NEW YORK STATE
DEPARTMENT OF PUBLIC SERVICE

In the Matter of a Three-Year Rate Proposal for Electric Rates and Charges Submitted by the Long Island Power Authority and Service Provider, PSEG Long Island, LLC	**Matter No. 15-00262**

INITIAL POST-HEARING BRIEF OF THE CITY OF NEW YORK

Dated: July 20, 2015

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TABLE OF CONTENTS

Page

INTRODUCTION

The City of New York ("City") has multiple interests in this proceeding. The City is a customer of PSEG Long Island LLC ("PSEG"), the service provider for the Long Island Power Authority ("LIPA"), with extensive municipal facilities located on the Rockaway Peninsula. In addition, the City wants to help ensure a reliable, affordable electricity supply for its residents and businesses on the Rockaway Peninsula, while minimizing environmental impacts.

The City regularly intervenes in utility rate proceedings to advocate for safe and reliable service at just and reasonable rates. In this proceeding, the City has focused on the adequacy of storm hardening and resiliency plans being implemented by PSEG and overseen by LIPA. The reason for this focus is simple – in 2012, Hurricane Sandy devastated New York City and Long Island. The storm caused extensive damage to utility infrastructure, and millions of utility customers experienced electric and/or gas service outages in the LIPA, Consolidated Edison Company of New York, Inc. ("Con Edison"), and National Grid service territories. Hurricane Sandy was not the first tropical storm in recent years to have such effects. It was, however, the most severe, and it demonstrated starkly the need to harden utility infrastructure against present and future climate risks.

SUMMARY OF POSITION

The City commends PSEG and LIPA for managing a storm hardening program that maximizes the current funding available through the Federal Emergency Management

Agency ("FEMA").[1] Conditions attached to that funding, however, limit its application to assets damaged by Hurricane Sandy. Although hardening the system in this manner provides a material benefit for customers, it does not constitute either a comprehensive or holistic approach to storm hardening. A broader effort is needed to protect LIPA's electric system against future climate events, and to make its operation more resilient to the impacts of those events.[2]

The City sponsored expert testimony that detailed the vulnerabilities of the LIPA system that will not be addressed by the FEMA Program. Dr. Radley Horton described the climate risks that a comprehensive storm hardening program should address, and discussed the models and climate projections that should inform a more comprehensive storm hardening program. Mr. John Marczewski identified elements of the LIPA electric system that remain vulnerable to climate-related outages but are not being addressed by the FEMA Program. Based on that testimony, the City recommends that LIPA and PSEG expeditiously commence a collaborative process that will analyze the system's need on a holistic basis utilizing the most current climate projections and storm hardening design standards.

Given the need for a comprehensive storm hardening program and the long lead time associated with such a capital program, the City recommends that the collaborative process should start immediately following the active work in this proceeding (*i.e.*, after all briefs have been submitted). At the outset, the parties, led by PSEG and LIPA, should focus on the scope of

[1] PSEG's current storm hardening program consists entirely of investments supported by the FEMA grants (Ex. 91 at 370) and, therefore, is referenced herein as the "FEMA Program."

[2] "Storm hardening" is defined as physical changes to the electric transmission and distribution infrastructure that make it less susceptible to climate-related damage and service outages. "Resiliency" is defined as improving the system's ability to withstand severe weather with fewer outages, and to shorten the time needed to restore service when an outage occurs. This brief conflates these distinct but related concepts into the single term "storm hardening" for ease of reference herein.

the collaborative, including how interested parties can assist PSEG and LIPA to address system vulnerabilities, design standards and storm hardening program enhancements.

Separately, the City as a large energy customer constantly seeks to improve its ability to collect, analyze, and evaluate its energy usage, and to identify opportunities for efficiency gains and cost savings. Accordingly, the City recommends herein certain billing enhancements that would improve the ability of large customers to engage in these activities, which are consistent with core principles of the "Reforming the Energy Vision" ("REV") proceeding pending before the New York State Public Service Commission.[3]

TABLE OF EXHIBITS

On July 6, 2015, the presiding Administrative Law Judges issued the *Hearing Exhibit List* that identified each exhibit submitted for inclusion in the evidentiary record in this proceeding, and assigned an Exhibit Number to those exhibits.[4] The Hearing Exhibit List is available through the Commission's Document and Matter Management System and will not be attached or otherwise reproduced herein. For ease of reference, however, the following list identifies the Exhibits referenced in this brief, and provides the Exhibit Number and "Pre-Filed Designation," as follows:

Exhibit No.	DMM No.	Pre-Filed Designation	Description
90	87	Exhibit__[JJM-2.1]	Direct Pre-Filed Exhibits of John J. Marczewski[5]

[3] Case 14-M-0101, *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision*.

[4] Matter No. 15-00262, *In the Matter of a Three-Year Rate Proposal for Electric Rates and Charges Submitted by the Long Island Power Authority and Service Provider, PSEG Long Island LLC*.

[5] Exhibits 90, 91, and 92 are a single Exhibit consisting of 731 consecutively-numbered pages that was split into three separate documents for electronic transmission and filing. Thus,

91	87	Exhibit__[JJM-2.2]	"
92	87	Exhibit__[JJM-2.3]	"
94	87	Exhibit__[RH-2]	Direct Pre-Filed Exhibits of Radley Horton
95	87	Exhibit__[RH-3]	"
96	87	Exhibit__[RH-4]	"
97	87	Exhibit__[RH-5]	"

BACKGROUND

On October 29, 2012, Hurricane Sandy struck Long Island and New York City with a storm surge consistent with a Category 3 hurricane, and wind speeds consistent with a Category 1 hurricane. (Tr. 888.) The effects of the storm were devastating. Hurricane Sandy damaged tens of thousands of homes and businesses on Long Island. (Tr. 59.) It wreaked havoc on utility infrastructure, causing electric service interruptions to 97% of the 1.1 million LIPA customers (representing a total population served of approximately 3 million people). (Tr. 49-50, 58-59.) Outages for many customers persisted for approximately 14 days before electric delivery service was restored. (Tr. 59; Ex. 91 at 368.)

