STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

I/M/O THE BOARD'S REVIEW OF THE PRUDENCY OF THE COSTS INCURRED BY JERSEY CENTRAL POWER & LIGHT COMPANY IN RESPONSE TO MAJOR STORM EVENTS IN 2011 AND 2012	)))))))	**BPU Docket Nos. AX13030196 and EO13050391**

DIRECT TESTIMONY OF PETER J. LANZALOTTA
ON BEHALF OF THE
DIVISION OF RATE COUNSEL

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PUBLIC VERSION

Q. Mr. Lanzalotta, please state your name, position and business address.

A. My name is Peter J. Lanzalotta. I am a Principal with Lanzalotta & Associates LLC, ("Lanzalotta"), 67 Royal Point Drive, Hilton Head Island, SC 29926.

Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of the New Jersey Division of Rate Counsel ("DRC").

Q. Mr. Lanzalotta, please summarize your educational background and recent work experience.

A. I am a graduate of Rensselaer Polytechnic Institute, where I received a Bachelor of Science degree in Electric Power Engineering. In addition, I hold a Masters degree in Business Administration with a concentration in Finance from Loyola College in Baltimore.

I am currently a Principal of Lanzalotta & Associates LLC, which was formed in January 2001. Prior to that, I was a partner of Whitfield Russell Associates, with which I had been associated since March 1982. My areas of expertise include electric system planning and operation. I am a registered professional engineer in the states of Maryland and Connecticut.

In particular, I have been involved with the planning and operation of electric utility systems as an employee of and as a consultant to a number of privately- and publicly-owned electric utilities and government agencies involved in the regulation of electric utilities over a period exceeding thirty years. I have presented expert testimony before the

FERC and before regulatory commissions and other judicial and legislative bodies in 22 states, the District of Columbia, and the Provinces of Alberta and Ontario. My clients have included utilities, state regulatory agencies, state ratepayer advocates, independent power producers, industrial consumers, the United States Government, environmental interest groups, and various city and state government agencies.

A copy of my current resume is included as Exhibit___(PJL-1) and a list of my testimonies is included as Exhibit___(PJL-2).[1]

Q. What is the purpose of your testimony?

A. I was retained to review the Petition filed by Jersey Central Power & Light Company ("JCP&L" or "Company") addresses the prudency of costs incurred by the Company in response to Major Storm Events in 2011 and 2012.

Q. Please explain how you conducted your analyses.

A. I have reviewed the following information in my investigation:

i. The Company's Petition and Direct Testimony in this Proceeding and in the recent rate increase proceedings.

ii. The Company's responses to discovery questions submitted by DRC, the Board Staff, and other intervening parties to this Proceeding and in the recent rate increase proceedings.

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[1] Exhibit___(PLJ-1) and Exhibit___(PJL-2) as well as all other Exhibits referenced herein are attached to and incorporated by referenced in this testimony.

iii. Various data and information from various reviews of storm performance of New Jersey electric distribution companies in general and of JCP&L in particular that considered various aspects of improving electric service reliability during major storms.

Q. Please summarize your conclusions.

A. My testimony concludes that the Company's distribution vegetation management program provided reduced levels of distribution tree trimming in a number of years that negatively affected the Company's performance during major storms in 2011 and 2012. One of the factors contributing to the reduced levels of distribution tree trimming was the Company's accelerated priority tree removal program.

Q. What major storms are being reviewed?

A. This proceeding is reviewing i) Hurricane Irene (August 27, 2011 – September 5, 2011)[2], ii) the October 2011 Snow Storm (October 29, 2011 – November 7, 2011)[3], and iii) Hurricane Sandy (October 29, 2012 – November 18, 2012)[4].

Q. Please review the tree-related major storm reliability effects of the major storms in 2011 and 2012.

A. The numerical data in Table 1, below, summarizes tree-related outage causes, outage duration, and total outage data for Hurricane Irene, the October 2011 Snowstorm, and Hurricane Sandy as reported by the Company in its responses to discovery.[5]

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[2] Direct Testimony of Steven Strah, Appendix B, pp. 1.

