STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

I/M/O The Merger of Exelon Corporation	**)**	**BPU Docket No. EM14060581**
And PEPCO Holdings, Inc.	**)**	

DIRECT TESTIMONY OF

MAXIMILIAN CHANG

ON BEHALF OF THE
DIVISION OF RATE COUNSEL

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<u>TABLE OF CONTENTS</u>

<u>Page No.</u>

I. STATEMENT OF QUALIFICATIONS

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 Division of Rate Counsel.

Q. Please describe your professional background at Synapse Energy Economics.

A. My experience is summarized in my resume, which is attached as Attachment MC 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 Energy Economics, I focus on economic and technical analysis of many aspects of the electric power industry, including: 1) utility reliability performance and distribution investments, 2) nuclear power, 3) wholesale and retail electricity markets, and 3) energy efficiency and demand response 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 experience in New Jersey energy matters.

A. In the last six years, I have worked on the following specific New Jersey Board of Public Utilities ("BPU" or the "Board") dockets: EO09010049 and EO09010054 (Infrastructure Investment Plan), ER09080664 (2009 ACE Base Rate Case), ER09060459 (Rockland Electric Smart Grid), EO11050306 (Stafford Properties Apartments), ER11080469 (2011 ACE Base Rate Case), EO11110780 (PSEG Base Rate Case), GO12050363 (South Jersey Gas Energy Efficiency), ER12121071 (2012 ACE Base Rate Case), and EO13020155 (Public Service Electric Energy Strong).

Q. Please describe your educational background.

A. 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 before the Massachusetts Department of Public Utilities and the Maine Public Utilities Commission. I have also filed testimony before the District of Columbia Public Service Commission, New Jersey Board of Public Utilities, and the United States District Court District of Maine.

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

A. The purpose of my testimony is to review reliability commitments filed by Exelon Corporation and Pepco Holdings Inc. ("the Joint Petitioners") in their joint petition (the "Joint Petition") for the merger (the "Merger") of the two entities. My testimony will review: 1) Atlantic City Electric's ("ACE") historical reliability performance and spending; 2) the Joint Petitioners' reliability commitments of 1.05 for SAIFI and 100 minutes for CAIDI by the end of 2020 relative to current reliability standards and commitments; and 3) ACE employment level issues.

II. FINDINGS AND RECOMMENDATIONS

Q. Please summarize your findings and recommendations.

A. My findings and recommendations are summarized as:

1) ACE's historical and current reliability improvements in the last few years have been a direct result of the 2011 Reliability Improvement Plan ("RIP") approved by the BPU in ACE's Phase II of the 2009 Base Rate Case Docket No ER09080664. These reliability improvements are independent of the Merger and should be the baseline for determining incremental benefits of the Merger. For the Merger to be a benefit to ratepayers in terms of reliability, the Joint Petitioners should markedly improve upon ACE's reliability and not just continue the positive trends that ACE has already made absent the Merger.

2) The Board should accelerate the Joint Petitioners' proposed merger reliability commitments from 2018-2020 to 2016-2018 to be seamless with the pre-merger RIP obligations.

3) The Board should require a firm commitment that the Joint Petitioners will achieve the merger reliability commitments for SAIFI and CAIDI within existing reliability budgets provided by ACE in response to discovery.

4) In addition to the merger reliability commitments made by the Joint Petitioners, as a condition of the merger, the Board should require the Joint Petitioners to commit to first quartile benchmarking performance

relative to their utility peers within a reasonable time frame to be determined by the Board.

5) The 12.5 to 25 basis point for failure to meet the reliability commitments are not stringent enough for the Joint Petitioners to ensure that its proposed reliability commitments are met. A higher penalty should be imposed and compliance should be determined at an earlier date.

6) It is my understanding the Board is currently contemplating the re-adoption of Chapter 5 of the N.J.A.C. Title 14 which included the electric utility reliability benchmarks. I reserve the right to supplement my testimony once I have received more information about the proposed amendments. At a minimum for the merger to be a positive benefit, the Joint Petitioners should commit to a level of performance that is substantially better than the new benchmark set by the Board.

III. PROPOSED RELIABILITY COMMITMENTS

Q Do the Joint Petitioners claim to demonstrate that there will be no negative impacts to reliability resulting from the Merger?