Although the impacts of Hurricane Sandy were severe in many areas of Long Island, the impacts could have been worse in other areas. Hurricane Sandy hit the western Long Island Sound at low tide, which attenuated the impact on Northern Queens and other locations located on the Sound.[6] If Hurricane Sandy instead had struck at high tide, the peak water level at King's Point, for instance could have increased by four feet (29%) as compared to the peak water level actually recorded during the storm.[7] Changes in other climate variables – *e.g.*, storm speed,

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Exhibit 90 is paginated 1 through 250; Exhibit 91 is paginated 251 through 500; and Exhibit 91 is paginated 501 through 731.

[6] *PlaNYC: A Stronger, More Resilient New York* ("Resiliency Report") at 21, *available at* http://www.nyc.gov/html/sirr/html/report/report.shtml.

[7] *Id.*

trajectory, wind speed, rainfall, and temperature – would have resulted in a much different distribution of damaged assets. (Tr. 145.)

Hurricane Sandy was the latest in a succession of storms, including Hurricane Irene and Tropical Storm Lee, that caused over 1.5 million power outages statewide and demonstrated the pressing need to harden utility infrastructure against severe weather. Acknowledging that the "sustained disruption of the power supply and its cascading damage to other critical systems … jeopardized the health and safety of New Yorkers and undermined public confidence in the public utility service system," Governor Cuomo issued an Executive Order establishing a commission under the Moreland Act (the "Moreland Commission").[8] The Moreland Commission investigated issues including utility preparation for major storms and recommended specific actions to reform how utilities prepare for and respond to those emergencies.[9]

The Moreland Report also advanced numerous, specific recommendations to improve LIPA's preparation for and response to severe weather, including the general recommendation that "[a]n analysis of existing utility storm hardening practices and the dire need for investment in the state's utility infrastructure …" should be conducted.[10] Further, the Moreland Commission recommended that "utilities harden their systems by prioritizing investments in infrastructure to be more resilient to the ever-increasing threat of severe

[8] Moreland Commission on Utility Storm Preparation and Response, Final Report (issued June 22, 2013) at 93-95 ("Moreland Report"), *available at* http://www.governor.ny.gov/sites/governor.ny.gov/files/archive/assets/documents/MACfinalreportjune22.pdf.

[9] *Id.* at 93-96.

[10] *Id.* at 9.

weather."[11] All "funding mechanisms and efficiencies available to support electric infrastructure hardening investments" were to be considered in those efforts.[12]

The criticality of ensuring that the State's utility infrastructure is hardened against climate risks has gained increasing attention and now is embedded in State and City energy policy. The 2015 State Energy Plan explains that "[r]eliability is a central objective of the State's energy system. Power outages across the country are lasting longer, resulting in greater economic losses each year. The growth of the digital economy means that even momentary blackouts can have significant impacts on businesses and residents."[13] The Energy Plan further states that "resiliency is a prerequisite to the reliability of our energy system."[14] In *One New York: The Plan for a Strong and Just City*, the City commits to adopt policies to support infrastructure adaption.[15]

LIPA Storm Hardening Efforts

Well before Hurricane Sandy and the tropical storms that preceded it impacted Long Island, LIPA commenced a 20-year, $500 million storm hardening program. (*See, e.g.*, Ex. 91 at 495.)[16] The framework of this initiative seemingly addressed all aspects of the LIPA transmission and distribution ("T&D") system, if implemented fully over the 20-year period. With an annual average spend of approximately $25 million, however, planned budgets were

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[11] *Id.* at 13.

[12] *Id.* at 40.

[13] *The Energy to Lead: 2015 State Energy Plan, Volume 1*, New York State Energy Planning Board (issued June 2015) at 12 ("State Energy Plan").

[14] *Id.* at 13.

[15] *One New York: The Plan for a Strong and Just City*, the City of New York, Mayor Bill de Blasio (issued April 2015) at 242.

[16] A consultant to LIPA estimated that it would cost approximately $3 billion to deploy all storm hardening measures identified by the consultant. (*See* Ex. 91 at 439-70.)

insufficient to drive the scale and speed of deployment needed to address present climate threats to the utility's infrastructure. (Tr. 840-41.) Thus, although those investments provided an incremental hardening and resiliency benefit, the system remained vulnerable to the effects of Hurricane Irene, Tropical Storm Lee, and Hurricane Sandy. In fact, questions were raised as to whether LIPA's storm hardening program adequately responded to the climate threats it was intended to address.[17]

As noted earlier, PSEG currently is focused on storm hardening projects supported by a FEMA grant. Specifically, FEMA awarded PSEG grants of approximately $705 million to restore the system following Hurricane Sandy, and approximately $730 million to harden specific assets damaged by that storm. (Tr. 837; Ex. 91 at 372.) PSEG explained that the former award was designated to reimburse LIPA for costs incurred restoring (but not hardening) the system in the aftermath of Hurricane Sandy, whereas the latter award was designated to reimburse five classes of storm hardening projects that target "very specific elements of the Long Island electric system" damaged by Hurricane Sandy. (Tr. 837; Tr. 1450-51.) Subject to this limitation and the other terms and conditions of the FEMA grant, the FEMA money is being used to elevate substation components, harden mainline distribution overhead lines, install up to 1,350 automated switching units ("ASUs"), harden certain distribution lines, and replace a "limited number" of transmission poles. (Tr. 837, 1450-51.) PSEG's storm hardening activities currently focus exclusively on projects supported by the FEMA grant. (Ex. 91 at 370.)

[17] *See, e.g.*, Matter 12-00314, *Comprehensive Management and Operations Audit of Long Island Power Authority*, Final Report (dated September 13, 2013) at 16-16 to 16-17 (finding that "LIPA has not appropriately incorporated lessons learned from storms into its storm hardening program in order to minimize the potential effects of major storms," and "LIPA should be more diligent in implementing storm hardening initiatives identified by major storms").

