Agenda Date: 6/18/12
Agenda Item: 2J

STATE OF NEW JERSEY
Board of Public Utilities
44 South Clinton Avenue, 9th Floor
Post Office Box 350
Trenton, New Jersey 08625-0350
www.nj.gov/bpu/

ENERGY

IN THE MATTER OF THE PETITION OF PUBLIC SERVICE ELECTRIC AND GAS COMPANY FOR A DETERMINATION PURSUANT TO THE PROVISIONS OF N.J.S.A. 40:55D-19 RE: NORTH CENTRAL RELIABILITY PROJECT	)))))	ORDER DOCKET NO. EO11050323

Parties of Record:

Stefanie A. Brand, Director, New Jersey Division of Rate Counsel
Tamara L. Linde, Esq., Public Service Electric and Gas Company

Jodi Moskowitz, Esq., Public Service Electric and Gas Company

BY THE BOARD

BACKGROUND

Public Service Electric & Gas Company ("PSE&G," "Company," or "Petitioner") is a corporation of the State of New Jersey that is engaged principally in the transmission and distribution of electric energy and gas service in New Jersey. (P:1-1)[1]. PSE&G is an electric public utility and is subject to the jurisdiction of the Board of Public Utilities ("Board") pursuant to N.J.S.A. 48:2-13. In that capacity, PSE&G provides service to approximately 2.1 million electric customers and 1.7 million gas customers. (P:2-3). PSE&G is responsible for ensuring safe, adequate and proper utility service in accordance with N.J.S.A. 48:2-23. PSE&G is also the default supplier for retail customers within its service territory and is a provider of last resort under the Electric Discount and Energy Competition Act, N.J.S.A. 48:3-49 et seq. ("EDECA").

Operational control over PSE&G's electric transmission system lies with PJM Interconnection, L.L.C. ("PJM"), the Regional Transmission Organization ("RTO") approved by the Federal Energy Regulatory Commission ("FERC"). PJM serves as the RTO for a centrally dispatched

[1] Reference to the Petition in this matter will be denoted as "P" followed by the page number and paragraph.

control area comprising all or parts of several states, including New Jersey and the District of Columbia. (P:2-3). PJM's responsibilities as RTO for that region include planning and operating the electric transmission system in a reliable manner and ensuring the reliability of the transmission grid in the PJM territory. (P:2-2.) In order to ensure the reliability of the transmission grid, PJM utilizes the Regional Transmission Expansion Planning ("RTEP") Process. The RTEP process allows PJM to conduct an annual system-wide analysis to determine the ability of the PJM regional transmission grid to meet several reliability standards, including reliability standards set by the North American Electric Reliability Corporation ("NERC").[2] Through the RTEP process, PJM conducts a baseline reliability analysis, which it uses to identify future reliability criteria violations and the need for transmission system expansion upgrades to resolve any anticipated reliability criteria violations. (P:3-6). The RTEP process allows PJM to identify transmission upgrades that are necessary to address near-term (five-years) and longer-term (six to 15 years) needs within PJM's long-term planning horizon. (P:3-5). The RTEP process allows PJM to consider input from all interested stakeholders. (P:4:9). PJM holds a series of meetings with the Transmission Expansion Advisory Committee ("TEAC") where PJM solicits input and presents its analyses along with descriptions of the proposed baseline projects to address any identified reliability problems. (P:4:9). Interested stakeholders may also provide written comments to both the TEAC and the PJM Board. (P:4:9). After review and input from the TEAC, projects included in the RTEP are presented to the PJM Board of Managers for approval. Id.

On May 26, 2011, PSE&G filed a petition ("Petition"), requesting that the Board determine that the construction of the proposed North Central Reliability Project (the "Project"), a 230kV transmission upgrade designed to address eight projected reliability criteria violations anticipated to commence in June 2014[3] and to replace aging infrastructure, is reasonably necessary for the service, convenience or welfare of the public pursuant to N.J.S.A. 40:55D-19.[4] PSE&G requested, in accordance thereto, that the Board issue an order indicating that the zoning, site plan review, and all other Municipal Land Use Ordinances or Regulations promulgated under the auspices of Title 40 of the New Jersey Statutes and the Land Use Act of the State of New Jersey shall not apply to the Project. (P:1).

PJM identified the Project through its RTEP process as being necessary to maintain the reliability of the transmission grid in the region and not for economic purposes. (P:6-14). The Project would address eight projected NERC Category C reliability criteria violations in municipalities affected by the Project.(P:6-15). Failure to adequately address the identified reliability criteria violations would result in voltage instability at critical circuits and substations, violate applicable NERC reliability standards and could result in large monetary penalties to PSE&G for those violations. While there is a range of emergency procedures to manage operating circumstances involving the potential for inadequate transmission system voltages, those procedures are intended for short-term use only and would not adequately address these NERC Category C violations on a permanent basis. (P:7-16).

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[2] NERC is the FERC-appointed entity responsible for establishing reliability standards within PJM.

[3] As discussed in some detail later in this Order, the violations are NERC Category C criteria violations. Category C criteria require that the system be stable and within system voltage limits after the loss of two bulk electric system elements

[4] At the December 15, 2011 evidentiary hearing, Paul McGlynn and Esam Khadr amended their testimony to indicate that while the Project is still necessary to maintain reliability, the number of NERC Category C reliability criteria violations expected to occur had changed to seven in 2014 increasing to eight in 2015. Supplemental Direct Testimony of Esam Khadr, page *8, lines 19-21. Supplemental Direct Testimony of Paul McGlynn, page 4, lines 18 through 21.

The Project consists of a transmission system upgrade of four (4) 138kV transmission lines to three (3) 230kV transmission lines and several interconnected switching and substations. (P:4-10). It will pass through 15 municipalities, result in upgrades to seven switching and substations, and follow an existing right-of-way. (P:6:14; P.5:10).

From a design and engineering perspective, the Project is divided into three segments: Roseland Switching Station to Metuchen Switching Station (Segment One); Metuchen Switching Station to Sewaren Switching Station (Segment Two); and Roseland Switching Station to West Orange Switching Station (Segment Three). As regards to Segment One, the Project would result in the replacement of any existing transmission structures that are not designed to support 230kV while those that are already constructed to support 230 kV operations would not be replaced. (P:5-12) In addition, Segment One would require the installation of four new structures located within PSE&G's Metuchen Switching Station, one of which would be an approximately 75-foot high tower east of the New Jersey Transit Northeast Corridor railroad. (P:5-12). Segment Two would operate with its existing structures for the entire length of the segment while Segment Three would require replacement of all existing transmission structures with new monopoles. (P:6-12)

The estimated cost of the Project was $330 to $350 million. (P:5-10)[5] PSE&G has requested Board approval to begin work in 2012, with a proposed two-year construction schedule and an in-service date of June 2014.

PROCEDURAL HISTORY

After the May 26, 2011, filing of the Petition along with 13 exhibits, the Board conducted a pre-hearing conference on July 19, 2011, attended by PSE&G, the New Jersey Division of Rate Counsel and Board staff. At that time, the parties agreed upon a procedural schedule for handling discovery and the evidentiary hearing as well as other factors outlined under N.J.A.C. 1:1-13.2. In accordance with N.J.A.C. 1:1-13.2, the Board issued a Pre-hearing Order on August 18, 2011, adopting the positions established at the July 19, 2011 pre-hearing conference. The Pre-hearing Order also authorized Commissioner Joseph Fiordaliso to serve as the presiding Commissioner at the hearing, with authority to modify the schedule, decide upon motions and otherwise control the conduct of the case without further Board approval, subject to subsequent Board ratification.

A. Public Hearings

Commissioner Fiordaliso presided over three public hearings, after proper publication and notice, on the following dates and times:

1) September 7, 2011, 7:00 pm Mayfair Farms, 481 Eagle Rock Ave., West Orange, New Jersey.
2) September 8, 2011, 7:00 pm, Chatham High School, 255 Lafayette Avenue, Chatham Township, New Jersey.
3) September 22, 2011, 7:00 pm, Sheraton Hotel, 125 Raritan Center Parkway, Edison, New Jersey.[6]

[5] By letter dated February 17, 2012, two months after the evidentiary hearing, PSE&G reported that the estimated cost of the Project had increased to $340-$390 million, with a confidence level of 70%. (February 17, 2012 letter from David Richter, Esq. to Kristina Miller).

Each public hearing lasted until approximately 8:30 pm and every attendee had the opportunity to comment on the proposed Project. Those proceedings were transcribed and made a part of the record.

B. Site Visit

On September 14, 2011, after notice and invitation to the parties, Commissioner Fiordaliso conducted a site visits along the proposed route accompanied by Board staff and representatives of PSE&G. The Commissioner stopped at the Metuchen Switching Station and the New Dover Substation in Edison, New Jersey, the Terrill Road School in Scotch Plains, New Jersey, the transmission right-of-way in Chatham Township adjacent to the Great Swamp, the East Orange Water Works and the Livingston Mall in Livingston, New Jersey. Commissioner Fiordaliso documented his observations in an October 7, 2011 site report.

C. Discovery and Pre-Filed Testimony

The parties engaged in discovery in accordance with the schedule outlined in the Board's August 18, 2011 Pre-hearing Order. Consistent with that order, PSE&G submitted the pre-filed testimony of its witnesses, all of whom would later be made available at the evidentiary hearing. Those witnesses and the issues for which they were presented to testify are as follows:

Need for the Project:

1. Esam A. F Khadr, Director of Electric Delivery Planning for PSE&G
2. Paul F. McGlynn, General Manager of the PJM System Planning Division

Overview for the Project:

3. Thomas Brauchle, Director of Transmission Planning for PSE&G
4. Barry A. Baker, Certified Project Manager of USR Corporation
5. Lynne M. Del Tosto, Lead Real Estate Representatives for PSE&G
6. Robert T. Pollock, Manager of Transmission Permitting for PSE&G
7. Dr. Joseph J. Seneca, Professor at Edward J. Bloustein School of Planning and Public Policy at Rutgers University

Construction/Engineering:

8. Richard F. Crouch, Senior Project Manager of Transmission Outside Plant Construction for PSE&G;
9. Matthew T. Brown, Project Director of USR Corporation
10. Stephen Czajka, Supervising Civil/Structural Engineer of URS Corporation
11. Jay A. Williams, Executive Engineer of Power Delivery Consultants Inc.