[3] Direct Testimony of Steven Strah, Appendix C, pp. 1.

[4] Direct Testimony of Steven Strah, Appendix D, pp. 1.

Table 1

Tree -Related Outage In Major Events (2011 - 2012)	Customer Interruptions	Customer Interruption Hours	Hours Per Interruption
Hurricane Irene (2011)			
Trees - Not Preventable	243,844	9,399,467	
Trees - Preventable	11,989	368,292	
Trees - Total	255,833	9,767,759	38.2
Total Storm	742,598	28,311,989	
Tree Percentage	34.5%	34.5%	
October 2011 Snowstorm			
Trees - Not Preventable	249,648	14,638,477	
Trees - Preventable	7,898	451,923	
Trees - Total	257,546	15,090,400	58.6
Total Storm	451,691	25,452,497	
Tree Percentage	57.0%	59.3%	
Hurricane Sandy (2012)			
Trees - Not Preventable	266,502	29,040,299	
Trees - Preventable	14,449	939,087	
Trees - Total	280,951	29,979,386	106.7
Total Storm	1,320,656	132,840,514	
Tree Percentage	21.3%	22.6%	

In Hurricane Irene, tree-related faults caused 34.5 % of customer interruptions and customer interruption hours, and were the largest outage cause category, causing more

[5] RCR-REL-51, Attachment 1.

than 9.7 million customer interruption hours. Each tree-related customer interruption lasted an average of 38.2 hours.

In the October 2011 Snowstorm, tree-related faults caused 57% of customer interruptions and 59.3% of customer interruption hours, and were the largest outage cause category, causing more than 15 million customer interruption hours. Each tree-related customer interruption lasted an average of 58.6 hours.

In Hurricane Sandy, tree-related faults caused 21.3% of customer interruptions and 22.6% of customer interruption hours, and were the largest outage cause category after the categories of “unknown” and “wind”, causing more than 29.9 million customer interruption hours. Each tree-related customer interruption lasted an average of 106.7 hours.

Q. Table 1 above uses the terms “preventable” and non-preventable” when describing tree-related customer service interruptions. How are these terms defined?

A. In his Direct Testimony (Exhibit JC-16) in the Base Rates Case, Ralph Hilmer describes preventable outages as follows:

> In general, a "tree cause" is a tree-related incident that results in an outage because a tree or other vegetation has grown into and contacted, or otherwise contacted, a Company circuit. In practice, this means that JCP&L tracks vegetation-related outages in such a manner as to consider as "preventable" those outages caused by vegetation that is within the right-of-way or trim corridor that is ordinarily addressed through the cyclical vegetation management program. This clearance or trim corridor is typically 15 feet from all sides of the conductor (including to a height of 15 feet above the conductor), but can vary depending on tree species and growth rate. The use of the term "preventable" in this context is a

> term of art that refers to outages caused by trees within the right-of-way or trim corridor.[6]

If a tree outage is not defined as "preventable', then it is considered "non-preventable".

Q. Does the term "preventable" as used by the Company accurately describe the nature of the tree-related interruptions they are attempting to describe?

A. No, these descriptions are artificial constructs that are not accurate in the impression they attempt to convey. Company witness Ralph Hilmer notes[7] that:

> …the use of term preventable…is a term of art that refers to outages caused by trees within the right-of-way or trim corridor. It does not mean or in any way imply that JCP&L's activities in connection with its cyclical vegetation management programs were deficient or that a particular 'preventable' outage could or should have been avoided through implementation of these accepted vegetation management practices.

By the same logic, the term "unpreventable" refers to tree-related faults from limbs or tree trunks located outside the normal trimming zone, including branches from the canopy located directly over the wires but outside the normal 15 foot trim zone.[8]

Q. Please discuss the Company's vegetation management program for its distribution system.

A. Under its regular program, the Company inspects its distribution circuits on a four-year cycle, trimming these "as needed" to a clearance equal to four years of growth.