A. The Joint Petitioners' have claimed that as a result of the merger ACE will meet current reliability commitments and future reliability commitments that will not be measured until 2021, years after the merger has already occurred. The Joint Petitioners have not provided commitments to improve upon ACE's RIP reliability levels reached before the program's end in 2016.

Q. What are Atlantic City Electric's current reliability requirements under New Jersey Regulation?

A. Under N.J.A.C. 14:5-8.9, Atlantic City Electric has two standards: 1) a benchmark standard; and 2) a minimum reliability level for Customer Average Interruption Duration Index ("CAIDI"), the average duration of sustained interruptions per customer during the year; and System Average Interruption Frequency Index ("SAIFI"), the average frequency of sustained interruptions per customer during the year.[1, 2] Under N.J.A.C. 14:5-8.9, the benchmark and minimum requirement values for ACE are the five-year averages (2002-2006) for CAIDI and SAIFI.[3] The benchmark standard is aspirational whereas the minimum reliability level is the standard that must be met by New Jersey's electric utilities. The benchmark standard is used to determine the minimum reliability level.[4] The Board may penalize ACE for not meeting its minimum requirements under N.J.A.C.14:5-1.2 and 14:5-8.12(c).

ACE's minimum requirements are summarized below:[5]

CAIDI: 144 minutes
SAIFI: 1.71

Q. Has Atlantic City Electric always met the standards set by N.J.A.C.?

A. Concerns regarding ACE's reliability performance were one issue in the Company's 2009 base rate case (BPU Docket: ER09080664). From that Rate

[1] New Jersey Administrative Code. §14:5-8.9. Available at: http://www.lexisnexis.com/hottopics/njcode/.
[2] Dickerson, Charles, Page 3, lines 8-11.
[3] New Jersey Administrative Code. §14:5-8.9. Available at: http://www.lexisnexis.com/hottopics/njcode/.
[4] New Jersey Administrative Code. §14:5-8.9. Available at: http://www.lexisnexis.com/hottopics/njcode/.
[5] Atlantic City Electric. Annual System Performance Report 2013. Dated May 30, 2014. Section B1 B2.

Case, the parties (Board Staff, Rate Counsel, and ACE) agreed to enter into a Phase II proceeding (BPU Nos: EO09010049 and EO09010054) to address reliability concerns among other matters as summarized below.[6]

> The fourth issue identified in the April 28, 2010 Stipulation focused on reliability concerns impacting the service quality provided to Petitioner's customers. (Paragraph 5)
>
> The RIP is designed to substantially increase the reliability of the distribution system across ACE's operating area by reducing the frequency and duration of customer outages. (Page 20)

Through discovery and discussions between 2010 and 2011, the three parties agreed upon a 2011 stipulation to implement a reliability improvement plan ("RIP Stipulation") to address reliability improvements that would ensure compliance with BPU standards and improve ACE's reliability performance.[7]

Q. What are the RIP commitments for ACE?

A. Atlantic City Electric's RIP obligations for System Average Interruption Duration Index (SAIDI) and SAIFI are more stringent than required under N.J.A.C. 14:5-8.9 and relative to the Company's 2009 reliability performance.[8, 9, 10] The 2016 RIP targets are SAIFI: 1.30 and SAIDI: 160 minutes (2.67 hours).

For an apples-to-apples comparison of 1) the N.J.A.C. 14:5-8-9 standards, 2) the RIP commitments, and 3) the Joint Petitioners' reliability commitments; I will use

[6] RCR ENG-1. Attachment 1.
[7] RCR ENG-1. Attachment 1. Page 2.
[8] RCR-ENG-1 Attachment 1. Page 19.
[9] Dickerson. Page 4, lines 3-8.
[10] The Reliability Improvement Plan (RIP) detailed the associated distribution spending to meet the more stringent reliability targets.

SAIFI and CAIDI values. Mathematically, CAIDI is equal to SAIDI divided by SAIFI. Thus, I convert the RIP obligations for SAIFI and SAIDI to CAIDI.

ACE's RIP performance metric for CAIDI would be 123 minutes (123=160÷1.3).