Electro Magnetic Fields ("EMF")

12. Kyle G. King, President of K&R Consulting
13. Meghan E. Mitchell, Managing Epidemiologist in Health Sciences Practice at Exponent

[6] See PSE&G's Affidavits and Proof of Publication of Notice of the Public Hearings, Exhibit P-14.

D. Evidentiary Hearings

Pursuant to the Board's August 18, 2011 Order, evidentiary hearings attended by members of the public were held on December 15 and 16, 2011 at the BPU's offices at 44 South Clinton Street, Trenton, New Jersey, with Commissioner Fiordaliso presiding.[7] At the outset of the December 15, 2011 hearing, Commissioner Fiordaliso acknowledged the parties' stipulations to mark and to move into evidence all discovery exchanged between the parties as well as the pre-filed testimony, witness-specific exhibits, and other exhibits, marked as P-1 through P-17.[8] (Tr.1:7-2; Tr.1:8-4 to 9-17).[9] All of PSE&G's witnesses attended the hearing in person with the exception of Dr. Seneca and Meghan Mitchell, who was made available for cross-examination by phone. After being introduced by PSE&G's attorney, each of the Company's witnesses noted on the record any subsequent changes to their pre-filed testimony before being presented for cross-examination. Each witness testified individually but in a panel setting, where they answered questions by Rate Counsel, Board staff and Commissioner Fiordaliso. At the conclusion of the evidentiary hearings, Commissioner Fiordaliso amended the briefing schedule at the request of the parties to allow Initial Briefs to be due on January 13, 2012 with Reply Briefs due on January 27, 2012. Rate Counsel and PSE&G filed post-hearing briefs on January 12, 2011 and January 13, 2011, respectively.

E. Post-Hearing Briefs

a. PSE&G

In its closing brief, PSE&G asserts that it has met, by a preponderance of the credible evidence, the standards necessary for granting its Petition under N.J.S.A. 40:55S-19. Through the testimony of its witnesses and the submission of several exhibits, PSE&G has shown that construction of the Project is necessary to address seven reliability criteria violations beginning in 2014, and that it is reasonably necessary for the service, convenience, or welfare of the public. PSE&G asks that the Board issue an order indicating that the zoning, site plan review and all other municipal land use ordinances or regulations promulgated under the auspice of Title 40 of the New Jersey Statues and the Municipal Land Use Act of the State of New Jersey shall not apply to the siting, construction or operation of the Project. (PSE&G brief at 1). PSE&G maintains that it has established the primary elements for approving the Petition including need, routing, engineering and design, undergrounding, EMF and economic impact, and that all of these elements confirm that the Project is reasonably necessary for the service, convenience and welfare of the public. (Ibid.). The Company also stresses the need to replace aging infrastructure, which would be satisfied if the Project is approved. PSE&G requests an Order authorizing it to unconditionally commence construction immediately upon issuance of the Order in all areas of the proposed Project route that do not require receipt of a certificate, license, consent, or permit to construct or disturb land from another state or federal agency with jurisdiction over aspects of the Project. (Id. at 4). PSE&G also requests that the Order explicitly

[7] While the August 18, 2011 Order allotted three days for testimony, Board staff and Rate Counsel chose not to cross-examine Dr. Joseph Seneca, resulting in the completion of the hearing within two days.

[8] Reference to the Transcript of the December 15, 2011 evidentiary hearing is referred to as "TR.1" followed by the page and paragraph number. Reference to the Transcript of the December 16, 2011 evidentiary hearing is referred to as "TR.2" followed by the page and paragraph number.

[9] At the start of the December 15, 2011 hearing, Commissioner Fiordaliso granted PSE&G's unopposed motion for the pro hac vice admission of Jodi L. Moskowitz, Esq., finding that the request complied with the requirements of N.J.A.C. 1:1-5.2.

permit adjustments and modifications to the Project either authorized or required by other regulatory agencies having jurisdiction over aspects of the Project. (Id. at 6).

b. Rate Counsel

The Division of Rate Counsel filed a closing letter brief on January 12, 2012, in which it acknowledged its full participation in this proceeding from the beginning. Rate Counsel agrees that the Project should be exempt from the Municipal Land Use Law provisions of N.J.S.A. 40:55D-1, et seq., and that transmission towers in question were over eighty years old and had exceed their estimated life. (Rate Counsel brief at 1). Rate Counsel takes no position on the Company's assertions as to environmental issues, EMF, and economic benefits. Rate Counsel stresses concern with the PJM's transmission planning process and the perceived need for projects during an extended economic downturn. Finally, Rate Counsel mentions concerns with potential interruption of public services such as wireless transmission as a result of the Project, a concern it shares with Commissioner Fiordaliso. (Id. at 2).

F. Post-Hearing Motions

On or about January 12, 2012, T-Mobile Northeast LLC, d/b/a T-Mobile ("T-Mobile"), Sprint Spectrum L.P. and Nextel of New York, Inc. ("Sprint") and New York SMSA Limited Partnership, d/b/s Verizon Wireless ("Verizon") (collectively referred to herein as the "Carriers"), filed motions with the Board seeking leave to intervene or in the alternative, to participate.[10]

The Carriers' share several factual allegations. The Carriers are Commercial Mobile Radio Service ("CMRS") providers who provide CMRS or cellular service throughout New Jersey. (January 18, 2012 letter to Kristi Izzo from the Carriers). Pursuant to a Master Antenna Site Licensing Agreement ("Agreement"), which each carrier executed with PSE&G, the Carriers had previously installed numerous antennas and related equipment on PSE&G's transmission towers and in PSE&G's rights-of-way. (Verizon, certification of Lisa Olesky at 2; Sprint, certification of George Ghantous at 1; T-Mobile certification of Tom Ellefson at 2).[11] Each Agreement requires that PSE&G use reasonable efforts to provide one-year notice of any termination or relocation of a wireless cell site license agreement. (Olesky cert. at 2; Ghantous cert. at 2; Tom Ellefson cert. at 3). The Carriers indicate that this advance notice is critical because it may take in excess of two years to relocate. (Olesky cert. at 3-4; Ghantous cert. at 2; Ellefson cert. at 3). The Carriers allege that PSE&G did not make reasonable efforts to provide one-year notice of termination when it sent the Carriers a formal notice of termination on December 19, 2011, terminating certain site license agreements effective March 2012. (Olesky cert. at 3, 4: Ghantous cert. at 3; Ellefson cert. at 4). The Carriers argue that the abbreviated termination notice will result in substantial likelihood of harm to the Carriers' provision of cellular communication, including degradation in wireless service, protracted cellular service outages, and risk of loss of access to emergency/911 services.[12] (Olesky cert. at 4; Sprint brief at 4; T-Mobile, brief at 5).

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[10] The application of Verizon Wireless sought participation status and leave to file a brief.

[11] Hereafter referred to as "Olesky cert." "Ghantous cert." and "Ellefson cert.".

[12] In its moving brief, Verizon quoted from the portion of the December 15, 2011 evidentiary transcript wherein Commissioner Fiordaliso questioned PSE&G witness Richard Crouch, about the likelihood of disruption to cellular phone service resulting from construction of the Project. Mr. Crouch responded that he did not foresee coverage issues since PSE&G would provide temporary installations for the Carriers' cellular equipment. (January 12, 2012 Brief of Verizon in Support of Motion to Participate) (TR..1:23-10 to TR.1:24-5).

The magnitude of the harm alleged by PSE&G's termination of the license agreements is slightly different for each Carrier. Verizon, for instance, claims to be in jeopardy of PSE&G decommissioning its facilities at three sites: Livingston, Watchung and Fanwood. (Verizon brief at 3). All three sites are critical to fill gaps in the network (i.e. coverage sites). (Ibid.). Verizon claims that PSE&G will not allow Verizon to erect temporary installation of "Cellular on Wheels," or mobile cellular facilities, at those sites. (Ibid.). While Verizon claims to have been diligently looking for alternative sites, the process for securing the locations cannot be completed within such a short time frame. (Id. at 3, 4). If Verizon is required to decommission the three sites in questions before it is able to install alternative sites, there will be degradation in wireless service covering a two-mile diameter around each site. (Id. at 4). Verizon requests that the Board impose reasonable conditions on PSE&G that will ameliorate the impact of the Project on wireless communication and that the Board take the issue into consideration in its resolution of the Petition for Approval of the Project. (Id. at 5).

Sprint claims it is in jeopardy of losing 15 cellular sites on the PSE&G transmission towers as a result of the Project. (Sprint brief at 3). Each of these sites provides coverage to Sprint's customers as well as roaming service to customers of other carriers within the affected coverage area. (Ibid.). Sprint also claims that PSE&G refused to allow Sprint to place temporary cell sites within PSE&G's transmission right-of-way. (Id. at 4). Sprint alleges a substantial likelihood that termination of Sprint's sites will result in a lack of cellular service including access to emergency 911 services for a substantial and populace portion of New Jersey. Sprint argues that its participation or intervention is necessary so that the Board can be accurately informed of the detrimental impact that the Project will have on cellular communications in the State, including 911 services. (Ibid.). Sprint asks that the Board take this issue into consideration in its resolution of the Petition for Approval of the Project. (January 18, 2012 letter to Kristi Izzo).

T-Mobile, like Sprint, claims to be in jeopardy of losing 15 cellular sites as a result of PSE&G's termination, which will impact cellular services including 911 emergency services. (T-Mobile Motion at 3; Ellefson cert. at 3). T-Mobile likewise claims that PSE&G has denied T-Mobile the option of placing temporary cell sites, including "Cellular on Wheels," within its rights-of-way. (Ellefson cert. at 3). T-Mobile asserts that it is substantially, specifically, and directly affected by the outcome of this proceeding, that there are no other parties with interests similar to T-Mobile, and that its participation in this proceeding would add measurably and constructively to the case. (T-Mobile motion at 2). T-Mobile asks that the Board take this issue into consideration in its resolution of the Petition for Approval of the Project. (January 18, 2012 letter to Kristi Izzo).

While it did not file a formal motion to intervene or participate, New Cingular Wireless PCS, LLC, also known as AT&T Mobility Corporation ("New Cingular Wireless"), joined with the Carriers in their submission of a January 18, 2012 letter to the Board concerning the termination of the cellular license agreements. Collectively, New Cingular and the Carriers sought to impress upon the Board their desire to have the Board take the termination of the cellular agreements and the resulting impact into consideration in its decision concerning the Project. (January 18, 2012 letter to Kristi Izzo). In that letter, the Carriers reminded the Board of Commissioner Fiordaliso's questions during the evidentiary hearing regarding cellular service interruption and PSE&G's assurance that there would be none. Ibid.