ARGUMENT

This brief is organized around the consensus Table of Contents distributed by the presiding Administrative Law Judges. The City expresses no position herein on many of the issues identified on the Table of Contents, but reserves the right to address those matters in response to positions advanced in the Initial Briefs of other parties.[18] The City's silence on those issues should not be construed as assent to or agreement with any particular recommendation advanced by any other party in this proceeding.

I. Overview and Revenue Requirement

i. Proposed Storm Hardening Collaborative

In the following sub-sections, the City describes the climate risks that threaten the reliable operation of LIPA's T&D system and explains why PSEG's current efforts are inadequate to address those risks. Based on these conclusions, in the final sub-section, the City recommends that LIPA and PSEG commence a stakeholder collaborative that is modeled on the Con Edison Storm Hardening and Resiliency Collaborative to review current investments and design standards and consider future hardening and resiliency projects that should be implemented. This effort should include the development of a climate vulnerability study, similar to the one developed for Con Edison, that would be used to inform the design and implementation of storm hardening investments.

a. Reliable Operation of LIPA's T&D System Already Is Threatened By A Variety of Climate Risks

LIPA customers periodically experience electric service interruptions caused by severe storms including, but not limited to, hurricanes and tropical storms. These events impact

[18] Matter No. 15-00262, *supra*, Ruling Confirming Briefing Schedule (issued June 29, 2015).

the system in multiple ways. Coastal and inland flooding may result from heavy rain, and coastal flooding also may be caused by the storm surge associated with a coastal storm. Strong winds can topple or otherwise move equipment, and may increase the risk that water (rain) will penetrate energized assets. Increased ambient temperatures reduce the ability of electric system assets to dissipate heat. This can lead to overheating and equipment failure, a risk that increases substantially when high temperatures persist for an extended period of time (for instance, during a heat wave).

From 2010 through 2014, LIPA/PSEG customers experienced regular and extensive climate-related service interruptions. The following table presents the number of LIPA customers interrupted by those events, and the minutes of interruption, from 2010 through 2014:

Table 1. Summary of Climate-Related Outages from 2010-2014.[19]

Year	Climate Event	Customers Interrupted	Interruption (minutes)
2010	**Severe Storm**	492,630	107,364,383
	Winter Storm	84,431	13,032,699
	Heat	47,155	6,157,709
2011	**Severe Storm**	311,701	31,456,447
	Winter Storm	32,117	3,655,928
	Heat	62,784	10,479,813
2012	**Severe Storm**	395,876	49,331,907
	Winter Storm	7,369	544,105
	Heat	12,675	1,033,356
2013	**Severe Storm**	231,292	34,863,747
	Winter Storm	69,367	18,075,443

[19] The information presented on Table 1 was derived from Ex. 91 at 362-66. The "Severe Storm" category summed data for all climate events described as including rain, wind, and thunderstorms/lightning, including events that also are described as being characterized by high temperatures. The "Winter Storm" category summed data for all climate events described as including blizzard-like conditions, snow, sleet, ice, and freezing rain. The "Heat" category summed data for all climate events described as heat and humidity, heat storm, severe heat event, or sustained extreme heat event, exclusive of events that also included the descriptions listed above in the "Severe Storm" category. "Customers Interrupted" and "Interruption (Minutes)" were calculated by summing data for each climate event included in the Severe Storm, Winter Storm, and Heat categories.

	Heat	93,395	8,189,216
2014	**Severe Storm**	173,999	21,756,088
	Winter Storm	51,504	5,365,914
	Heat	0	0

Although the extent of service interruptions is variable from year to year, it is clear that LIPA customers already are experiencing substantial outages due to severe weather.

b. The FEMA Program Is Important But Will Not Adequately Protect The Electric System Against Present And Future Climate Risks

The FEMA Program being carried out by PSEG is focused on administering a federal grant that provides funding to harden a portion of LIPA's electric system damaged by Hurricane Sandy. This limited focus is dictated by grant terms that restrict hardening investments to the following measures for assets damaged by Hurricane Sandy: (a) elevation of substation equipment; (b) strengthening of select mainline distribution circuits; (c) installation of up to 1,350 ASUs; and (d) strengthening damaged transmission lines to resist damage from 130 mph winds. (Tr. 1450-51.)

System vulnerability to future climate events cannot be determined solely with reference to the assets damaged by past storms. A future storm of comparable or greater intensity to Hurricane Sandy would result in a different distribution of damaged system assets. (Tr. 845.) LIPA and PSEG agree. (Tr. 61-62, 145-46.) The City agrees that assets damaged by Hurricane Sandy should be repaired or replaced, and the City fully supports PSEG's efforts under the FEMA Program. However, other assets remain vulnerable to the winds and flooding associated with a Category 3 hurricane, and LIPA's system also is vulnerable to heat-related outages. The record in this proceeding exposes deficiencies in PSEG's storm hardening efforts, and are detailed below.

1. Transmission System

After reviewing a comprehensive approach to storm hardening recommended by its consultant (Navigant Consulting ["Navigant"]), LIPA previously decided to implement a number of transmission system hardening projects that were designed to withstand a Category 3 hurricane.[20] That initiative seemingly was more expansive than the transmission hardening projects embedded in the FEMA Program, and included projects such as the installation of alternative cable types that are more resistant to severe weather, and selective undergrounding. (Ex. 91 at 448-49.)

A much smaller set of transmission hardening measures are being deployed under the FEMA Program. When transmission poles need to be replaced, PSEG installs a larger pole that is better able to withstand the design reference storm. Transmission poles installed in flood zones are buried a foot deeper, larger poles are used when replacements are needed, and other measures are installed on lines that traverse rights-of-way and Long Island Rail Road lines. (Tr. 849.) New lines also are designed to withstand Category 3 hurricane winds (*i.e.*, 130 mph). These measures generally were included in the larger program previously considered by LIPA.