Restating the RIP obligations for 2016, they are:

SAIFI: 1.30
CAIDI: 123

As I stated earlier, the RIP commitments are commitments already made by ACE and approved by Board Order in a previous proceeding and is unrelated to the merger.

Q. What are the Joint Petitioners' proposed reliability commitments for Atlantic City Electric post merger?

A. As stated in the direct testimony of Mr. Alden, Exelon has committed Atlantic City Electric to meet the following SAIFI and CAIDI targets excluding major events in 2020.[11] [12]

SAIFI: 1.05
CAIDI: 100

[11] RCR-ENG-6.
[12] RCR-ENG-5.

Q. Will ACE's future reliability commitment be calculated in the same manner as currently calculated?

A. Yes, according to Mr. Alden ACE will use the Board's current methodology for calculating SAIFI and CAIDI.[13]

Q. How do these metrics compare with current reliability standards and ACE's 2011 RIP commitments for 2016?

A. The Joint Petitioners' proposed merger reliability metrics are more stringent than *current* N.J.A.C. 14:5-8.9 minimum reliability requirements and the Company's RIP commitments.

Q. Are these target values for each year starting in 2018?

A. I do not believe so, because the Joint Petitioners have stated that the merger reliability commitments are a three-year average (2018-2020) to smooth out effects such as weather.[14] However, the Joint Petitioners have also indicated that the merger reliability commitments will exclude major events, which address the impacts of severe storms.[15] More importantly, the Joint Petitioners would report to the Board its three-year average no later than April 1, 2021.[16] Thus, the Board will not be able to determine if the Joint Petitioners have achieved their reliability commitment until several years after the Merger is completed, if approved.

Q. If the Joint Petitioners' reliability commitments are more stringent than current standards and commitments, why is there a concern?

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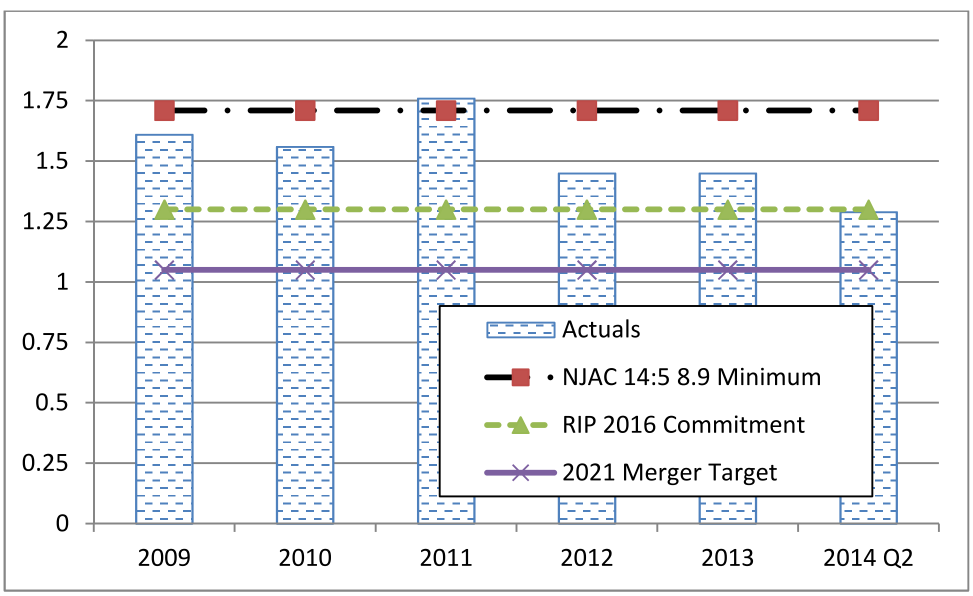
[13] Alden. Page 8, lines 18-19.
[14] Alden, Page 8, lines 13-15.
[15] RCR-ENG-5.
[16] Alden, Page 8, lines 20.

