concerns regarding Joint Applicants' actions regarding customer initiatives?

A. Yes I do. Notwithstanding the above, the Joint Applicants have identified threats to them from distributed generation. Specifically, in the District of Columbia, Pepco has indicated that PV displaces energy and, therefore, revenue.[26] Further Exelon seems to be concerned that customer owned generation could negatively affect the utility industry.[27]

Also, in the District of Columbia, Pepco appears to have identified future opportunities for itself, including some opportunities that could compete with its customers' distributed energy resources. The identified opportunities include:[28]

- Grid and Distributed Energy Resource Management (Additional control equipment into rate base);
- Central management of DER to maximize benefit;
- PHI-owned solar, community solar, wind, Combined Heat and Power (CHP);
- PHI-owned battery systems, ancillary services; and
- PHI-owned/operated microgrids.

[25] DC PSC Case 1119. DC Sun 1-11.
[26] DC PSC Case 1119. DC Sun 1-4. Attachment Q (page 14 of 28)
[27] Exelon 2013 10 K. page 44.
[28] DC PSC Case 1119. DC Sun 1-4. Attachment Q (page 24 of 28)

I am concerned that Delmarva could take similar actions in Delaware to make it harder for its customers to initiate such measures, seeing them as potentially competing with its own opportunities.

Q. Do you have additional concerns should the merger proceed?

A. Yes, I fear a worsening of the status quo for solar projects. The status quo is apparently that solar projects can get connected. PHI has indicated that it has to date, successfully completed 99 percent of all interconnections requests for net energy metering. [29, 30, 31] It is not known how the Merger would impact the Delmarva interconnection process. At the very least, assuming the Merger is approved, there should be no degradation of the Delmarva interconnection process.

Q. What are your recommendations regarding the Joint Applicants' renewable energy resources?

A. I recommend that the Commission encourage the development of cost-effective renewable generation and distributed generation that can help serve the needs of Delmarva's ratepayers. Of the 1,700 MW of renewable and distributed resources in Exelon's generation fleet; 1,568 MW, or approximately 91 percent, are located outside the PJM footprint that includes Delaware. Meanwhile Exelon owns some 12,000 MW of fossil fuel generation resources.

[29] S. Steffel. "How to determine the Costs and Value of Solar PV" April 10,2014. Slide 5. Available at http://sites.energetics.com/madri/pdfs/2014/MADRI_meeting_33_Steffel.pdf.
[30] DC PSC Case 1119. DC Sun 1-4 Attachment Q (page 20 of 28)
[31] DC PSC Case 1119. DC Sun 1-4 Attachment Q (page 21 of 28)

Q. What are your recommendations regarding distributed energy resources?

A. My recommendation parallels those for renewables. Because of the above-stated concerns, I recommend that the Commission require no less effort than at present to accommodate customer interest in DER. Further, I urge that the Commission require a comprehensive analysis of the accommodation of higher penetrations of DER into the Delmarva distribution system, factoring in all costs and benefits.

Q. To what extent do you conclude that Joint Applicants' presentation demonstrates benefits for renewables and DER?

A. I do not find that the Joint Applicants have shown that the merger will provide any benefits in these areas.

Q. Do you request that this pre-filed testimony and related exhibits be entered into the record of this case?

A. Yes, I do. I have signed a declaration that my foregoing testimony is true and correct.

Q. Does this conclude your direct testimony?

A. Yes.