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[6] See JCP&L Base Rate Case, BPU Docket No. ER12111052 ("Rate Case"), Direct Testimony of Ralph Hillmer, pp.8, lines 2-11.

[77] See Rate Case Direct Testimony of Ralph Hillmer, pp.8, lines 9-14.

[8] See Rate Case Direct Testimony of Ralph Hillmer, pp.8, lines 15-21.

Trimming may be deferred as the Company deems appropriate. Deferred trimming miles are discussed in greater detail later in my testimony. .

The JCP&L distribution system has 12,012.6 overhead miles of circuits.[9] On a balanced four-year cycle, about 3,003 miles would be inspected and, if the Company deems necessary, trimmed every year. Table 2 below summarizes actual miles "trimmed" and the cost[10] of such trimming, as provided in response to RCR-REL-5, and the cost per mile of such trimming as calculated from this data.

Table 2

	JCP&L Distribution				
Year	Miles Trimmed[11]	Cost ($)	Cost/Mile ($)	SAIDI (with ME[12])	Miles[13] Deferred
2005	3,073	21,438,756	6,976	137	
2006	1,784	10,201,663	5,718	167	
2007	2,842	12,503,253	4,399	132	
2008	3,923	15,232,972	3,883	164	1,152
2009	3,382	12,761,529	3,773	122	1,135
2010	2,945	13,668,141	4,641	231	902
2011	2,925	23,462,674	8,021	1,298	416
2012	4,001	26,760,999	6,689	3,248	

[9] See Company's response to RCR-REL-2 (b). This response "updates" the milage number used in Mr. Hillmer's Direct Testimony.

[10] Both expensed and capitalized costs.

[11] Miles Trimmed means miles of right of right scheduled to be trimmed in a particular year.

[12] With ME means including Major Events, such as storms.

[13] Miles Deferred means mile of right of way that was scheduled to be trimmed but was deferred.

Note that the cost per mile of distribution tree-trimming exhibits large levels of variability, ranging from a high of around $8,000 per mile to low values around $3,800 per mile. This variability raises questions about the level of tree trimming being provided, and about how much actual trimming of limbs and branches, or priority tree removal, is being performed for those per-mile costs. Note that the years 2007, 2008, 2009, and 2010 have per mile trimming costs in the range from $3,773 to $4,641, considerably below the other years, which range from $5,718 to $8,021.. Note, also, that after four years of this low-cost tree-trimming, the Company's reliability performance during storms, as reflected in the SAIDI index for the total Company (with major events), which is also shown in Table 2, deteriorated sharply.

Q. Please address the Deferred Miles shown in Table 2.

A. The mileage trimmed annually in Table 2 reflects the planned trimming for each year, without reflecting that some mileage in some years was deferred to later years for a variety of reasons.[14] Miles of deferred trimming for selected years are shown in Table 2 in the year from which trimming was deferred.[15]

Deferring tree trimming on circuits with no recent tree-related reliability problems is one way to reduce tree trimming expenses. There were other reasons for the deferrals as well,

[14] See Note on Attachment 1 to Company's response to RCR-REL-5.

[15] The value for 2008 was estimated. These miles were reported trimmed in 2009 after more than a four-year interval from the prior trim. Some of these 2008 miles may have been deferred from even earlier years.

including the Company's distribution corridor widening initiative, started in 2009, and the need to repair the system after the major weather events experienced in recent years.

Deferring tree trimming, for whatever reason, tends to make the distribution system more vulnerable to major weather events. This is because trees along distribution circuits are supposed to be trimmed by JCP&L to provide four years growth worth of clearance between trees and wires. After four years, the limbs and branches to the sides of the wires on a distribution circuit will have grown into close proximity with the wires, while any limbs overhanging the wires, in the tree canopy, will have grown longer, reaching further over the wires. This may not make much of a difference under normal, blue-sky, conditions. But, under conditions with high winds, ice, or heavy snow, this increased proximity between branches and wires and increased canopy coverage will translate into increased system damage and customer interruptions. Thus, such deferrals increase the likelihood of tree-related customer interruptions during storms.