On January 27, 2012, PSE&G filed a response in opposition to the motions, arguing that the Carriers had notice of the hearings and raised contractual issues outside of the Board's jurisdiction. Alternatively, PSE&G sought approval of its Petition conditioned on the following: 1)

that it abide by the terms of a January 19, 2012 letter sent by the Company to the Carriers; 2) that it work cooperatively in finding temporary and permanent relocations for the Carriers' installations; and 3) that the Company provide regular status updates to the Board. (PSE&G's January 22, 2012 Response to Carriers' Motion to Intervene or Participate).

On February 2, 2012, T-Mobile and Sprint filed a Joint Reply in support of their motions and in opposition to PSE&G's response. The two carriers disagreed with PSE&G's position concerning the contractual nature of the dispute, characterized the terms of PSE&G's January 19, 2012 letter as insufficient to address their concerns, and reiterated their request that the motions be granted.[13] Verizon filed a separate reply the following day, bolstering arguments in favor of its motion and agreeing with the other Carriers that the terms of PSE&G's January 19, 2012 letter were insufficient to protect against possible disruption or loss of wireless service.

On February 15, 2012, PSE&G filed an executed Stipulation and Agreement ("Stipulation") signed by PSE&G and the Carriers.[14]. By its terms, the effectiveness of the Stipulation is conditioned upon execution by each Carrier and Board approval without modification. (Stipulation at 15). Any carrier can withdraw from the Stipulation if the Board has not issued an order approving the Stipulation by April I3, 2012.[15] (Id. at 4). In exchange for each Carrier withdrawing its motion and all filings made to the Board in this action, PSE&G would withdraw the December 19, 2011 terminations notices; abide by the terms of the January 19, 2012 letter (Exhibit A, to the Stipulation); and assist each Carrier in finding temporary and permanent locations to replace any terminated locations. (Id. at 3). PSE&G would use best efforts to identify locations on its properties, rights-of way, substations and structures where the Carriers could temporarily house their wireless facilities upon the termination of the site licenses related to the Project and work with the Carriers to provide opportunities to attach to PSE&G's proposed Project towers. [16] (Id. at 3-4). Upon its receipt of an application from a Carrier for permission to attach to a new transmission tower, PSE&G will provide written response within 30 days. (Id. at 4). No further correspondence was filed by the Carriers subsequent to the Stipulation.

TESTIMONY PRESENTED

A. The Need for the Project

At the December 15, 2011, evidentiary hearing, PSE&G presented the pre-filed and live testimony of Esam Khadr and Paul McGlynn, both of whom testified concerning the need for the Project. Through their testimony, they described the nature and objective of reliability planning of transmission systems, PJM's responsibilities as a RTO, and the RTEP process performed by PJM that disclosed the anticipated reliability criteria violation and the Project's need to address them. (EK 4:3-10).[17]

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[13] PSE&G's January 19, 2012 letter to the Carriers was appended to the PSE&G's January 27, 2012 reply brief in opposition to the intervention motions and served to amend the December 19, 2011 termination notices it served on the Carriers in accordance with the terms specified in that letter.

[14] The Agreement is also signed by William Moss, Jr., Esq., on behalf of New Cingular Wireless.

[15] At the writing of this Order, no Carrier has notified the Board of its withdrawal from the Stipulation.

[16] Subject to legal, regulatory and other applicable requirements regarding those sites.

[17] Reference to the pre-filed testimony of each witness will be identified by the witness's initials followed by the page and line number of the testimony.

Mr. Khadr currently serves as the Director of Electric Delivery Planning. (EK 2:18-22). Mr. Khadr has been employed with PSE&G in various capacities since 1976 and has been working on planning PSE&G systems since 1980. (EK 5:7-7). In that capacity, he manages the electric transmission and distribution planning organization for PSE&G and participates in the PJM planning process. (EK 2:20-22). His responsibilities include planning and designing the electric transmission and distribution system to assure the future reliability of the PSE&G system and related systems to which it is interconnected. (EK 1:31-34). To assess future reliability of PSE&G's system, Mr. Khadr performs transmission reliability studies to determine compliance with reliability criteria established by NERC as well as with reliability and operational performance criteria established by PJM and PSE&G. (EK 2:1-5). Mr. Khadr also performs analyses of the need for and viability of future economic transmission expansion projects in accordance with PJM's economic cost/benefit metrics. (EK 2:6-8). Finally, Mr. Khadr is the PSE&G representative on the PJM Planning Committee and the PJM TEAC. (EK 5:13-15).

Mr. McGlynn is employed as the General Manager of the PJM System Planning Division for PJM and testified in favor of the Project based on its established need. Mr. McGlynn is responsible for all aspects of the transmission planning analysis conducted by PJM. His responsibilities include assessing long-term transmission system adequacy and reliability to recommend bulk transmission system expansion or enhancement options; integrating the results of the baseline reliability analysis into the overall RTEP for PJM; and managing System Planning Division analytical staff. He also serves as chair of the TEAC. (PM 1:27-33; PM 2:1-4). Mr. McGlynn has spent over 26 years working in engineering and energy transmission design related roles. (PM 2:6-22).

As a FERC approved RTO, PJM is responsible to ensure the reliability of the electric transmission system under its functional control comprising 13 states, including New Jersey, and the District of Columbia. (PM 4:10-11; PM 8:4-5). PJM has more than 700 members, comprising power generators, transmission owners, electricity distributors, power marketers and large consumers. PSE&G is a member of PJM and is considered a "Transmission Owner" under the PJM Operating Agreement. (PM 5:17-19. PM 4:19-21).[18] As a federally regulated RTO, PJM is required to act independently in operating and planning the regional transmission system. (PM 4:21-23).

PJM's role in transmission planning is set forth in Schedule 6 of the Operating Agreement, entitled "RTEP Protocol." (PM 8:19-22). The Protocol describes conformance requirements for the RTEP and other standards for that process. (PM 9:10-11). In order to demonstrate compliance with NERC Reliability Standards, PJM tests system conditions to evaluate the reliability of the transmission system and then, in conjunction with the relevant transmission owner, determines transmission solutions that are needed to ensure that the criteria underlying the NERC Reliability Standards are met. (PM 3:18). As part of its ongoing responsibilities, PJM prepares the RTEP each year in order to analyze the electric supply needs of the customers in the PJM region. (PM 5:2-4). PJM evaluates the aggregate needs across its system, identifies potential problems locally and regionally, and identifies the most effective regional solution that ignores state and transmission owner boundaries. (PM 5:4-7). The RTEP process integrates transmission, generation and demand-side resources to address transmission system constraints involving reliability and persistent congestion. (PM 9:19-21). It is an open and dynamic planning process and all decisions and analyses are subject to stakeholder review and participation. (PM 4:1-3). Due to its dynamic nature, transmission system conditions can

[18] Transmission owner means a PJM member that owns Transmission Facilities or leases Transmission Facilities with rights equivalent to ownership; PM 6: 3-4.

change over time. (PM 19:9). To account for changing circumstances that may result in the need to adjust assumptions used in planning studies and to re-evaluate decisions from previous analyses, PJM tracks changes to those assumptions. (PM 19:10-12). During each RTEP process, PJM also reviews the transmission plans developed in earlier years to determine whether changed assumptions affect the need for a previously approved project, and if it is still required whether the implementation date should change. (PM 20:1-5). This reassessment process is called a "retool" and serves as PJM's safeguard to ensure that the planning process reflects the most current conditions as effectively as possible. (PM 20:5-7).

The RTEP is intended to provide a "looking forward" snapshot of the state of the supply and delivery infrastructure and identifies future system needs both in terms of reliability and market efficiency, PM 5:9-12. The RTEP directs transmission upgrades to address near-term needs within five years and longer lead time options requiring a planning horizon of 15 years or more. PM 5:7-9. The affected transmission owner, in this case PSE&G, then validates PJM's analysis using its own planning tools, with a more localized focus. PJM and the transmission owner then work together to identify a solution that will remedy the violations. EK 9:3-7. The RTO then directs PJM's respective transmission owner to address identified needs through specific transmission solutions. PM 5: 12-13. FERC authority allows PJM to direct the building of new transmission projects or upgrades to ensure grid reliability. PM 3:23; PM 4:1.

The need for the Project, according to PSE&G, stems from system studies conducted by PJM during the 2009 RTEP process. (PM 18:18-20). [19] Based on the 2009 RTEP studies performed, PJM concluded that, absent this Project being placed in service in June 2014, eight NERC Category C reliability criteria violations will occur due to voltage issues. (PM 18:18-20). The study confirmed that voltage drop violations would occur at multiple 138kV substations due to the loss of both Roseland 230/138kV transformers. The affected sub-stations and the expected voltage drops are as follows:

Substation Name	Voltage Drop
Roseland 138 kV	13.7%
Fanwood 138kV	8.8%
New Dover 138kV	7.1%
Aldene 138kV	12.0%
Laurel Avenue 138kV	13.6%
Marion Drive 138kV	13.5%
West Orange 138kV	13.5%
Springfield Rd 138kV	12.5%

(PM 19:3-6).

PJM conducted a retool in October 2011 ("2011 retool") using updated historical data, planned generation and interconnections, and topology changes predicted to impact the system by PJM in the 2015 timeframe. While the 2011 retool established that violations would still occur and confirmed the on-going need for the project by 2014, the magnitude and number of the NERC Category C violation had changed. (Supplemental Direct Testimony of Paul McGlynn, 17:16-18). Paul McGlynn presented a chart from the 2011 Retool that identified seven violations expected to occur in 2014 which would increase to eight violations in 2015 without the Project.

[19] Mr. McGlynn supervised all of the analyses conducted as part of the 2009 RTEP cases and the 2011 RTEP cases-including model development, identifying reliability criteria violations, and formulating solutions to violations. Supplemental Direct Testimony of Paul McGlynn, 18: 8-10.