Mr. Marczewski testified that more extensive hardening investments are needed for the transmission system. For example, all poles on a transmission line ultimately must be replaced and/or hardened to avoid "weak links" along the line's route. (Tr. 849-50.) Some transmission lines may be located on multiple circuit structures, thereby creating a risk that damage to a single structure could give rise to multiple circuit outages. (Tr. 850.) PSEG should mitigate this risk by examining the costs and benefits of separating such lines onto their own

[20] Ex. 91 at 430. The Trustees apparently adopted Navigant's recommendations in large part. (*See* Ex. 91 at 423-36 [presenting LIPA's "Policy and Program Summary" for withstanding severe storms, which presents initiatives that are substantially similar to those recommended by Navigant].)

structures (Tr. 850), and separating them in this manner where it would be cost-effective to do so.

In general, aside from approximately $5 million designated for the hardening of certain transmission lines (Tr. 1450), there seemingly are *no* plans to harden the transmission system (including the 69 kV system that serves the Rockaway Peninsula). (Tr. 850.) This represents a major deficiency that needs to be cured. To put the current investment level in context, Navigant estimated that the transmission hardening projects it recommended would cost approximately $70 million. (Ex. 91 at 450.) Although the City expresses no opinion as to whether Navigant's estimate is appropriate, it illustrates that the scope of investment needed to harden the electric transmission system is substantially larger than the $5 million provided by the current program.

2. Substations

The FEMA grant provides funding of up to $9.82 million to elevate substation equipment damaged by Hurricane Sandy. (Tr. 1450.) These investments are appropriate and should be completed, but they also are inadequate to address all substation hardening measures that can and should be implemented. For instance, LIPA previously adopted a more expansive substation hardening scope of work recommended by Navigant that also included (i) circuit breaker upgrades, (ii) substation rebuilds to incorporate flood-resistant design, (iii) modified fences to withstand stronger wind and protect against flying debris, and (iv) hardening of control houses and outdoor control equipment to withstand high winds, rain, and flooding.[21] The City agrees that these measures should be considered for implementation at all substations on a site-specific basis, but they apparently are outside the scope of the FEMA grant. (Tr. 853.)

[21] Ex. 91 at 431. New substations will avoid flood zones and be designed to withstand Category 3 hurricane force winds. (Tr. 851-52.)

A comparison of budgets for illustrative purposes shows that Navigant estimated the foregoing substation projects would cost approximately $150 million. The City does not endorse this estimate, but provides it for illustrative purposes to demonstrate the substantial gap between the current substation hardening investment level, and the investment level previously considered by LIPA.

PSEG's existing storm hardening program should be expanded to better satisfy the need for substation hardening. Initially, all critical substation equipment, generally, and all energized equipment, specifically, should be elevated to a height that reflects a sufficient freeboard to protect the equipment from future floods. (Tr. 853.) (As discussed below, PSEG should adopt and apply a uniform freeboard standard.) The projects previously considered by LIPA (and, potentially, other hardening measures) should be evaluated for implementation under the modified program, and the proposed collaborative should examine the plans for substation hardening.

Substations on the Rockaway Peninsula are served by 69 kV transmission and 33 kV subtransmission circuits that originate off the Peninsula. (Tr. 858.) Outages at substations neighboring those located on the Rockaway Peninsula potentially could impact supply to substations located on the Rockaway Peninsula. (*Id.*) The Rockaway Peninsula also has a limited ability to diversify its transmission and subtransmission supply connections. (Tr. 859.) For these reasons, it is imperative that the existing supply lines to the Rockaway Peninsula be hardened to the extent practicable. (Tr. 859.)[22]

At least three design standards must be applied to substation hardening projects. First, critical equipment should be raised to a height that is based on uniform standards and the

[22] Mr. Marczewski offered several recommendations as to how this hardening could be accomplished. (*See* Tr. 859-60.)

best climate data available. However, PSEG is not relying on the most up-to-date flood maps for all projects. (Tr. 854.) For each substation hardening project that was not designed in reliance on the latest flood map, PSEG should evaluate whether additional elevation is needed to protect against the updated design flood level plus an incremental safety margin. (Tr. 854.) The City is particularly concerned that the Arverne substation in the Rockaway Peninsula was rebuilt before the latest FEMA flood data was available. Equipment elevations at Arverne should be examined in the context of current flood data and, if that data implies an elevation level above the standard applied at Arverne, then PSEG should evaluate the cost and benefit of incremental work to meet that standard. (Tr. 854.)

Second, PSEG's substation hardening projects include elevating equipment and installing flood control walls but do not adequately account for the uncertainty of future flood levels. In general, project designs should compensate for this uncertainty by incorporating a design safety margin, or freeboard, above the reference flood level that is implemented uniformly. Substation projects planned or completed by PSEG, however, reflect an inconsistent freeboard standard among projects located within a substation, as well as projects located across multiple substations. (Tr. 854-55.) This inconsistency is inappropriate and provides no confidence that equipment elevation projects will be adequate to protect the targeted assets against future flooding. A lack of a consistent freeboard standard also could lead to stranded investment if equipment replaced due to Sandy is damaged again because it was not properly elevated. Instead, uniform design safety margin should be adopted for all equipment elevation projects and flood control walls, unless there is a physical constraint or compelling circumstance to deviate from that standard. (Tr. 855.)

Finally, it is imperative that all critical substation equipment be elevated to protect against flood water inundation. This includes, at a minimum, all energized assets. (Tr. 856.) It is not clear whether all critical equipment at the Company's substations has or will be elevated. To the extent that this essential work remains outstanding, PSEG expeditiously should complete it.[23] Importantly, elevation as a flood control measure is preferable to installing a flood control wall because the latter can fail. (Tr. 856-57.)