Q. Have JCP&L's performance metrics under storm conditions reflected this increased vulnerability?

A Yes, as seen below in Table 2A, which was included in my filed testimony in the JCP&L Base Rate Case, the Company's performance metrics show a dramatic decline in reliability when Major Events are included in the metrics.

Table 2A

SAIFI	Without Major Events			With Major Events		
	Northern	Central	Total Co.	Northern	Central	Total Co.
2004	1.60	1.19	1.36	1.77	1.24	1.47
2005	1.44	1.24	1.32	1.51	1.36	1.43
2006	1.53	1.31	1.40	1.90	1.63	1.75
2007	1.37	1.14	1.24	1.43	1.34	1.38
2008	1.12	0.99	1.05	1.73	1.40	1.54
2009	1.04	0.97	1.00	1.32	1.12	1.20
2010	1.25	1.00	1.11	1.76	1.87	1.83
2011	1.30	0.77	0.99	3.19	1.94	2.46
2012	1.20	1.04	1.11	2.43	3.16	2.85
Average	1.32	1.07	1.18	1.89	1.67	1.77
Benchmark	1.44	1.26				
Minimum	1.63	1.50				

Table 2B

CAIDI	Without Major Events			With Major Events		
	Northern	Central	Total Co.	Northern	Central	Total Co.
2004	136	88	112	166	88	128
2005	154	114	132	158	120	137
2006	127	112	119	176	159	167
2007	119	72	94	119	141	132
2008	104	86	94	239	97	164
2009	133	81	104	158	91	122
2010	133	107	119	196	255	231
2011	132	100	117	1,662	867	1,298
2012	130	100	114	3,815	2,933	3,248
Average	130	96	112	743	528	625
Benchmark	158	110				
Minimum	199	132				

As can be seen from the above tables, JCP&L's SAIDI and CAIDI deteriorates substantially when Major Events are included.

My discussion of deferred trimming miles is intended to illustrate the effect of the deferral on the system's storm reliability, as a lead in to the following section on reduced trimming of limbs and branches. My calculations, addressed later on, assume that there were no such deferrals and, as such, will tend to be conservative in estimating the storm reliability and cost impacts of the Company's distribution vegetation management program .

Q. Why are the reduced per-mile distribution trimming expenses shown in Table 2 in 2008 - 2010 of interest?

A. When a Company spends significantly less per mile of circuit trimmed, it is doing less trimming of limbs and branches and/or it is removing less tree material. These reductions have implications for reliability during major storm conditions. Just as in the case for deferred trimming discussed above, reduced trimming of limbs and branches tends to make the distribution system more vulnerable to major weather events. Reduced trimming of limbs and branches leaves these limbs and branches in closer proximity to the wires, while any limbs overhanging the wires, in the tree canopy, will be longer and reach further over the wires. Under conditions with high winds, ice, or heavy snow, this increased proximity between branches and wires and increased canopy coverage will translate into increased system damage and customer interruptions. Such reduced trimming increases the likelihood of tree-related customer interruptions during storms.

Q. Please discuss any other vegetation management practices that can affect the amount of resources available for trimming limbs and branches.

A. Vegetation management involves not only the trimming of tree limbs to create a clear zone around distribution wires. It also involves the removal of priority trees that are along the circuits, although not necessarily immediately on the right-or-way. The removal of priority trees has varied greatly between years during the eight-year period from 2005 through 2012, which has affected the funds available for the trimming of limbs and branches. The more that is spent on priority tree removal, the less that is available for the trimming of limbs and branches.

Q. What are Priority Trees?

(Begin Confidential)

[redacted]

[redacted]

17 [redacted]

[redacted] **(End Confidential)**

Q. Is it possible to quantify how these reductions in per-mile trimming costs will affect the risk of electric service interruption during storms?