A. Figure MPC 1 and Figure MPC 2 summarize the Company's historical performance relative to current and proposed reliability requirements. Lower CAIDI and SAIFI numbers reflect shorter outage durations and fewer interruptions.[17] The two figures show that even before the announcement of the Merger in April 2014, early indication of ACE's 2014 reliability performance shows that it is meeting the 2011 RIP obligations and, in the case of CAIDI, meeting the Joint Petitioners' 2018-2020 CAIDI commitment. On a SAIFI basis, in the second quarter of 2014, the Company has met its 2016 RIP SAIFI target of 1.3 but still has some work to meet the merger commitment SAIFI target of 1.05. For the Merger to be a benefit to ratepayers in terms of reliability, the Joint Petitioners should markedly improve upon ACE's reliability and not just continue the positive trends that ACE has already made absent the Merger.



[17] Dickerson. 4, lines 1-2.

Figure MPC 1. ACE SAIFI Performance Relative to NJAC 14:5 8.9, RIP Commitment, and Joint Petitioners' 2021 Target

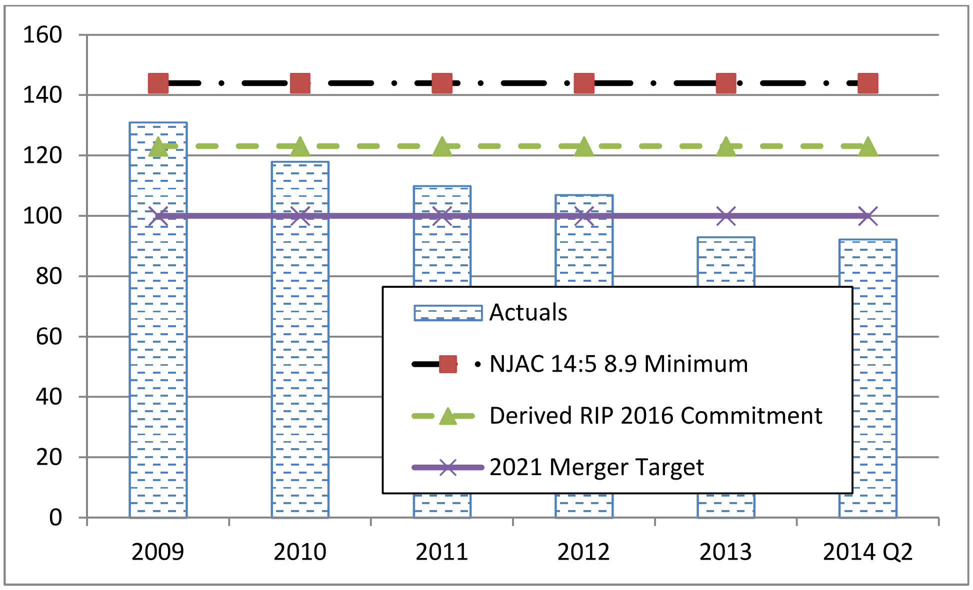


Figure MPC 2. ACE CAIDI Performance Relative to NJAC 14:5 8.9, RIP Commitment, and Joint Petitioners' 2021 Target

Q. Have the Joint Petitioners analyzed how ACE will achieve the Joint Petitioners' reliability commitments?

A. Yes. The Joint Petitioners have analyzed ACE's reliability performance in order to determine the Joint Petitioners' proposed reliability commitments for ACE.[18] That same analysis also compared ACE's future performance goals to 2012 first quartile rankings that I describe in detail below.

[18] RCR-ENG-12 Confidential Attachment 1

Q. Besides reliability commitments for ACE's future reliability performance, are there other measures of reliability performance that the Board may consider?

A. Yes, ACE and the other PHI distribution utilities already rank themselves against peer utilities through benchmarking evaluations that are conducted regularly.[19,20] While I do not have an opinion on the methodology employed by PA Consulting Group, I do note that ACE has participated and provided benchmarking studies conducted by PA Consulting Group for 2009, 2010, 2012, 2013, and 2014.[21]

Q. How does the Company compare to its peer utilities?

A. Although ACE has made strides in reliability improvements relative to its historical performance as shown in the two figures above, the Company still is generally in the bottom 25 percent, or fourth quartile, compared to a peer group of 13 utilities reviewed in a 2014 benchmark analysis for SAIFI and SAIDI, excluding major events and planned outages.[22] While ACE's 2013 CAIDI of 93 minutes places it in the second quartile; first quartile performance of CAIDI was 85 minutes. First quartile SAIFI performance was 0.68 events in the 2014 benchmark study and 61 minutes for SAIDI. The first quartile performance metrics are more stringent than the merger reliability commitments currently proposed and could provide continued reliability improvement.