3. Distribution System

The vast majority of FEMA funding – approximately $640 million (86.5%) – is designated for strengthening select mainline distribution circuits damaged during Hurricane Sandy. (Tr. 1450.) This work includes adopting a narrow profile construction for certain distribution poles, and installing new poles that are larger and buried to a greater depth. (Tr. 861.) FEMA also awarded approximately $74.3 million for PSEG to install up to 1,350 ASUs. (Tr. 837, 861, 1450.) Notwithstanding the magnitude of these investments, the work is narrowly-focused, does not constitute a comprehensive hardening initiative, and will not provide upgrades for distribution circuits undamaged by Hurricane Sandy. (Tr. 861-62; Ex. 91 at 402-03.)

LIPA previously adopted a more expansive distribution hardening program that included, for instance, the installation of spacer cable in heavily treed areas, selective undergrounding, and certain projects designed to protect distribution equipment from storm surge damage.[24] The City supports the ongoing investments and believes that Navigant's recommendations should be re-examined for potential implementation in the short-term. These

[23] For instance, City witness Mr. Marczewski recommended several projects that should be completed as part of a comprehensive effort to harden LIPA's substations.

[24] Ex. 91 at 430-36.

projects will benefit the distribution system to a degree commensurate with the deployment of those assets.

PSEG's distribution hardening program also should be modified to include certain measures that commonly are deployed by other utilities. The distribution hardening program initially approved by LIPA, for instance, included the deployment of alternative cable types that are more resistant to severe weather. Consistent with that decision, PSEG should install aerial cable and insulated tree wire where it would be appropriate and cost-effective to do so. (Tr. 862-63.) Aerial cables essentially are the cable used for underground installations that instead are secured to a messenger wire and suspended from poles. (Tr. 864.) This configuration has a narrow profile that resists outages caused by tree contact, and also may be deployed on roadside transmission lines at 33 kV and below in heavily treed areas. (*Id.*; Ex. 91 at 433.) Tree wire is a partially-insulated conductor covered with a material that resists physical wear and withstands tree contact. (Tr. 865.) It is useful in overhead distribution line applications, and could be deployed cost-effectively in areas at greater risk of tree-related outages. (*Id.*) PSEG should evaluate the benefits and cost of these options in the proposed collaborative, giving special consideration to installations on lines that serve critical services. (*Id.*)

4. Transmission Interfaces

Transmission tie lines and their associated remote-end connections from other utilities or control areas enable the exchange of economic energy under normal operating conditions, and provide emergency assistance if needed in response to outages on other parts of the system. (Tr. 866.) LIPA's electric system is relatively isolated from its neighbors, and the transmission interfaces can supply a material amount of LIPA's load. (*Id.*) The tie lines also can

provide import capacity from neighboring systems when a localized storm or other event interrupts the availability of generation on Long Island

The LIPA electric system connects to multiple adjacent utilities and control territories. (Tr. 867.) These interfaces include connections that terminate in substation facilities located in areas that are at risk of coastal flooding. (*Id.*) LIPA is connected to the Con Edison system via two phase angle regulator-controlled tie points, with transmission interfaces that are vulnerable to severe weather. (*Id.*) PSEG and LIPA should discuss the implementation of hardening measures with the owners of assets located across those interfaces (Tr. 867-68), but no such effort is underway. (Ex. 91 at 488.)

Importantly, LIPA has acknowledged the need to harden major interconnections to other power systems, and that those interconnections can provide additional flexibility that improves system durability and resilience. (Ex. 91 at 429, 561.) LIPA initially committed to working closely with the entities that own assets on the other side of transmission interfaces "to ensure that adequate programs are in place to protect these facilities from severe storm damage and to restore these systems in the event of damage." (*Id.* at 429.) This was not carried forward to the FEMA Program. LIPA and PSEG should be directed to examine potential means for hardening the transmission interfaces as part of the collaborative recommended by the City.

c. PSEG's Storm Hardening Program Must Include The Most Current Assumptions Regarding Sea Level Rise and Coastal Flooding

Extending 118 miles in length with a maximum north-to-south distance of 23 miles, Long Island has an extensive coastline bordering the Long Island Sound and the Atlantic Ocean. The topography of Long Island generally is low lying and susceptible to extensive flooding from coastal storms. (Ex. 91 at 427.) LIPA has estimated that the storm surge associated with a Category 1 hurricane could flood a large portion of the south shore of Long Island, as well as both sides of the north and south forks. (*Id.*) The storm surge from a Category 3 hurricane could cause more severe flooding along the south shore while inundating the north and south forks. (*Id.*)[25]

The sea around Long Island is rising. Based on current climate models, the coastal region is projected to realize sea level rise of 2 to 10 inches by the 2020's, 8 to 30 inches by the 2050's, and 13 to 58 inches by the 2080's. (Tr. 882.)[26] Rising seas will increase the frequency and intensity of coastal flooding events in the future and also may increase rainfall-induced flooding. (Tr. 882-84.) It also will expand the region at risk of flooding. These changes will manifest in multiple ways.

Sea level rise will increase the probability that a 100-year or 500-year flood will occur in any given year, and will increase the potential flood level associated with those events. (Tr. 883-84.) Most definitions of the 100- and 500-year floods have treated the probability of

[25] The storm surge associated with a tropical storm "is a dome of water 40 to 60 miles long that moves onto the shoreline near the landfall point of the eye of a hurricane. A cubic yard of sea water weighs approximately 1,700 pounds. As this water is constantly slamming into shoreline structures, even well-built structures quickly get demolished. As the waters move inland, more debris floats along with it causing further damage. Storm surge is responsible for nearly 90% of all hurricane-related deaths and injuries." (Ex. 91 at 427, n.2 [citation omitted].)

[26] Under the "worst case" scenario, sea level could rise as much as six feet by 2100. (Tr. 882.)

occurrence as constant through time, and thus do not reflect future sea level rise. (*Id.*) Climate change, however, is increasing the probability that these events will occur, as well as increasing the extent and depth of flooding associated with those events. (Tr. 884.) The impact of sea level rise similarly is omitted from the flood maps that widely are used to inform a variety of investment, insurance, regulatory and other decisions, including storm hardening investments. For these reasons, a design safety margin is needed to account for variability and uncertainty in estimates of future flood levels.