A. Yes. Attached as Exhibit___(PJL-4) is an article by Siegfried Guggenmoos entitled "Increased Risk of Electric Service Interruption Associated with Tree Branches Overhanging Conductors," in which he describes a calculation which shows that the risk of outages increases as the extent by which the tree canopy extends out over the conductors increases, and as the clearance between the conductors and the bottom of the canopy decreases.[18] As trees continue to grow and more time passes since the last trim, both an increase in the extent to which the tree canopy overhangs the conductors and a decrease in the clearance between the conductors and the bottom of the canopy, are detrimental to electric service reliability.

Q. Have you previously applied this type of calculation to determine estimates of increased tree-related outage risk in Major Storms in testimony before a regulatory agency and, if so, what was the result?

A. Yes. I presented testimony, on behalf of the Maryland People's Counsel, in 2012 in two electric rate cases before the Maryland Public Service Commission ("PSC") that offered adjustments to recovery of storm-related repair costs that used the type of risk increase calculation I use here. In PSC Case No. 9285, which involved Delmarva Power & Light Company, the Commission accepted my adjustment based on this calculation. Similarly,

[18] Also available at http://www.ecosync.com/overhangs.pdf.

in PSC Case No. 9286, which involved Potomac Electric Power Company, the Commission also accepted my adjustment based on this calculation[19].

I note that, in those Maryland proceedings, I did not reduce the increased risk-related costs by the 50% factor that I use here to reduce the increase in tree-related storm costs attributed to reduced trimming of limbs and branches. In that regard, my estimates on increased tree-related costs in this proceeding are considerably more conservative than what was accepted by the Maryland PSC.

Q. Please explain how this calculation shows that the risk of outages increases as the extent by which the tree canopy extends out over the conductors increases, and as the clearance between the conductors and the bottom of the canopy decreases

A. To understand the relationship between a tree falling and its risk of hitting the power line, visualize, from above, a tree next to a power line. If the tree has no branches, then it would look like a pole from above. If that tree falls down, it would have roughly a 50% chance of hitting the power line, which would happen if the tree falls towards the power line, and roughly a 50% chance of missing the power line, which would happen if the tree falls away the power line. Looking at the tree from above, all the possible directions the tree could fall would look like a circle around the tree, with a total of 360 degrees of arc. There would be roughly 180 degrees of arc where, if the tree falls, it misses the power line and roughly180 degrees of arc where, if the tree falls, it hits the power line.

[19] These decisions, as well as my testimony in these cases, is available on the Maryland PSC website, http://webapp.psc.state.md.us/Intranet/home.cfm, under the respective case numbers.

Now, if branches are added to the tree at or above the height of the power line, and the tree falls parallel to the power line, the branches can hit the power line if they are long enough, whereas the tree with no branches would miss the power line. This means that the presence of branches changes the angle at which the tree can fall and still miss the power line. That is, now there are *less than* 180 degrees of arc in which the tree can fall and miss the electric circuit, and *more than* 180 degrees of arc in which the tree can fall and hit the power line. This will change, and increase, the risk of a tree-caused outage in the event that the tree falls. As the length of the branches increase, the degrees of arc in which the tree can fall and still hit the power line increase, and conversely, the degrees of arc in which the tree can fall and miss the power line decrease[20]. By looking at a distribution system trimmed to a particular clearance and overhang and a system that is trimmed to reduced clearances or increased overhang, the difference in these degrees of arc can be calculated, as well as the change in the probability of a tree-caused outage, in the event of a falling tree or a falling tree limb.

Q. What annual tree growth rate did you use in your analysis?

A. In my analysis I used an annual tree growth rate of 2.5 feet per year. I chose this after reviewing a list of the tree species common to the mid-atlantic area.[21] The list contained 35 species with average normal annual growth rates ranging from 1 foot per year to 5 feet per year. Utilities typically try to remove the fastest growing species and trim to accommodate the rest. The vast majority of the species listed had annual growth rates of

[20] The clearance between the electric line and the bottom of the tree canopy over the line can also influence the amount of risk of an outage.

[21] Attached hereto as Exhibit___(PJL-5).