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[19] RCR-ENG-26
[20] RCR-ENG-27
[21] RCR-ENG-26
[22] RCR-ENG-26 Attachment 5

Q. Do you have any recommendations regarding benchmarking studies?

A. Yes, as a condition for approval of the merger, I recommend that the Board also require that ACE meet first quartile performance metrics relative to its peer group—established through credible benchmarking studies—by 2018. The peer group performance shows that ACE still has much room for reliability improvement when compared to other peer utilities.

Q. What is your recommendation regarding the goal of first quartile performance for ACE?

A. I recommend that the Joint Petitioners provide the Board with an analysis of what reliability performance can ACE currently achieve through its existing reliability related budgets and operation and maintenance expenses and then provide the Board with an analysis of what incremental reliability related capital and operation and maintenance expenses would be required to meet first quartile performance. It is possible that first quartile performance will require additional spending beyond current budgets, but the Board should have some indication if the first quartile goal can be achievable with ACE's current resources.

IV. RELIABILITY RELATED SPENDING AND BUDGETS

Q. Do the Joint Petitioners believe they can meet the merger reliability commitments within existing ACE budgets?

A. Yes, the Joint Petitioners state that the Company intends to achieve its heightened reliability performance goals within existing reliability-related capital budgets.[23] I note that because of the RIP program and the progress ACE has made under it, I believe that meeting the merger commitment made by the Joint Petitioners should not be difficult and in fact with respect to CAIDI, ACE has already met the merger commitment.

Q. Have the Joint Petitioners provided specifics as to how they will meet the proposed merger reliability commitments under existing budgets?

A. There is no complete explanation of how this will be achieved, other than to note that the same programs originally developed by ACE will continue to be implemented. Furthermore, the Joint Petitioners have not currently evaluated how the merger will affect ACE planning and procedures.[24] Witness O'Brien describes some "best practices" that were implemented as a result of the BGE/Constellation merger, but he has not indicated which ones could be applied to PHI specifically at this point.[25]

Q. **What is Atlantic City Electric's actual and projected distribution capital spending?**

A. The Joint Petitioners do not include projected spending in the Joint Petition. Figure MPC 3 shows the Company's historical capital spending based on RCR-

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[23] Joint Petition dated June 14, 2014, Paragraph 31, Page 14.
[24] RCR-ENG-38.
[25] Denis O'Brien testimony, Pages 15-17.

ENG-3 and projected capital budgets for the years 2014-2018 based on the response to RCR-ENG-4. The figure excludes emergency reliability spending.