The affected sub-stations and the expected voltage drop at each (excerpted from the chart) are as follows:[20]

Substation Name	%Voltage Drop in 2014	% Voltage Drop in 2015
Roseland 138 kV	5.76%	11.55%
Fanwood 138kV	NA[21]	11.86%
New Dover 138kV	NA	5.98%
Aldene 138kV	4.96%	9.92%
Laurel Avenue 138kV	5.69%	11.43%
Marion Drive 138kV	5.61%%	11.27%
West Orange 138kV	5.61%%	11.25%
Springfield Rd 138kV	5.17%	10.34%
West Caldwell "D"[22]	5.03%	NA
West Caldwell "G"	5.03%	NA

The 2011 retool confirmed, as illustrated above, that seven voltage violations are expected to occur in 2014, which would increase to eight violations the following year. (Supplemental Testimony of Esam Khadr, 9:11-4). Pursuant to the 2011 retool results for the Project, voltage drops ranging from 5.03% to 5.76% are expected to occur, which would violate PJM's voltage criteria which do not permit voltage drops exceeding 5%. (Id. at 11:4-5). Mr. McGlynn explained that the driving force behind the expected increase in violations in 2015 (in both magnitude and number of violations) is the result of load, generation and topology. (TR 1 38:18-21). Topology refers to the lines and transformers that are modeled between different points. (TR 1 38:13-14).

The anticipated Category C violations expected to occur in both 2014 and 2015 are based on NERC standards. Specifically, NERC reliability standards require PJM to test three categories of events (Categories A, B, and C events) to ensure that the transmission system will operate within acceptable levels under each of the three categories tested. (PM. 15:5-13). Under Category C criteria[23], a system that experiences the loss of one system element followed by system readjustment, and then the loss of a second system element, must remain stable and within applicable equipment thermal ratings and system voltage limits. If the system cannot remain stable and within applicable voltage limits under those conditions, a Category C violation occurs. (PM 15:15-22). A voltage drop violation occurs when the line experiences a reduction exceeding 5% of the pre-contingency system voltage. (PM 17:11-13). This condition is alternately referred to as "N-1-1." NERC Reliability Standards require that PJM identify all critical system conditions that the system must be evaluated against to ensure that it meets performance criteria. (PM 14:15-18).

The Project is tailored to address the expected voltage drops in that region which will result in NERC Category C violations. Adequate voltage levels are necessary to enable the transmission system to move electric energy. (PM 16:11-13). Insufficient voltage levels and

[20] Exhibit ENR-163, TEAC October 5, 2011 retool, page 13).
[21] The 2014 reference to "NA" for Fanwood and Dover is reflective of anticipated voltage drops below 5% in that year. TR. 1 74:6-8.
[22] 2015 "NA" projections for West Caldwell "D" and "G" are reflective of the fact that that those buses will not exist in 2015 as they will be converted to another voltage. TR.1 74: 2-5.
[23] Because there are no Category A or B violations asserted in this matter, those categories are not discussed in this Order.

sudden changes in voltage levels can have adverse consequences and cause varying degrees of damage to a transmission system. (EK 6:14-16; PM 16:11-13). While voltage drops of less than 3% on facilities with 138kV or higher are usually not significant, voltage drops at a switching station, which exceed 5%, can degrade the operation and integrity of certain appliance and machinery or lead to a system collapse. (EK 6:7-20). Overall, the "voltage magnitude" needs to be within a specified range for electrical equipment to operate properly, and failure to retain this level can result in significant impacts. (PM 16:13-14).

A voltage collapse occurs when the voltage on the system drops to a critically low level and the system is unable to support power transfers across the system and customers' load connected to the system. (EK 7:20-23). This condition can result in a brownout or a blackout and may affect a single community or an entire region. (EK 8:1-2). For these reasons, transmissions systems regulate voltage levels to ensure that they are maintained within the range required to supply adequate voltage to customers and to ensure safe system operation. (EK 7:2-4).

The Project was developed as the most effective solution to resolve the identified NERC Category C violations that are expected to occur in 2014. (EK 9:13-14; EK 11:12-13). Mr. Khadr reviewed the PJM RTEP studies identifying the NERC Category C reliability criteria violations and worked closely with PJM to devise the Project. Based on his overall review of the PJM RTEP studies which identified the violations, Mr. Khadr believes that the Project provides the most effective solution from reliability and planning perspective to address the identified reliability criteria violations. (EK 11:17-19). Mr. Khadr explained that in addition to addressing the reliability criteria violations, the Project would provide additional voltage support to prevent localized brown-outs, result in the replacement of infrastructure along the Project route that is near the end of its useful life, allow for the replacement of distribution transfers that are over 40 years old that would need to be replaced in the near future, and result in replacement of the West Orange Station design to one that provides more flexibility for operations and maintenance. (EK 12:22; EK 13 1-2).

PSE&G claims that the time frame for construction of the Project is critical given the impending violations that are likely to occur. (EK 11:22-23; EK 12:1). Without the Project or any material changes in the date underlying PJM's analysis, there will be voltage deficiencies on critical facilities in the region. (EK 12:1-3). If that were to occur, claims PSE&G, PJM and the transmission owner would likely need to implement emergency operating procedures such as implement rolling blackouts for network transmission service customers. (EK 12:4-6). Mr. Khadr placed particular emphasis on the risk of voltage collapse and uncontrolled system blackouts when unresolved reliability criteria are not addressed. (EK 12 6-9).

While alternatives to the Project were considered, PSE&G asserts that none is suitable to address the identified reliability criteria violations. A new generator, for example, was considered and rejected. A generator can typically be used to provide the reactive support necessary to address deficiencies to low system voltages through the creation of reactive power. However, due to the density and development within the Project area, it is unlikely that a generator could be sited and placed in that load pocket. (EK 13:5-11). Nor are there any other planned generation projects in the PJM interconnection queue located in the Project area. (EK 13:10-11). Approval of new generation project entails a process which requires time. Generation operators must first request interconnection to the PJM transmission system through the interconnection queue. (PM 1:11-12). Then a series of studies is performed to determine the network transmission upgrades that will be required in order to safety and reliably interconnect the new generator to the PJM grid. (PM 10:15-17). After the completion of those studies, the interconnection customer is tendered an Interconnection Service Agreement ("ISA")

and, if required, an Interconnection Construction Service Agreement. (PM 10:22-23; PM 11:1). Once an interconnection customer has executed an ISA, the generation project is modeled in all RTEP studies. (PM 11:1-3). To date, PJM has evaluated requests for the interconnection of over 1,800 generation projects totaling over 310,000 MW of generation capacity. Of all of the projects initially proposed, approximately 13% of the MW of these projects is eventually connected to the transmission system while 87% of all proposed MW are never placed into service. (PM 11:16-19). This, according to PSE&G, represents a significant level of uncertainty regarding the likelihood that proposed generators will be available in to future to resolve identified reliability criteria violations. (PM 11:19-21).

Construction of an additional 138kV parallel circuit and installation of a new 138kV transformer at Roseland was also considered to address the voltage violations, but that alternative was rejected due to space limitations at the Roseland Station, the need for new transmission right-of-ways, and the inability of that installation to address the aging infrastructure of the existing 138kV line and transformers. (EK 13:13-19).

Finally, PJM considered the installation of additional capacitor banks, but rejected the option because of its inability to address all of the identified violations and its cumulative tendency to result in high voltage conditions that can damage some equipment including computers and televisions and jeopardize manufacturing processes. (EK 14:1-2; PM 16:21-23).

The PSE&G witnesses assert that the cost of the Project would be distributed in accordance with FERC rules which require use of a cost causation methodology. Under that methodology, PSE&G's and Rockland Electric's customers would cover 100% of the Project's costs, with PSE&G's customers covering 96% of that amount. (EK 14:8-12).

Ultimately, the Project was reviewed by the TEAC on December 16, 2009 and approved by the PJM Board of Managers ("PJM Board") on February 15, 2010. (EK 9:14-15). Once the PJM Board approved the Project, PSE&G, as the transmission owner member of PJM, became obligated to construct, own, and or finance the Project. (EK 9:20; EK 10:1). PSE&G was officially informed of its designation to build the Project in a June 16, 2010, letter it received from PJM. (Exhibit EAK-1).

B. Overview of Project

Mr. Barry Baker testified on PSE&G's behalf concerning the May 23, 2011 Siting Study Report ("SSR"). (BB 3:7-8). PSE&G retained URS Corporation, which employs Mr. Baker, to develop and evaluate alternatives for the Project. Mr. Baker is a Certified Project Manager, an Information Management Solutions Group Lead, and a Principal Geographic Information Systems Specialist.

The siting study for the Project was conducted using the URS-adapted methodology of the siting process developed by the Electric Power Research Institute and Georgia Transmission Corporation, which is a nationally recognized process that incorporates GIS technology, statistical evaluation, site assessment and expert judgment in the decision making process. (BB 3:20-22; BB 4:1-2). The methodology utilized in the study identified major opportunities and constraints in the general study area and used a quantitative and qualitative evaluation process to generate and compare alternative transmission line routes. (BB 8:1-4). The overall objective of the SSR was to select a transmission line route that would result in the least amount of impact to the natural and as-built environments, while still being practicable to construct. (BB 4:2-5). Since the proposed route would be constructed entirely within an existing transmission

line right-of-way, the route would not result in any change in existing or potential future land use. (BB 6:5-7). This consideration is important when compared to the alternative routes that would have significant impacts upon the human environment. (BB 6:9-11).

Additionally, URS assisted PSE&G in conducting public outreach by providing the Company with documents, maps and displays for public workshops and participating in four public workshops throughout the study area. (BB 4:10-14; BB 7:3-4). Ultimately, the analysis performed and input gathered from the public workshops resulted in determining the selected route (the "Selected Route") for the Project. (BB 4:12-14).

The SSR describes the Selected Route as an overhead ("OH") alignment constructed within three sections. The Project will be constructed within 1) PSE&G's existing Roseland-Metuchen Right-of-Way which runs from PSE&G's Roseland Switching Station in Roseland, south to PSE&G's Fanwood Substation in Fanwood, then southeast to PSE&G's New Dover Substation in Edison, and then southeast to PSE&G's Metuchen Switching Station in Metuchen; 2) PSE&G's Roseland-West Orange Right-of- Way that runs from PSE&G's Roseland Switching Station east to PSE&G's Laurel Avenue Substation in Livingston to PSE&G's Marion Drive Substation in West Orange and to PSE&G's West Orange Switching Station, in West Orange; and 3) PSE&G's Right-of-Way between the Metuchen Switching Station and the Sewaren Switching Station.[24] (BB 4:16-23; BB 5:1-6).