As it relates to sea level rise and coastal flooding, PSEG explained that relevant storm hardening projects (*i.e.*, equipment elevation) rely exclusively on sea level rise projections developed by Worley Parsons, a third party consultant to PSEG's predecessor-in-interest as the LIPA system operator, as presented in reports provided to the Company in December 2013. (*See* Ex. 97 at 3-57 and 58-91.) Importantly, however, the Worley Parsons reports rely on outdated and inadequate climate projections that are unreliable to serve as the basis of a storm hardening design standard.

Worley Parsons developed sea level rise projections that were used to inform the storm hardening project design standards that should be adopted for equipment elevation projects and related efforts to protect the system against future flood events. (Ex. 97 at 13.) In preparing their estimates, Worley Parsons relied on the climate projections presented in the ClimAID 2011 study prepared by City witness Dr. Horton and colleagues. (Tr. 894; Ex. 97 at 13.) ClimAID 2011 presented two sea level rise scenarios that reflected a range of possible outcomes, but Worley Parsons considered only the lower of the two scenarios without explaining or justifying this decision. (*Id.*) Worley Parsons also failed to model a scenario that studied the relationship between sea level rise and an increased rate of melting ice. (*Id.*) Refined climate models that

reflect improved awareness of environmental inputs that impact sea level rise, including observations of an acceleration in the melting of land ice, were developed after the Worley Parsons reports were completed; those reports have not been updated to reflect current climate projections.

The credibility of Worley Parsons' analysis is undermined further by its reliance on unsound analytical methods. Worley Parsons developed a short duration sea level trend analysis projection based on "Historic SLR Data" from 1964-2006, and "Recent SLR Data" recorded from 2006-2013. (Ex. 94 at 15; Tr. 894.) Short duration trends are highly-sensitive to natural variability and, therefore, generally are unreliable. (Tr. 894.) Extrapolating future projections of sea level rise from a historical linear trend also is inappropriate because the method cannot account for the accelerating rate of sea level rise caused by the accelerating rate of land ice melting. (Tr. 896.) Worley Parsons did not explain why it settled on these unsound methods to project future sea level rise for purposes of its analyses.

Noting that typical substation equipment has a 40-year lifespan, Worley Parsons recommended that a sea level rise of 8 inches be adopted for planning purposes. (Tr. 895; Ex. 97 at 57.) This effectively assumes that Long Island will realize only 8 inches of sea level rise by the mid-2050's. (Tr. 895.) In contrast, projections from current climate models indicate that Long Island may realize sea level rise of up to 30 inches over the same time period. (*Id.*) This estimate may be conservative, depending on how the melting of glacial ice accelerates over time. (*Id.*) A design standard for storm hardening projects should not be based on the lowest available projection of sea level rise. (*Id.*)

In sum, the Worley Parsons reports "do not reflect the current state of climate science…" (*id.*) because: (a) they do not consider advances in climate science since the ClimAID

2011 study issued; (b) they assume only a low-end scenario of potential sea level rise without considering the possibility of rapid ice melt; and (c) the sea level rise projection recommended by Worley Parsons is derived by projecting into the future a linear extrapolation of historic data, which is not a reliable and appropriate method. (Tr. 895-96.) Dr. Horton concluded that, for all of the foregoing reasons, the sea level rise projections presented in the Worley Parsons reports are "inaccurate, stale, and unreliable." (Tr. 896.)

PSEG stated that the Worley Parsons reports were "prepared with the best available data at the time." (Ex. 97 at 1-2; Tr. 897.)[27] PSEG, however, presently does not intend to update Worley Parsons' analyses, although the Company would update the sea level rise projections if "the conditions change" or "if better data becomes available." (Tr. 147.) Dr. Horton's testimony details the changed conditions and "better data" that have become available since Worley Parsons completed its report. It therefore is time for the analysis to be updated.

Several actions are needed to remedy measures deployed in reliance on Worley Parsons' sea level rise projections. First, PSEG should review all equipment elevation and other storm hardening projects that relied on those projections to assess whether the underlying design standards are adequate in comparison to current projections of sea level rise. (Tr. 897.) If the project design standard is found to be inadequate, then PSEG should evaluate the benefit and cost of incremental equipment elevations that reflect current climate projections of sea level rise. This review should be conducted as part of the storm hardening resiliency collaborative recommended below.

[27] The foregoing discussion also demonstrates that the Worley Parsons reports were not, in fact, "prepared with the best available data at the time."

d. PSEG's Storm Hardening Program Should Address System Vulnerability to Ambient Temperature and Heat Waves

The region encompassing Long Island and New York City is anticipated to realize a significant increase in the ambient temperature as this century progresses.[28] Temperature increases are projected to range from 1.5º F to 3.2º F by the 2020's, 3.1º F to 6.6º F by the 2050's, and 3.8º F to 10.3º F by the 2080's. (Tr. 878.) In practical terms, these changes will cause mean temperatures on western Long Island to resemble those currently experienced in cities like Raleigh, North Carolina or Norfolk, Virginia. (Tr. 879.)

Long Island is expected to experience more individual days of extreme heat as well as a general increase in ambient temperatures throughout the year. (Tr. 880.) Climate models currently estimate that the number of days per year at or above 90º F is projected to increase from 18 to 24 to 33 days by the 2020's, 32 to 57 days by the 2050's, and 38 to 87 days by the 2080's. (Tr. 880.) The models further indicate that the annual number of heat waves is likely to increase from 2 per year, to 5 to 9 per year by the 2080's. (*Id.*)

LIPA's electric system indisputably is vulnerable to heat-related outages. Multiple heat-related service interruptions occur virtually every year (*see* Table 1, *supra*, and Ex. 91 at 362-66), and climate models project that the frequency and intensity of these events will increase as the century progresses. (Tr. 880.) The FEMA Program, however, does not address system vulnerability to heat-related outages. (Ex. 91 at 407.)