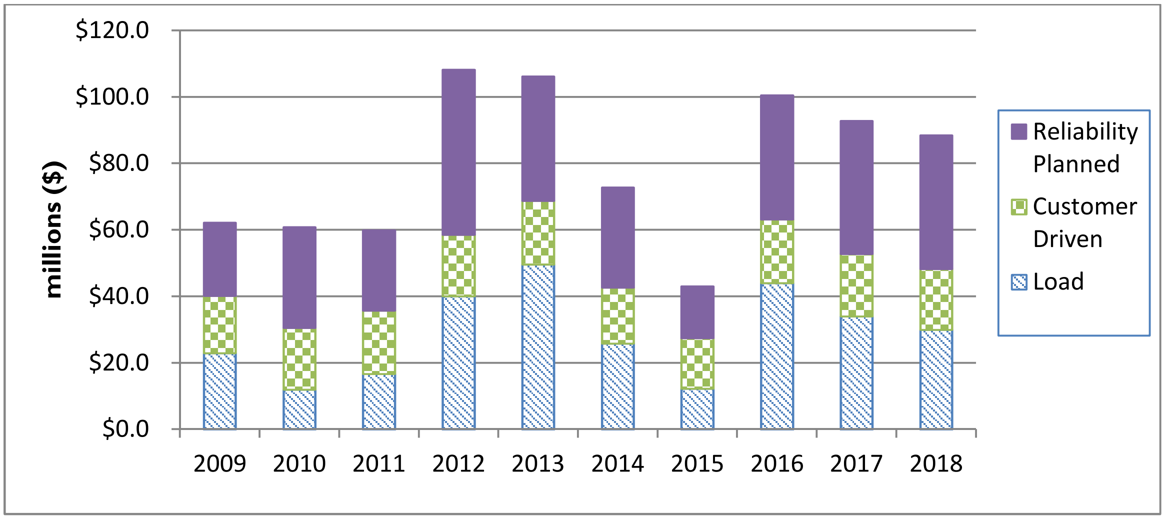

Figure MPC 3. ACE Historical (2009-2013) and Planned (2014-2018) Distribution Capital Budgets Excluding Emergency Budgets

The figure indicates that projected capital budgets will decrease in 2014 and 2015, but then increase in 2016 through 2018. It should be noted that some of the increase in reliability spending in 2012 and 2013 was the direct result of the RIP program stipulation.

Q. Are these budgets adequate to meet Atlantic City Electric's current and future reliability commitments?

A. As previously stated, the Company is committed to meet its RIP obligations in 2016, and merger commitments within existing reliability-related capital budgets. The importance of the proposed budgets is that they represent ACE's commitments **prior** to the merger. The merger reliability commitments should be taken as incremental to existing commitments and should be made with no increase to the existing budget as claimed by the Joint Petitioners.[26, 27]

Q. Do you have some concerns about ACE's historical reliability spending?

A. As part of the RIP stipulation, ACE provided guidance on average spending from the RIP program indicating that the planned five year cumulative capital spending would be $252 million ($286 million less $35 million for vegetation management).[28] ACE's cumulative actual and currently planned reliability and load growth spending (2012-2016) is $341.8 million or $89 million more than the budget guidance that ACE gave in the 2011 stipulation.[29 30]

The Board will have an opportunity to review ACE's distribution spending for prudency in the next rate case.

Q. What is your recommendation with regard to ACE's projected capital budget?

A. The Board should require guarantees from the Joint Petitioners that their proposed reliability commitments for SAIFI and CAIDI will remain within the existing reliability budgets provided by ACE through discovery.

[26] Joint Petition dated June 14, 2014, Paragraph 31.
[27] Crane, Christopher testimony, Page 12, lines 13-15.
[28] RCR-ENG-1. Attachment 1 (Exhibit C Attachment 2 Page 1 of 2).
[29] RCR_ENG-3.
[30] RCR-ENG-4.

Q. Does vegetation management contribute to reliability performance?

A. Vegetation management is a very important component of reliability performance, since tree-related outages accounted for 19 percent of outage events and 23 percent of outage durations for ACE's 2013 performance.[31] For 2013, ACE ranks tree-related outages third for events and first for duration.[32] Understandably, the Company made commitments to improve vegetation management as detailed in the enhanced vegetation management program that was part of RIP.[33]

Q. Do you have some recommendations with regard to vegetation management?

A. ACE has currently budgeted $14.4 million for vegetation management in 2014.[34] In light of the planned reliability-related budgets of approximately $33 million per year (2014-2018), it appears that appropriate vegetation management spending and improvements should play a major role in reducing ACE's current outage events and duration.

Q. Are there other considerations besides capital and expense budgets that could affect Atlantic City Electric's ability to meet its reliability requirements?

A. Yes. In addition to developing adequate budgets to fund ACE's ability to meet its future reliability commitments, ACE will need to maintain adequate staffing in New Jersey to maintain and improve ACE's distribution assets.

[31] ACE 2013 Annual Performance. (2014) (page 23 of 140).
[32] ACE 2013 Annual Performance. (2014) (page 23 of 140).
[33] RCR ENG-1. Attachment 1, (Exhibit C).
[34] RCR-ENG-4.

V. CURRENT AND FUTURE STAFFING

Q. Has the Company provided details regarding future staffing requirements at ACE?

A. The Joint Petitioners have made a two-year commitment not to institute involuntary workforce reductions at ACE.[35] In response to RCR-EMPLOY-14, Exelon indicated that it does not have **current** plans to reduce employment levels at ACE.[36] As described in more detail in Mr. Comings' testimony, the Joint Petitioners have identified anticipated employment reductions, including transmission and distribution operations in the future; they just have not identified where these reductions will occur within the merged entity.