As set forth in the SSR, six alternative routes were identified that connected the Roseland Switching Station to the Metuchen Switching Station and the West Orange Switching Station while still tapping into the interrelated substations in Fanwood, New Dover, Laurel Avenue and Marion Drive. (BB 8:8-11). These alternative routes included four OH options and two underground options. The results of the analyses conducted indicated that rebuilding the existing OH system within the existing Roseland-Metuchen and Roseland-West Orange transmission line rights-of-way would be the optimal OH choice, and that building an underground transmission line within the existing rights-of-way would be the optimal underground choice. (BB 8:8-15). However, upon further assessment of the overhead versus underground choices, it was determined that the OH option is the best route for the Project. (BB 8:14-15). Mr. Baker and his team selected the Existing OH Alternative Route as the Selected Route for the Project because it would limit impact to surrounding properties; significantly minimize environmental impacts relative to other OH alternatives; have significantly less environmental impacts relative to an underground option that would use an existing right-of-way; and it would use an existing right of way. (BB 8:17-22; 9:4).

Mr. Thomas Brauchle is the Director of Transmission Projects for PSE&G and testified for PSE&G as a member of the Overview Panel. His functions as Director include directing internal and external resources for the execution of large utility projects such as this one. His responsibilities include the development and implementation of strategic objectives, and reviewing the scope, cost, safety and quality of large projects. (TB 2:4-6). On this Project, Mr. Brauchle is the Project Director and responsible for obtaining permits, providing resources and completing the Project within established timeframes set by PJM. (TB 4:6-10).

The Project is divided into three segments and will cost between $330-350 million and has a required in-service date established by PJM of June 1, 2014.[25] (TB 4:8-10). The current

[24] URS did not perform a routing analysis for the segment as PSE&G is not replacing any transmission structures. BB 5:4-6.

[25] PSE&G later amended that cost figure as stated above.

schedule calls for completion of preliminary engineering, testing, and site investigation, property rights negotiations and permitting, allowing for construction to begin early spring 2012. (TB 4:14-16). Construction would conclude by the spring of 2014, after testing and commissioning is complete. (TB 4:16-17). Any property owners within 200 feet of the Right-of-Way would receive periodic updates on the Project. (TB 4:20-21).

C. Construction and Engineering

PSE&G proffered the testimony of four witnesses to discuss construction and engineering of the Project. Richard Crouch is a Senior Project Manager for Transmission Outside Plant Construction at PSE&G, where he has been employed for 29 years. (RC 1:25-27). Mr. Crouch is responsible for the management of transmission line work associated with large utility projects including the Project, and has overall responsibility for the execution of the design, engineering, and construction of each project within approved scope and schedule. (RC 2:1-5). Mr. Crouch sponsored several exhibits comprising various site plans, plan profiles and simulated engineering drawings of the three segments that would comprise the Project. (RC 3:1-10). For instance, the transmission structures are illustrated in Exhibit RFC-3, the preliminary Site Plan Drawing for the Project. Exhibit RFC-4 contains the Plan and Profile Drawings showing the topography of the rights-of-way for this Project and the location and height of each proposed structure.

Mr. Crouch reiterated PSE&G's plan to divide the project into three segments. PSE&G proposes to install four new structures along Segment 1, three of which will be located within PSE&G's Metuchen Switching Station, and one of which will be an approximately 75-foot high tower east of the New Jersey Transit's Northeast Corridor Railroad. PSE&G proposes to use the existing structures for the entire length of Segment 2. For Segment 3, PSE&G proposes to replace all of the existing transmission structures with new monopoles. (RC 4:8-9).

Along Segment 1, from the Roseland Switching Station to the M-L split, PSE&G currently has one double-circuit 138 kV lattice structure and one 230 kV single circuit lattice structure located on two adjacent rights-of-way ("ROW"). (RC 4:13-16). The total widths of PSE&G's ROW in this segment range from 100 to 225 feet. (RC 4:17-18). PSE&G plans to replace the existing 138 kV structures with double circuit 230 kV monopoles, but currently plans to operate only one 230 kV circuit on these monopoles. (RC 4:18-20). Continuing in Segment 1 from the M-L Split, the existing 230 kV structure on the Roseland-Lambertville ROW splits from the Roseland-Metuchen ROW and runs to Lambertville. (RC 4:22-23; RC 5:1). The existing double circuit 138 kV structure continues on the Roseland-Metuchen ROW to Tower 19/1 in Clark Township. PSE&G plans to replace the existing double circuit 138 kV structure with a double circuit 230 kV monopole to Tower 19/1. (RC 4:20-22). From Tower 19/1A to the Metuchen Switching Station, PSE&G will be using the existing transmission structures to support the 230 kV. (RC 4:1-3).

The existing structures along the Roseland-Metuchen ROW are double circuit steel lattice 138 kV structures with vertical construction of the circuit up to Tower 19/1. (RC 5:21-22). PSE&G is proposing to install double circuit 230 kV monopoles with a vertical circuit configuration to replace existing 138 kV structures. (RC 6:4-5). Exhibit RFC-2a provides an engineering drawing of the proposed structures from the Roseland Switching Station to the M-L Split. Exhibit RFC-2b is an engineering drawing of the proposed structures from the M-L Split to Tower 19/1. PSE&G will only operate one circuit on these monopoles and will use two conductors per phase for the three phases of the circuit in order to reduce magnetic field levels.

Two additional options for the design and configuration of the replacement monopoles were considered. (RC 7:3). The first option involved replacing the double circuit 138 kV monopole with a single circuit 230 kV monopole in a delta configuration ("Option 1") as shown in Exhibit KGK-2. (RC 7:3-5). The second option ("Option 2") was to replace the double circuit 138 kV structures with a double circuit 230 kV monopole, but only install one conductor per phase rather than two conductors per phase. (RC 7:13-15). However, a single circuit delta configuration would prevent PSE&G from meeting the construction in-service date, would prohibit future expansion on this ROW without replacing monopoles and, as outlined by PSE&G witness Kyle King in his testimony, would result in an increase in magnetic fields over existing levels and increase the structure height in several locations. (RC 7:18-20; RC 8:1-4).

Along Segment 2, from the existing Metuchen Switching Station in Edison to the existing Sewaren Switching Station in Woodbridge, PSE&G currently has three transmission structure lines that run adjacent to U.S. Route 1. (RC 8:8-10). The western structure is a double circuit 230 kV lattice structure, a second (middle) structure is a double circuit 138 kV lattice structure and the third (eastern) structure is a 230 kV double circuit lattice structure supporting a 138 kV circuit and a 230 kV circuit in a vertical configuration. (RC 8:10-14). PSE&G will upgrade the existing 138 kV circuit on the eastern structure to 230 kV using the existing infrastructure, which is already constructed to 230kV, requiring no modifications to any of the existing structures. (RC 8:14-17). The existing eastern transmission structures from Metuchen Switching Station to the Sewaren Switching Station were built in 1972. (RC8:19-20). The existing ROW consists of three rights-of-way immediately adjacent to each other. (RC 8:22-23). They include the Sewaren-Brunswick Right-of-Way, the Sewaren- Metuchen Right-of-Way and the Linden-Metuchen Right-of-Way. The width of all three adjacent rights-of-way is approximately 235 feet. (RC 9:1-2).

Along Segment 3, from the existing Roseland Switching Station in Roseland to the existing West Orange Switching Station in West Orange, PSE&G currently has two 138 kV lattice transmission structures, each supporting a single 138 kV circuit. PSE&G will replace these existing structures with two double circuit 230 kV monopoles in a vertical configuration, initially supporting one 230kV circuit on each structure. Exhibit RFC-2c shows the proposed replacement monopoles along Segment 3. (RC 9:8-15).

Construction of the Project would have operation benefits given the age of the line. Since most of the existing structures are over 80 years old, there are inherent operational and maintenance benefits derived by their replacement. (RC 11:20-21).

Stephen Czajka discussed the design and location of transmission structures. Mr. Czajka has been employed by URS and its legacy companies for 34 years in their energy and construction division. (SC 1:32-34). Mr. Czajka performed the engineering review of the foundations associated with existing structures and the proposed monopoles for PSE&G. (SC 2:8-10). Mr. Czajka conducted a preliminary foundation assessment including the identification of the existing structures with the most severe corrosion. A total of 36 foundations were excavated and pictures taken through the PSE&G maintenance program along the 18 miles of line between the Roseland Switching Stations and Tower 19/1 (Segment One). (SC 2:17-22). The pictures reviewed for the ROW indicate evidence of severe corrosion on 11 of the exposed tower legs associated with several transmission towers and moderate corrosion at the other 25 sites. (SC 3:6-7). Based on those images, it was concluded that many of the buried portions of the steel tower foundations had experienced severe corrosion. (SC 3:7-8). While there is no immediate risk that existing towers will collapse, Mr. Czajka concluded that the structures are at

the end of their useful life. (SC 3:12-15). If the Project does not move forward, PSE&G will need to address or to replace those structures. (SC 3:14-5).

Jay Williams testified about the option of under-grounding the Project. Mr. Williams has been employed with Power Delivery Consultants, Inc. ("PDC") for 19 years. (JW 1:28-29). He is an executive engineer at PDC and heads a group of engineering professionals that specialize in underground cable systems. (JW 2:5-7). Mr. Williams explained why under-grounding is not the preferred option for the Project and submitted details of his findings in a report titled, "Analysis of Potential 230-kV Cable Systems as Alternatives to Proposed Overhead Lines for the North Central Reliability Project" which was admitted into evidence as Exhibit JAW-2. (JW 3:11-13).

Mr. Williams stated that the route chosen for the Project crosses several creeks, highways, and railroads, where underground installation may not be permitted. (JW 6:13-14). In these instances, a trenchless installation, achieved by horizontal auger boring, would be required. Horizontal directional drilling would be required for river crossings. All of these methods are, according to the witness, time consuming, expensive, and risky. (JW 6:14-18). In addition, the route contains extensive wetlands, which create substantial problems since underground installation is generally not permitted and it is technically infeasible to carry heavy equipment through the wetlands to install cables. (JW 6:19-21). Horizontal directional drilling can allow crossing of some wetlands, but the maximum feasible length is approximately 3,000 feet. (JW 6:22-24). Longer lengths through wetlands would probably require re-routing the lines. (JW 6:22-24). Finally, substantial portions of the lines' route have high rock content and steep elevation changes, which make trenching and cable installation difficult and prohibitively costly. (JW 7:2-4).