Further, PSEG does not consider projected temperature increases when designing storm hardening projects. (Tr. 890.) PSEG claims that it relies on a temperature/humidity metric

[28] For ease of reference, modeling results will be discussed in the context of potential changes in Long Island climate, although similar changes are anticipated to occur on a broader geographic scale.

to inform investment decisions regarding storm hardening projects (Ex. 91 at 418-19), but the metric is based on a weather normalization that relies exclusively on 30 years of historic climate data. (Tr. 891.) Storm hardening projects should be designed to withstand future climate conditions, which includes increasing ambient temperatures and heat waves that exceed the current events that interrupt electric service to customers. City witness Dr. Horton explained that "[d]esigning utility systems to meet the demands of the historic climate could leave the system vulnerable to the demands of a future climate that is projected to be characterized by higher average ambient temperatures and heat waves of greater frequency, duration and intensity." (Tr. 892.) A design standard that accounts for the risk of future ambient temperature increases and more frequent heat (and intense) heat waves is needed. The proposed collaborative should examine this issue, and develop a recommendation for PSEG's consideration.

e. LIPA/PSEG Expeditiously Should Convene a Stakeholder Collaborative to Review Current and Future Storm Hardening Investments, and to Consider Future Climate Risks

The City commends LIPA for initiating storm hardening and resiliency investments well before the devastation of Hurricane Sandy demonstrated the pressing need for those investments. LIPA and PSEG also should be commended for refocusing the storm hardening program to capture the full benefit of federal funding made available after Hurricane Sandy. Those investments will benefit many customers by improving the resiliency and reliability of LIPA's system.

Nevertheless, the record here clearly reveals the substantial deficiencies inherent in the FEMA Program. These deficiencies result in substantial blocks of LIPA's electric system remaining at a comparatively heightened risk for climate-related outages. Immediate action should be taken to address these vulnerabilities.

The Commission recently explained that the purpose of a storm hardening collaborative is to provide a forum for the analysis of "the potential impacts of climate change on [utility infrastructure] and to afford the parties the opportunity to provide input to the Company to assist in these efforts."[29] Mr. Marczewski and Dr. Horton recommended that PSEG expeditiously commence a storm hardening and resiliency collaborative that adapts the ongoing Con Edison collaborative to PSEG's storm hardening program. (Tr. 844-49.) The City has participated actively in Con Edison's collaborative and found it to be highly productive, and it provides a template for a collaborative here.

On January 25, 2013, Con Edison filed electric, gas, and steam rate cases with the Commission.[30] One result of the electric rate proceeding was that Con Edison convened a stakeholder collaborative to consider the storm hardening proposals advanced by the utility and stakeholders, and to examine alternative resiliency options (*e.g.*, microgrids, on-site generation, and energy efficiency).[31] Additional areas of inquiry were identified by the stakeholders participating in the collaborative process.[32]

The work of Con Edison's Collaborative is proceeding in annual phases that culminate in the filing of a Annual Report with the Commission. The Commission reviews the Annual Report and comments by parties prior to determining the extent to which Con Edison should modify – if at all – its planned storm hardening projects for the subsequent year. In its

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[29] Cases 13-E-0030, 13-G-0031, and 13-S-0032, *Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consolidated Edison Company of New York, Inc. – Electric, Gas, and Steam Rates*, Order Adopting Storm Hardening and Resiliency Collaborative Phase Two Report Subject to Modifications (issued February 5, 2015) at 1-2 ("Phase Two Order").

[30] Cases 13-E-0030 *et al.*, *supra*.

[31] Cases 13-E-0030 *et al.*, *supra*, Amended Storm Hardening and Resiliency Collaborative Phase Two Report (dated November 14, 2014) at 2 ("Phase II Report").

[32] *Id.* at 2.

initial order approving the Collaborative, the Commission praised the stakeholders for the "unique process and … far-sighted approach … [that] has provided a valuable focus for innovative approaches to the 21st Century challenges to the utility system."[33] At Con Edison's request, the Commission repeatedly has extended the Collaborative for incremental one-year periods.

Although the collaborative did not usurp Con Edison's ultimate discretion on capital investment decisions, it recommended numerous improvements in Con Edison's storm hardening program, and Con Edison adopted many of those recommendations.[34] For instance, Con Edison adopted the FEMA+3 design standard for equipment elevation projects and committed to revising the flood protection design standard as and when indicated by updated sea level rise and climate projections.[35]

There is no dispute in this proceeding that storm hardening investments improve the electric system's ability to sustain operations throughout severe weather and shorten the time needed to restore service following a climate-related outage, and LIPA agrees that such investments may be economical over the long-term because they extend the lifespan of utility assets. (Tr. 60.) LIPA does not oppose the proposed collaborative (Tr. 62), and PSEG stated that it would not oppose meeting with the City, Staff, and other stakeholders to discuss storm hardening efforts, if it provides value to LIPA's customers. (Tr. 152.)

As noted above, the Commission has found the Con Edison collaborative to provide value to that utility's customers, a finding with which the City agrees. It is highly likely

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[33] Cases 13-E-0030 *et al.*, *supra*, Order Approving Electric, Gas and Steam Rate Plans in Accord With Joint Proposal (issued February 21, 2014) at 64-65 ("Collaborative Order").

[34] *See, e.g.*, Phase Two Order at 4-5.

[35] *Id.* at 5 and n.6.

that a stakeholder collaborative to inform PSEG's storm hardening program would benefit customers by enhancing PSEG's capital investment decisions. It also would support the program modifications needed to ensure that LIPA's storm hardening program is benefitting customers.