Q. **Related to staffing requirements, have the Joint Petitioners identified the number of personnel that work on overhead lines by age?**

A. Yes, the Joint Petitioners have identified the breakout by age of ACE's personnel who work on overhead lines, including supervisory positions.[37] This information identifies the number of personnel over 51 years old as 45 out of the 160 identified by the PHI.

Q. Why are voluntary reductions important to consider?

A. I note above that the Joint Petitioners have committed to a two-year moratorium on involuntary workforce reduction. However, voluntary reductions still may

[35] Joint Petition dated June 14, 2014, Paragraph 37.
[36] RCR-EMPLOY-14 and RCR-ECON-4.
[37] RCR-ENG-29 (part e).

occur at ACE as individual circumstances warrant. The pool of older employees represents 28 percent of ACE overhead personnel. As I also note above, the Joint Applicants have only indicated that they do not have current plans to reduce employment levels for ACE. However, the Joint Applicants have not affirmed a commitment to a specific level of employment at ACE after the two-year commitment and net of any voluntary attrition. Nor have the Joint Petitioners determined the exact number of reductions that may occur after the two-year commitment.[38, 39] If older employees retire and are not replaced, it may have a negative impact on the Joint Petitioners reliability commitments.

Q. Do you have any recommendations for the Board regarding employment levels?

A. Yes. While the Board should not deter the Joint Petitioners' ability to identify opportunities to improve the reliability and performance of ACE as a result of the merger, the Board should consider options to hold the Joint Petitioners accountable for their proposed reliability commitments so that changes to staffing do not detrimentally impact the Company's requirement to provide safe and reliable service. As example, ACE's current staffing should be maintained for five years as described in more detail in Rate Counsel Witness David Peterson's testimony.

[38] S-ACE-EMP-1
[39] S-ACE-EMP-13

VI. ACCOUNTABILITY FOR RELIABILITY COMMITMENTS

Q. Will the Company commit to a penalty if it fails to meet its 2020 reliability commitments?

A. Yes. The Joint Petitioners have proposed a financial penalty of a 25 basis point reduction in its authorized return on equity ("ROE") in the next base rate case after January 1, 2021 if it fails to meet both requirements.[40] If it fails to meet one of the two reliability requirements, the Board should impose a 12.5 basis point reduction in ACE's authorized ROE.[41]

Q. Is this penalty sufficient?

A. I do not think that a 12.5 to 25 basis point penalty that can only be assessed in the middle of 2021 or almost seven years from today is stringent enough for the Joint Petitioners to ensure that its proposed reliability commitments are met. A higher penalty should be imposed and compliance should be determined at an earlier date.

Q. Can the Board impose additional penalties?

A. Yes. The Joint Petitioners acknowledge that the Board may impose additional financial penalties if ACE fails to meet its reliability commitments.[42]

Q. Why should the Board consider additional penalties?

A. The Joint Petitioners have indicated that the merger will result in synergy savings.[43] This means loss of jobs across PHI, although the Joint Petitioners have

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[40] Kouzami testimony, page 31, lines 4-7.
[41] Kouzami testimony, page 31, lines 16-21.
[42] Kouzami testimony, page 31, lines 7-9.
[43] Kouzami testimony, page 28 lines 12-16.

not identified specific employment losses at the operational level beyond the two-year commitments for ACE employees.[44] Future synergy savings should not come at the expense of the Company's commitment to provide safe and reliable service. The threat of imposing additional penalties provides the Board with leverage to ensure that improved reliability commitments will be guaranteed, since ACE has failed to meet the BPU's reliability requirements in the past and has improved its performance after reaching a stipulated agreement with Rate Counsel and Board Staff.

Q. What requirement should the Board consider to ensure the Joint Applicants proposed reliability commitments will be met?

A. The Board should accelerate the Joint Petitioners' proposed reliability commitments for 2018-2020 to 2016-2018. As I have noted previously, in the second quarter of 2014, ACE has already achieved 1) the 2018-2020 reliability commitment for CAIDI and 2) the 2016 RIP requirements. Waiting for the 2018-2020 reliability commitments will create an unnecessary gap between the 2016 RIP commitments and the proposed merger reliability commitments. The Board should close this commitment gap by accelerating the reliability commitment period to 2016 to ensure that the merger will create positive reliability benefits for ACE's customers.