Cost and service interruptions are further deterrents to under-grounding. The cost differential between undergrounding and over-head installation can range from 5 up to 10 to 1 and go as high as 20 to 1. (JW 11:19-23). In addition, longer outages and service restoration periods result from undergrounding due to the complexity of identifying and repairing the source of a fault within an underground line, particularly within some of the remote areas traversed by the lines in this matter. (JW 6:4-5; JW 10:20-21). A faulty underground cable can take from one week to one month to locate and repair. (Exhibit JAW-2 at 12). In addition, the disturbance caused by the equipment necessary to construct and maintain underground cables within these remote areas, particularly the wetland areas, can result in significant adverse environmental impact, requiring extensive additional disturbance of the soil than overhead construction will cause. (Exhibit JAW-2 at 9).

Matthew T. Brown provided testimony about the conceptual design performed for the inside plant work as part of the Project. Mr. Brown is a Project Director at USR Corporation, where he has been employed by it and its predecessor companies for more than 35 years. (MB 1:29-30). PSE&G retained URS Corporation to perform the conceptual design of the "inside plant" (switching stations and substations) and upgrades associated with the Project. Inside plant work is the term used to connote upgrades within existing PSE&G switching stations and substations. (MB 3:29-32).

Electrical substations and switching stations are the infrastructure within the electrical transmission grid which, among other things, allows transmission companies to control and monitor the flow of electrical power, provide protections of transmission assets in order to clear system instabilities and provide a location for the safe step-down or step-up of electrical voltage levels. (MB 3: 34-36; MB 4:1-2). A switching station provides for an interconnection between

two or more transmission lines while a substation provides for an interconnection between transmission, sub-transmission and distribution voltages. (MB 4:4-6).

Mr. Brown provided 28 exhibits along with his testimony that illustrate the conceptual design of the Project and display, among other things, the height, size and foundation construction. PSE&G would be performing work within the West Orange Switching Station (West Orange), Marion Drive Substation (West Orange), Laurel Avenue Substation (Livingston), Fanwood Substation (Fanwood), New Dover Substation (Edison), Pierson Avenue Substation (Edison) and Woodbridge Substation (Woodbridge). (MB 4:9-13).

All terminal equipment at each station will be installed to match or exceed the upgraded inter-connected 230 kV lines' ratings such that no terminal equipment at the upgraded station is a circuit rating limiter. The work at all stations will include the associated protection and control equipment necessary for a completely functioning system. Line, load and generation positions are provided as necessary for each station and the primary back-up, breaker-failure and transfer-trip relay protective functions are included. (MB 15-22; MB 4:15-22).

D. Economic Benefits

Dr. Joseph J. Seneca, an economics Professor at Edward J. Bloustein School of Planning and Public Policy at Rutgers University, testified on behalf of PSE&G. The Company retained Dr. Seneca to prepare an economic analysis of the expenditures made for construction and installation of the various components of the Project. (JS 3-5). Dr. Seneca prepared a report outlining his findings entitled "Economic Impacts of Construction Expenditures for the North Central Reliability Project." That report was admitted into evidence as Exhibit JJS-2. (JS 3:10-12).

Dr. Seneca used the RECOM™ Input-Output model ("the model") to estimate the economic impacts of various types of expenditures or investments in terms of employment, gross domestic product, income and tax revenues. (JS 3:17-21). The model consists of 517 individual sectors of the New Jersey economy and measures the effect of changes in expenditures in one industry on economic activity in all other industries. (JS 3:21-23). Thus, the model measures the direct impact of expenditures made on labor, materials, legal and design services, for instance, as those expenditures become income and revenues for workers and businesses. The model also measures subsequent indirect impacts as those workers and businesses spend those dollars on other goods and services. (JS 3:17-24; JS 4:1-6). In essence, the model estimates both direct economic impacts (jobs and income) and indirect economic impacts (in additional jobs and income) of the subsequent economic activity that occurs following the initial expenditures. (JS 4:9-12).

In order to conduct his analysis, Dr. Seneca began with certain assumptions, including:

- PSE&G's total cost of construction, equipment and installation for the Project
- PSE&G's base cost of construction including labor, materials support and third party services
- Calculation of escalation and contingency costs and their proportionate distribution between the various costs (i.e. % of contingency costs assigned to labor vs. % of contingency costs assigned to supplies)
- Percentage distribution of subcontract allocations
- Use of New Jersey construction labor

- In state purchase of engineered electrical equipment
- Direct manufacturer purchase of certain construction material and acquisition of rental equipment

Based on the application of these assumptions in the model, the Project's expected economic impact is as follows.[26]

- The direct creation of 1,641 in-state jobs including 1,100 jobs associated with the construction of the Project;
- The indirect creation of 541 jobs (as the initial expenditures on labor, services and material are reinvested into the economy);
- Total gross domestic product of $261.4M;[27]
- $137.6M in labor compensation in New Jersey
- Estimated generated state tax revenues of $9.6M[28]
- Local tax revenues of $5.3M
- $6.4M in additional licensing and permitting fees.

In addition to this study, Dr. Seneca expects to present a subsequent analysis showing other economic impacts associated with potential reliability or price impacts resulting from the upgrades. (JS 9:1-5).

E. Electromagnetic Fields ("EMF")

PSE&G presented two witnesses to testify concerning the potential effects of electrical and magnetic fields from the Project and the state of health research concerning EMF from transmission projects. Kyle G. King is the President of Massachusetts based engineering firm K&R Consulting, L.L.C. (KK 1:27-29). He holds a Bachelor and Masters Degree in Electrical Engineering and has several years of experience working as the Director of a High Voltage Research and Test Center. Mr. King has extensive background in transmission line design and magnetic field management. (KK 2:5-9). Mr. King analyzed the effects of electric fields, magnetic fields, audible noise and radio noise associated with the Project and provided his findings in a report titled "Electrical Effects from the North Central Reliability Project," which was admitted into evidence as KCK-2. (KK 2:19-21; KK 3:2-4). The purpose of his testimony was to describe and quantify the electrical effects of the Project, including the levels of 60-hertz EMF, corona effects and noise. (KK 3:8-10). As explained below and in his report, Mr. King concluded that the Project will meet all New Jersey regulations for electric fields and audible noise. (KK 8:1-3).

Megan Mitchell is a Managing Epidemiologist in the Health Sciences practice at New York based Exponent. (MM 1:25-27). In her capacity as a Manager, Ms. Mitchell conducts critical evaluations of epidemiologic health research, concentrating primarily in the field of cancer epidemiology and the research of occupational and environmental causes of various cancers.

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[26] $261M of the estimated $336M cost of the Project was allocated for economic impact under the model.

[27] Total gross domestic product ("GDP") is a measure of the value of the economic output generated in the state as a result of the construction expenditures. JS 7:18-19. While the resulting GDP is less than the $261M allocated for economic impact under the model, the difference is primarily due to "leakage", which is the out-of-state expenditures (direct and indirect) which would reduce the value of economic outputs generated in the state. JS 7:20-24.

[28] Total state tax revenues comprises sales tax from Project expenditures, income tax generated from direct and indirect job growth, and sales tax generated from expenditures made by those with the jobs.

(MM 1:29-32). She holds a Bachelor of Science from Cornell University, a Master of Public Health in Epidemiology from Columbia and has spent six years reviewing research related to the possible health effects of EMF. (MM 2:4-7).[29] Ms. Mitchell provided expert testimony to the Connecticut Siting Council and the Iowa Department of Commerce Utilities Board concerning the status of EMF in connection with transmission projects. PSE&G retained her to advise the Company on the current state of the science and health with regard to EMF and the Project. (MM 4:8-9). In conducting her review, Ms. Mitchell relied on calculations provided by Mr. King concerning the existing and anticipated levels of magnetic fields for the Project. (MM 6:10-11).

Electric fields are created by any device which produces, carries or uses electrical energy. (KK 4:20-21). Transmission and distribution lines, for example, generate electric fields in their vicinity because of electrical charge (voltage) on energized conductors. (KK 3:14-16). New Jersey has a guideline of 3kV/m for electric fields at the edge of a Right-of-Way. (KK 13:9-11). Magnetic fields are also created by any device that produces energy. (KK 4:20-21). The source of a magnetic field is the electrical current carried on a power line or other conductor. (KK 8:6-9). The 60-Hz electric current flowing in the Project's conductors will generate a 60-Hz magnetic field in the vicinity of those conductors.[30] (KK 4:11-15). Although New Jersey has no limits for exposure to magnetic fields created from transmission lines, Florida and New York do. (MM 6:-9-10). Florida limits magnetic fields to 200 mG for 500 kV lines and 150 mG for transmission lines that are 230kV or lower while New York limits magnetic fields to 200 mG.[31] (MM 6:11-3). Ms. Mitchell confirmed that the fields produced by the proposed Project are categorized in the extremely low frequency ("ELF") range of the electromagnetic spectrum. (MM 5:2-4; KK 13:21-22).

Likewise, although there are no state or federal standards limiting exposure to magnetic fields based on health effects, several scientific organizations have published guidelines for exposure to EMF. (MM 7:13-14). For instance, the International Commission of Non-Ionizing Radiation Protection ("ICNIRP") set limits to protect against the acute effects that can occur at very high field levels. ICNIRP recommends a screening value of 2,000 mG and 4.2 kV/m for the general public. (MM 7:15-19). The International Committee on Electromagnetic Safety ("ICES") also recommends limiting residential EMF exposure to 9,040 mG for magnetic fields and 5 kV/m for electric fields. (MM 8:1-3).

The concentrated electric field at the surface of transmission line conductors can also cause a phenomenon called corona. (KK 3:22-23). Corona results from the ionization of air in very strong electric fields at the surface of the conduction and can be a source of audible noise, radio noise and ultraviolet light. (KK 3:22-23; KK 4:1-2). New Jersey limits for audible noise are found at N.J.A.C. 7:29-1.2(a)(2)(i), which establishes a limit of 50 dBA for "continuous airborne sound" between the hours of 10:00 P.M. and 7:00 A.M. (KK 14:3-5).

To quantify electrical effects of the Project, Mr. King calculated the electric and magnetic fields, radio noise, and audible noise caused by corona from the transmission lines using the EPRI Transmission Line Workstations computer programs. (KK 7:20-22). The EPRI Transmission Line Workstations is used to calculate electric field, magnetic field, audible noise, and corona

[29] Epidemiology is the science of understanding the different factors that contribute to diseases. MM 2: 9-10. Through evaluating a body of evidence, an epidemiologist can make judgments about whether exposure is a health hazard, and, if so, at what level the hazard occurs. MM 2:15-18.