Mr. Marczewski recommended that LIPA should begin the collaborative as soon as possible by identifying stakeholders that would like to participate in the collaborative. (Tr. 846.) Quick action is needed because utilities plan their systems to address current and future needs. (Tr. 847.) Many utility assets will be in service for decades. Delaying the start of a truly comprehensive storm hardening program increases the risk that storm hardening design concepts and standards are not reflected adequately in infrastructure investment decisions. Collaborative participants should discuss current and future storm hardening plans, design standards and system vulnerabilities, and provide PSEG and LIPA with recommendations for program enhancements. The collaborative also should oversee the work of a third party consultant retained to develop a climate change vulnerability study. (Tr. 848-49.) This study would provide a long-range basis for the ongoing review of storm hardening design standards. (Tr. 848.)

The Commission has recognized the value of a climate change study, finding that "ongoing review of [storm hardening design] standards is appropriate in light of the rapid developments in climate science forecasts, and in federal, state, and city policies."[36] For Con Edison, the Commission stated that it expected "this process to yield additional data necessary for Con Edison to continue to assess, and revisit if indicated, its use of the FEMA+3 design standard."[37] The study also will address how temperature and humidity, temperature variability

[36] Collaborative Order at 67.

[37] *Id.* at 71.

and load, precipitation, extreme events, and sea level rise and coastal storm surge flooding will impact Con Edison facilities in the future. (Tr. 848.)

For the reasons set forth above, LIPA and PSEG's storm hardening efforts do not include a holistic approach that analyzes system-wide needs based on the most current climate information that is available. The specific scope of the proposed collaborative should be developed by participating stakeholders – led by PSEG and LIPA – but the collaborative being conducted by Con Edison, under the Commission's supervision, provides a useful model for the study that LIPA and PSEG should track.

II. Customer Service Panel

The City has a strong interest in the quantity and quality of information that it can access regarding consumption and demand on each of its meters and accounts. As a large customer of PSEG with numerous facilities, energy costs are a substantial operating expense for the City. The City actively seeks opportunities to decrease those costs by increasing the efficiency of its energy usage. The City's interest in monitoring and reducing energy usage is driven by the core policy objectives announced in Mayor de Blasio's *One New York*, a comprehensive sustainability blueprint for the City to reduce greenhouse gas emissions, improve building energy efficiency, and pursue numerous other goals.[38]

The City's ability to monitor energy consumption and cost on its various PSEG accounts currently is limited by the quality, quantity, and format of data available to it. There are opportunities to achieve greater reductions in energy cost and usage that can only be realized with enhancements to PSEG's billing system. Although the City pays bills centrally for more than 80 accounts, it is treated as singular customer in very limited ways. For example, the City

[38] *See generally One New York: The Plan for a Strong and Just City*, *available at* http://www.nyc.gov/html/planyc/html/home/home.shtml.

can access its multiple accounts through a single web portal, but each account must be added individually. Similarly, when new accounts are opened, they must be added one by one. Further, the web portal does not provide a consolidated overview of the multiple accounts.

Perhaps the greatest deficiency is that the current systems do not provide monthly billing detail, with each billing determinant, in an electronic format (such as Excel) that may be used for analytical purposes by large customers with multiple accounts. This failure limits the City's ability to analyze electricity cost and usage at all of its LIPA facilities over time because it cannot key certain billing parameters, each month, into its own database. Finally, customers with interval metering, even large ones, cannot monitor consumption and demand on an account and meter level on real- or near real-time basis via a web-based portal. By adding these capabilities, PSEG would provide its customers with a powerful tool to take control of and manage their energy usage, thereby enabling activities such as managing peak demands and reducing overall consumption.

PSEG needs to address these billing shortcomings in order to satisfy core objectives of the "Reforming the Energy Vision" initiative and the State Energy Plan.[39] Specifically, one of the six stated objectives for REV is to develop "[e]nhanced customer knowledge and tools that will support effective management of the total energy bill."[40]

PSEG indicated in discovery that enabling these capabilities may require upgrades to PSEG's billing system.[41] Moreover, the specific upgrades required have not been identified,

[39] State Energy Plan at 3 (stating that "[t]his State Energy Plan coordinates every State agency and authority that touches energy to advance the REV agenda").

[40] Case 14-M-0101, *supra*, Order Adopting Regulatory Policy Framework and Implementation Plan (issued February 26, 2014) at 4.

[41] *See* Appendix A, PSEG Response to City of New York Information Request No. 92.

and the cost of the upgrades must be considered.[42] Some of the capabilities that the City is requesting are standard business practice at other utilities. The City therefore recommends that PSEG study and file a report with Staff on the capabilities of the current systems, and also address the upgrades and estimated cost needed to provide an online, interactive interface that improves customer access to consumption and demand data on a real-time basis. Following public comments on the report, Staff may advance a recommendation to the Trustees as to when these upgrades should be pursued.

CONCLUSION

For the reasons described herein, the City respectfully urges that PSEG and LIPA be directed to commence a collaborative stakeholder process to examine ongoing storm hardening activities, and inform how those activities should be modified. The City further recommends that PSEG study and report on the cost needed to improve customer access to consumption and demand data, and the system upgrades or modifications that would be needed to effectuate same.

Respectfully submitted,

Dated: July 20, 2015
Albany, New York

/s/ S. Jay Goodman

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[42] *Id.*

APPENDIX A

PSEG Long Island
Case Name: PSEG LI - Rate Case 2015
Docket No(s): Matter No. 15-00262

Response to Discovery Request: CITY-0092
Date of Response: 05/18/2015
Witness: CUSTOMER SERVICES BUDGET AND OPERATIONS

Question:
a. Can PSEG provide large customers with multiple accounts electronic delivery of monthly billing detail, with each billing determinant, in electronic file format (e.g., Excel)?
b. If the answer to (a) is in the negative, please (i) detail the billing and other system changes that would be necessary to provide such service, (ii) explain whether such changes would require reprogramming or replacement of an existing system or program, and (iii) estimate the cost of such changes.

Attachments Provided Herewith: 0

Response:

a. Not currently, this would require a new platform that could interact with the current customer information system or a brand new system.

b. No such estimate currently exists. System changes for this would be significant and would require IT project methodology to estimate the scope and investment that would be needed to make this change. A change of this magnitude would need to be incorporated into the annual IT project planning cycle.