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[44] Kouzami testimony, page 28, lines 12-13.

VII. FUTURE RELIABILITY REQUIREMENTS

Q. Should the Board consider how its changes in reliability standards impact the Joint Petitioners?

A. Yes. If the Board approves the merger, then ACE will have made two commitments to reliability standards more stringent than N.J.A.C. 14:5-8.9 in the last four years. However, I understand that the BPU is currently considering revisions to N.J.A.C. 14:5-8.9 in a separate proceeding. While it is not known what the future standards for ACE will be, it is known that the revisions to N.J.A.C. 14:5-8.9 may result in more stringent requirements. I reserve the right to supplement my testimony if new regulations are adopted, but in any event the Joint Petitioners should commit to meet even more stringent CAIDI and SAIDI levels than any regulations adopted. The Joint Petitioners' reliability commitments should be compared to the more stringent standards to ensure that the merger will result in a positive benefit for ACE ratepayers.

Q. Does this conclude your testimony?

A. Yes. However, I reserve the right to supplement my testimony subject to further updates to discovery and information provided by the Joint Petitioners.

ATTACHMENT MC 1

QUALIFICATIONS OF

MAXIMILIAN CHANG

Maximilian Chang, Principal Associate

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc., Cambridge, MA. *Principal Associate*, 2013 – present, *Associate*, 2008 – 2013.

Consults and provides analysis of technologies and policies, electric policy modeling, evaluation of air emissions of electricity generation, and other topics including energy efficiency, consumer advocacy, environmental compliance, and technology strategy within the energy industry. Conducts analysis in utility rate-cases focusing on reliability metrics and infrastructure issues and analyzes the benefits and costs of electric and natural gas energy efficiency measures and programs.

Environmental Health and Engineering, Newton, MA. *Senior Scientist*, 2001 – 2008.

Managed complex EPA-mandated abatement projects involving polychlorinated biphenyls (PCBs) in building-related materials. Provided green building assessment services for new and existing construction projects. Communicated and interpreted environmental data for clients and building occupants. Initiated and implemented web-based health and safety awareness training system used by laboratories and property management companies.

The Penobscot Group, Inc., Boston, MA. *Analyst*, 1994 – 2000.

Authored investment reports on Real Estate Investment Trusts (REITs) for buy-side research boutique. Advised institutional clients on REIT investment strategies and real estate asset exchanges for public equity transactions. Wrote and edited monthly publications of statistical and graphical comparison of coverage universe.

Harvard University Extension School, Cambridge, MA. *Teaching Assistant*, 1995 – 2002.

Teaching Assistant for Environmental Management I and Ocean Environments.

Brigham and Women's Hospital, Boston, MA. *Cancer Laboratory Technician*, 1992 – 1994.

Studied the biological mechanism of tumor eradication in mouse and human models. Organized and performed immunotherapy experiments for experimental cancer therapy. Analyzed and authored results in peer-reviewed scientific journals.

EDUCATION

Harvard University, Cambridge, MA
Master of Science in Environmental Science and Engineering, 2000

Cornell University, Ithaca, NY
Bachelor of Arts in Biology and Classics, 1992

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TESTIMONY

United States District Court District of Maine (C.A. No. 1:11-cv-00038-GZS): Declaration regarding the ability of the New England electric grid to absorb the impact of a spring seasonal turbine shutdown at four hydroelectric facilities. On behalf of Friends of Merrymeeting Bay and Environment Maine. March 4, 2013.

State of Maine Public Utilities Commission (Docket 2012-00449): Testimony regarding the Request for Approval of Review of Second Triennial Plan Pertaining to Efficiency Maine Trust. On behalf of the Maine Efficiency Trust. January 8, 2013.

New Jersey Board of Public Utilities (Docket No. GO12050363): Testimony regarding the petition of South Jersey Gas Company for approval of the extension of energy efficiency programs and the associated cost recovery mechanism pursuant to N.J.S.A 48:3-98:1. On behalf of the New Jersey Division of Rate Counsel. November 9, 2012.

Resume dated October 2014