[30] The National Institute of Environmental Health Sciences estimates the average level of background magnetic fields in most homes ranges from 0.5 to 5.0 mG.

[31] Magnetic field is expressed in units of milligauss ("mG").

effects for various transmission line configurations, and may be used to verify compliance with regulations of those electrical parameters. (Discovery Response of KK, ENR-80). As part of his analysis, Mr. King modeled the existing and proposed line configuration to compare expected levels of electric and magnetic fields in 2015, the first full year in which the Project will be in service against the existing levels. (KK 7:15-18). Since it is the electrical current carried on a power line or conductor that is the source of the magnetic field, Mr. King used historical load figures from the existing 138k lines which he obtained from Mr. Khadr as well as forecasted future load follows in 2015 for the Project. (KK 8:6-9). The load prediction provided data to determine the median level of electrical current and associated magnetic field for each line segment of the Project. (KK 8: 10-11).[32]

Mr. King's study concluded that the Project will meet all New Jersey regulations for electric fields and audible noise. (KK 8:1-3). Table 1 of his report illustrates that the Project will meet the State of New Jersey's electric field guidelines at the edge of the right of way, producing a maximum electric field of 0.11 kV/m between Roseland and West Orange, and 1.8 kV/m between Roseland and Tower 191 in Clark Township along the edges of the rights-of-way, which is the same electrical field range for the existing 138kV and 230 kV circuits. (KK 13:14-19). Audible noise standards will also be met. While 138 kV and 230 kV transmission lines do not typically produce much corona or associated audible noise, the calculated audible noise levels after the Project is completed in 2015 range from 33.7 to 38.0 dBA, well below the State limit of 50 dBA. (KK 14:7-11). In addition, the size and spacing of the design of the conductor chosen for the Project will minimize corona related effects. (KK 4:2-5; KK 4:5-8).

While New Jersey has no requirements for magnetic fields from transmission lines, PSE&G claims it has employed a policy of "prudent avoidance." (KK 13:21-22; KK 6:4-7). Prudent avoidance is a precautionary principle whereby reasonable efforts are taken to minimize potential risks when the actual magnitude of the risks is unknown. (KK 6:4-7). Several agencies have adopted the prudence avoidance policy including the National Institute of Environmental Health Sciences and the World Health Organization. (KK 6:23; KK 7:1-9). PSE&G has exercised prudent avoidance by optimizing the design of its upgraded 230kV transmission lines to limit the magnetic field levels produced at the edge the rights-of-way and by choosing the transmission design that minimized magnetic fields the most. (KK 11:16-18; KK 7:10-12). As part of its "prudent avoidance" policy, PSE&G also took efforts to minimize pipeline electromagnetic interference by following the guidelines of the National Electrical Safety Code which recommend separating its AC power system grounds by at least 10 feet of soil from the pipelines to minimize voltage coupling during fault conditions which is a safety concern. (KK 13:1-5). According to Mr. King, the Project will result in a reduction in units of milliguass as illustrated in Table 3 of Exhibit KCK-2.

From a health standpoint, Ms. Mitchell testified that there has been considerable research on exposure to EMF and related potential health effects. As in all other areas of science, research on EMF is an ongoing activity. (MM 18:20-21). According to the witness, the overall conclusions by several government and scientific organizations who performed weight-of-evidence reviews of EMF and health was that the body of evidence does not support the conclusion that EMF is the cause of any long-term adverse health effect, including adult and

[32] The values of the magnetic field calculated at median line loadings are the best descriptors of the magnetic field for purposes of estimating "typical" exposure. MM 6:1-3.

childhood cancer, neurological disease or reproductive effects. (MM 13:10-13).[33] Each organization expressed that the evidence in support of a causal relationship is tenuous because it is founded largely on findings from epidemiology studies that are inconsistent, weak and subject to various methodological limitations. (MM 13:13-17). Furthermore, the in vivo studies (i.e. animal studies) did not report consistent increases in cancer among animals exposed to high levels of magnetic fields, and the in vitro studies (i.e. in the cells and tissues) have not confirmed any mechanism capable of explaining how magnetic fields could cause disease. (MM 13:16-19; MM 8:10-11). The most recent comprehensive review was conducted by the World Health Organization and published in June 2007. (MM 14:7-9). Although national and international health agencies have concluded that exposures encountered in daily life, including those from transmission lines, do not pose any recognized long-term health risks, the WHO recommends "when constructing new facilities...low-cost ways of reducing exposure may be explored." (MM 18:4-7; MM 18:7-9). Ms. Mitchell confirmed her belief that PSE&G has taken steps in the siting of the Project that are consistent with those recommendations. For example, PSE&G has sited the Project on an existing ROW instead of locating it on a new ROW and it has designed its upgraded circuits to reduce magnetic fields. (MM 18:14-17).

No other parties submitted testimony in this matter.

DISCUSSION AND FINDINGS

A. Procedural Motions

In ruling on a motion to intervene, N.J.A.C. 1:1-16.3(a) requires that the decision-maker consider the following factors:

1) the nature and extent of the moving party's interest in the outcome of the case,
2) whether that interest is sufficiently different from that of any other party so as to add measurably and constructively to the scope of the case,
3) the prospect for confusion and delay arising from inclusion of the party, and
4) other appropriate matters.

If the standard for intervention is not met, N.J.A.C. 1:1-16.6 provides for a more limited form of involvement in the proceeding as a "participant" if, in the discretion of the trier of fact, the addition of the moving party is likely to add constructively to the case without causing undue delay or confusion. Under N.J.S.A. 1:1-16.6(c), such participation is limited to the right to argue orally, or file a statement or brief, or file exceptions, or all of these as determined by the trier of fact.

As the Board has stated in previous proceedings, application of these standards involves an implicit balancing test. See, Order, I/M/O the Joint Petition of Public Service Electric and Gas Company and Exelon Corporation for Approval of a Change in Control, BPU Docket No. EM05020106 (June 8, 2005). The need and desire for development of a full and complete record which involves consideration of a diversity of interests must be weighed against the requirements of the New Jersey Administrative Code which recognizes the need for prompt and expeditious administrative proceedings by requiring that an intervener's interest be specific,

[33]Such reviews include those performed for the U.S. National Institute of Environmental Health Sciences (NIEHS, 1999), the IARC (IARC, 2002), the ICNIRP (ICNIRP, 2010), the National Radiological Protection Board of Great Britain (NRPB, 2001; NRPB, 2004), the Health Council of the Netherlands (HCN, 2004; HCN, 2005; HCN, 2009), and the World Health Organization (WHO, 2007b). MM13:1-8.

direct and different from that of the other parties so as to add measurably and constructively to the scope of the case.

The nature and extent of the Carriers' interest in the outcome of the case is tenuous. The Carriers are not seeking the Board's denial of the Petition, but recognition that PSE&G did not give them proper notice under their Agreements before issuing the December termination letters. The Carriers are also seeking the Board's placement of conditions upon PSE&G which would mitigate the harms expected by the Carriers due to the alleged breach, if the Petition is approved. The nature of the Carriers' issue is not with the Project but with PSE&G's conduct under the terms of their preexisting Agreements. The question of whether PSE&G used reasonable efforts to provide the Carriers with one-year notice of termination under their Agreements is neither properly before the Board nor is it related to the Board's determination of the Petition under N.J.S.A. 40:55D-19. Rather, the Board's determination concerns the necessity of the use for reliable electric supply. Therefore, the nature and extent of the Carriers' interest in the outcome of the Petition is unclear.

Furthermore, full intervention status entitles an intervener to all the rights and obligation of a party to a proceeding. N.J.A.C. 1:1-16.1(b). That includes the right to propound discovery, to present witness testimony and to cross-examine witnesses. Given the timing of the Carriers' motions -after the evidentiary hearings had ended and beyond the expiration of time for filing intervention motions under the Board's pre-hearing order - the limited scope of the Carriers' interests in relation to the Project as a whole, and the fact that the Carriers' underlying Agreements and PSE&G's actions thereunder are not properly before the Board, granting the Carriers intervention status would result in unnecessary delay and substantial unneeded confusion. For those reasons, the Board **HEREBY DENIES** the Carrier's motions for intervention.

However, the Board grants the Carriers' request in the alternative for participation status.[34] Because the expected harm to the Carriers' is fully outlined in the briefs and correspondence that they filed with the Board, and that information adds constructively to the case without causing undue delay or confusion, in accordance with N.J.S.A. 1:1-16.6(c), the Board **HEREBY GRANTS** the Carriers' motion for participation limited to any filings made prior to their execution of the Stipulation. The Board **FURTHER ACKNOWLEDGES** the Carriers' execution of the Stipulation to which they certify, by their signatures, is a resolution of all issues that are the subject of their motions. As such, while the Board grants the participation, it also recognizes that such participation has been effectively rendered unnecessary by the stipulation.

B. Review Criteria

The applicable criteria to be reviewed by the Board in this matter is set forth in N.J.S.A. 40:55D-19. The statute states that a public utility proposing a project through multiple municipalities may grant the petition if, after hearing, on notice to all interested parties, the Board finds that:

> the present or proposed use by the public utility ...of the land described in the petition is necessary for the service, convenience or welfare of the public... that the present or proposed use of the land is necessary to maintain reliable electric or natural gas supply service for the general public and that no alternative site or sites are reasonably available to achieve an equivalent public benefit, the public

[34] The Board grants Verizon's motion for participation in the first instance, as it did not seek intervention status.

> utility ...may proceed in accordance with such decision of the Board of Public Utilities, and ordinance or regulation made under the authority of [Municipal Land Use Law] notwithstanding.

The New Jersey Supreme Court, in In Re: Public Service Electric &Gas Co., 35 N.J. 368 (1961), set forth the applicable legal principles:

a. The phrase "For the service, convenience and welfare of the public" refers to the whole public served by the utility and not the limited group that benefits from the local zoning ordinance;

b. The proposed use must be reasonably, not absolutely or indispensably, necessary for the service, convenience, and welfare of the public;

c. The particular site or location must be found to be "reasonably necessary" and so the Board must consider the community zoning plan, the physical characteristics of the site, and the surrounding neighborhood;

d. Alternative sites and their comparative advantages and disadvantages, including cost, must be considered in determining reasonable necessity; and

e. The Board must weigh all interests and factors in light of all the facts, giving the utility preference if the balance is equal. The legislative intent is clear that the broad public interest is greater than local considerations.