2-3 feet per year or less. Based on the forgoing, I selected 2.5 feet for an annual growth rate. **(Begin Confidential)**

[redacted]

[redacted] **End Confidential)**

Q. How were these differences in overhang and BAHT Adder used to analyze the impact of the Company's tree trimming policies on the 2011 and 2012 storms?

A. The changes in outage risk from these differences in overhang and BAHT Adder lengths are studied separately for each of the three major storms and for each of the annual trimmings in 2008, 2009, and 2010. Table 3 below reflects the percentage of the distribution system that was trimmed in each of 2009, 2009, and 2010.

Table 3

Year	Miles Trim	% of System
2008	3,923	33%
2009	3,382	28%
2010	2,945	25%

These percentages are based on 12,013 total system miles.

The 2008 miles trimmed are looked at with three years of growth for the 2011 storms. These miles are assumed to have been trimmed prior to the 2012 storm. The 2009 miles trimmed are looked at with two years growth for 2011 storms and with three years growth for the 2012 storm. The 2010 miles trimmed are looked at with one year growth for the 2011 storms and with two years growth for the 2012 storm.

Exhibit___(PJL-7) calculates the additional risk between i) the 2008 miles trimmed with three years of growth after trimming and ii) the base case with three years growth. This increased risk is to be applied to each of the 2011 storms in a later exhibit.

Note that Exhibit___(PJL-7) shows a set of calculations reflecting a range of typical pole heights, 35 foot poles, 40 foot poles and 45 foot poles, and includes a calculation for a tree that breaks at ground level, on the upper half of the exhibit, and a tree that snaps or loses a major limb 25 feet off the ground, on the lower half of the exhibit.

In addition to overhang, shown in Exhibit___(PJL-7) as "OH," and the height of the canopy attachment point, shown as "BAHT," the calculation uses the distance between the tree and the conductor, shown on Exhibit___(PLJ-7) as "clear to side" or "CW," for which I used 12 feet, and the height of the power line, shown on Exhibit___(PJL-7) as "height of line" or "LH," which I varied among three popular pole sizes, a 35 foot pole, a 40 foot pole, and a 45 foot pole.[23] The top part of Exhibit___(PJL-7), lines 3-21, reflects a tree breaking or uprooting at ground level, and for each pole height, two calculations are made: (i) one with base case values from Exhibit___(PJL-6) with three years growth,

[23] The height of the conductor is less than the pole size, since a portion of the pole is set into the ground. The depth of this set is nominally taken to be 10% of total pole length, plus two feet. Hence, the forty foot pole is set six feet into the ground. I use pole set depths rounded up to the next whole foot.

labeled as "base", as shown in columns C, E and G and, (ii) one with 2008 trimming year values from Exhibit___(PJL-6) with three years growth, labeled as "2011" and shown in columns D, F and H. The bottom part of Exhibit___(PJL-7), lines 23-41, reflects the scenario where the tree, or a major limb, breaks free at a point 25 feet above ground[24].

(Begin Confidential)

[redacted] **(End Confidential)**

Q. **How did you decide on the weights of 15 for uprooted trees and 49 for falling limbs?**

A. I derived these weights from a presentation given by James Wetteroff, Environmental Consultants, Inc., entitled "Tree Risk Assessment and Reliability," in which he discusses

[24] The height of the limb break is subtracted from the power line height and from the height to the bottom of the canopy and the calculation proceeds the same as before.

various aspects of vegetation management[25]. On page 13 of 70 of the presentation, a pie chart shows an industry survey of tree-related outages of which 15% are due to uprooted trees, 49% are due to broken limbs, 22% are due to grow-ins, 10% are due to unknown tree faults, and 4% are due to cut or felled trees or limbs. The respective percentages for uprooted trees and broken limbs were used to weight the increased risk for each to produce a combined increase in risk. **(Begin Confidential)**

[redacted]

[25] A copy of the Wetteroff presentation is attached hereto as Exhibit___(PJL-8).

[redacted]

Q. [redacted]

A. [redacted]

[redacted]

[redacted]

[redacted] **(End Confidential)**

Q. Does this conclude your direct testimony?

A. Yes, at this time.