In making its determination under these concepts, the Board must weigh all the interests and, in the event the interests are equal, the petitioner should be entitled to a preference because the legislative intent is clear that the broad public interest to be served is greater than local consideration. See, e.g., In Re: Monmouth Consolidated Water Co., 47 N.J. 251 (1966); In re: Public Service Electric & Gas Company, supra, 35 N.J. at 377.

C. Need for the Project

As stated above, the Project consists of upgrading and converting the existing circuits between the West Orange and Roseland Switching Stations and the circuits between the Roseland and Sewaren Switching Stations from 138 kV to 230 kV. The Project also requires the conversion of the related substations from 138 kV to 230 kV. The purpose of the Project is to remedy voltage violations expected to begin during the 2014 energy year.

PJM is responsible for ensuring the reliability of the regional transmission system and coordinating the movement of wholesale electricity in its 13 state-plus region, including New Jersey. The reliability criteria are established by NERC through jurisdiction awarded by FERC. A major component of this responsibility is planning for the transmission system. PJM evaluates the projected operation and capacity of its high-voltage electrical transmission system over both a five-year and 15-year planning basis. This evaluation includes the current transmission infrastructure, existing generation assets, dedicated capacity, updated load forecasts, and planned assets and generation on a multi-year look ahead and takes the PJM assumed conditions for each study year into account. From this analysis and review, PJM develops its RTEP. Part of the function of this process is to specify anticipated NERC Reliability Standards criteria violations on the transmission system and then to develop projects designed to fix or mitigate these violations.

PJM's 2009 RTEP analysis identified eight violations that would occur beginning in June 2014 that needed to be addressed. The October 2011 retool confirmed the occurrence of seven NERC Category C violations expected to occur in 2014, which will increase to eight expected violations the following year in the absence of the Project. Despite changes in the magnitude and number of expected violations, PJM determined that the Project remains necessary to address the expected reliability criteria violations with no change to the Project's in-service date.

NERC's reliability standards require that the transmission system operate within applicable voltage limits. PJM has determined that voltage drops exceeding 5% are not acceptable because such drops can degrade the operation and integrity of appliances and machinery or lead to a system collapse. Additionally, voltage levels must be maintained on the transmission system to ensure that voltage-sensitive equipment operates properly. NERC's reliability standards require that PJM test events that fall into three categories: Category A, Category B and Category C. Category C criteria impose such requirements in situations involving second contingencies, for example the loss of a second system element. (EK 8:12-19). In this case multiple voltage drop violations will result from the loss of both of the Roseland 230-138 kV transformers and constitute a violation under NERC's standards. (PM 18:20-22).

The criteria violations are a result of several factors that combine to create the voltage drops to substations in the project area including load growth, generation and changes in topology. However, given the contingencies driving the need for the Project, changes in other assumptions would not affect the need for the Project.

Changes in topography are projected to significantly affect the level of the voltage drop. PJM defined "Topology" as the circuits and transformers at points in the system. Because of pending projects and work, the system configuration will change by 2015. A specific example of this impact is that two 138kV circuits into Roseland substation will be converted to 230kV circuits for the North East Grid ("NEG") Project. This will result in two less feeds into the 138kV system in the project area increasing the amount of voltage drop estimated under Criteria C circumstances in 2015. PM 18:20-23.

The NCRP is the PJM proposal to fix for these violations. According to PJM, If the NCRP is not constructed and in-service by summer of 2014, the transmission system, as currently modeled, is at risk of partial or total collapse should there be a Category C event.

a. <u>Alternatives to the Project</u>

PJM considered the Project as the most reasonable solution to the potential voltage violations. PJM reviewed whether Demand Response ("DR") or new generation could be potential solutions but concluded that neither alternate would vitiate the need for the Project. PJM found that DR is not a viable solution to long-term voltage based criteria violations. Furthermore, PJM's rules require it to consider new generators in the RTEP process only when the proposed generator signs an Interconnection Services Agreement ("ISA") or clears an RPM auction. Since the Project has an in-service date of June 2014 and there are currently no potential generators that have either advanced to an ISA or cleared the RPM auction, PJM concluded that generation is not a viable option to remedy these concerns.

PJM also considered the installation of an additional parallel 138kV circuit and transformer into Roseland, but determined that it would not be feasible. The new line would require additional easements and rights-of-way and there is no room in the Roseland substation to build a new transformer due to current expansion projects at the facility. Furthermore, a new circuit would not address the secondary concern identified by PSE&G of the aged structures on the existing 138 kV circuits.

While PSE&G assessed the installation of capacitor banks ("Caps") within the 138kV system to resolve the projected 2014 voltage drops, they are limited in the amount of voltage drop they can mitigate and have a tendency to create high-voltage situations if they do not compensate for the system changes quick enough. Moreover, the installation of Caps would not address the aged 138kV infrastructure concerns expressed by PSE&G as a driver for this Project.

The Company has met its burden of showing that NERC Category C violations are likely to commence as early as June 2014 (with worsening violations in the succeeding year absent the construction of the Project) and that there are no suitable alternatives to remedy those violations.

b. Other Factors

The Company contends that, in addition to the need based on PJM's reliability criteria, the Project will have the added benefit of replacing aging infrastructure. An engineering review performed by PSE&G revealed moderate to severe corrosion at the existing foundations and legs of the transmission structures. Of the 36 locations tested, severe corrosion was exposed at 11 locations and moderate corrosion at the other 25. Although there is no immediate risk that the towers will collapse, they are at or near the end of their useful life.

Therefore, based upon the record as a whole, the Board **HEREBY FINDS** that the Company has shown that the Project is necessary for the service, convenience and welfare of the public under N.J.S.A. 40:55D-19.

D. Design, Engineering and Construction

As noted above, the Company considered six alternate options with respect to the routing of the lines; four OH options and two underground options. The testimony shows that the proposed route for the Project, which will be constructed entirely on an existing ROW, will have the least impact on property owners and the environment. The evidence confirmed that the Project will be engineered and designed to minimize environmental impacts to the greatest degree possible. The Company also presented persuasive evidence that placing parts or all of the Project underground would not be feasible due to cost, environmental and operational considerations.

a. Infrastructure Benefits, Structure Location and Construction

Given the age of the existing lines and tower structures, construction of the Project would provide engineering and operational benefits. Since most of the existing structures are at or near the end of their useful life, there are operational and maintenance benefits derived by their replacement. Operational issues such as lightning induced outage performance and relay protection, for instance, would be enhanced. Furthermore, as explained by Stephen Czajka, an engineering review of the foundations indicates that if the Project does not go forward, PSE&G

will need to repair and/or replace some of the existing structures or reinforce existing foundations in the near future.

E. Economic Benefits

The testimony was persuasive in concluding that the project would have a positive economic impact on the State through among others things:

- The direct creation of 1,641 in-state jobs including 1,100 jobs associated with the construction of the Project;
- The indirect creation of 541 jobs (as the initial expenditures on labor, services and material are reinvested into the economy);
- Total gross domestic product of $261.4M[35]
- $137.6M in labor compensation in New Jersey
- Estimated generated state tax revenues of $9.6M[36]
- Local tax revenues of $5.3M
- $6.4M in additional licensing and permitting fees.

(JS 6:11-23; JS 7:1-24; JS 8:1-22)

F. Electromagnetic Fields ("EMF")

Mr. King and Ms. Mitchell testified as to existing standards for EMF. While there are no standards for electric fields within the right-of-way, New Jersey has adopted a 3 kV/m electric field standard at the edge of the right-of-way. There are also no standards in New Jersey for magnetic fields at the edge of the right-of-way, or within it.

Several scientific organizations have published guidelines for exposure to EMF based on acute sensory effects that can occur at very high field levels. In their recently published updated guidelines, the International Commission of Non-Ionizing Radiation Protection ("ICNIRP") set limits to protect against the acute effects (i.e., the stimulation of nerves and muscles) that can occur at very high field levels. ICNIRP recommends a screening value of 2000 mG and 4.2 kV/m for the general public. The International Committee on Electromagnetic Safety ("ICES") also recommends limiting EMF exposure at high levels because of the risk of acute effects, although their guidelines are higher than ICNIRP's guidelines at 60 Hz. The ICES recommends a residential exposure limit of 9,040 mG for magnetic fields and 5 kV/m for electric fields. Both guidelines incorporate large safety factors. The expected EMF levels outside the ROW would be below those recommended in the exposure guidelines published by these international organizations.

[35] Total gross domestic product ("GDP") is a measure of the value of the economic output generated in the state as a result of the construction expenditures (JS 7:18-19). While the resulting GDP is less than the $261M allocated for economic impact under the model, the difference is primarily due to "leakage", which is the out-of-state expenditures (direct and indirect) which would reduce the value of economic outputs generated in the state (JS 7:20-24).

[36] Total state tax revenues comprises sales tax from Project expenditures, income tax generated from direct and indirect job growth, and sales tax generated from expenditures made by those with the jobs.

While there are no federal standards for electric fields, New Jersey has adopted a standard of 3 kV/m for electric fields at the edge of a right-of-way. The maximum level of electric fields at the edge of the right-of-way for the Project is projected to be 1.8 kV/m. Thus, the Board **HEREBY DETERMINES** that the Project will comply with the New Jersey's standard for electric fields at the edge of the right-of-way.

Although the methodologies used by Mr. King are reasonable and based upon his professional experience as a consultant with respect to EMF issues, the Board would like a post-construction analysis conducted to confirm whether the estimates of EMF from the Project are accurate. While scientific studies have not been able to provide conclusive evidence linking EMF to adverse impacts on human health at the levels expected from this Project, the Board is continuously monitoring ongoing efforts in this area. Should material evidence be established that EMF could subject the population of New Jersey to adverse health effects at the levels occurring as a result of the Project, this Board will take appropriate action. In this regard, the Board **HEREBY DIRECTS** PSE&G to conduct a survey of field readings in 2015 similar to that included in the record with the purpose of ensuring that: 1) PSE&G's estimated EMF and noise levels are correct, and 2) that the EMF and noise levels are within the New Jersey Guidelines, as well as within all other guidelines and standards considered in this Order. The Board **HEREBY ORDERS** PSE&G to submit to the Board a report describing the results of the survey as soon as practicable after completion of the Project and in no event more than 12 months after the line becomes operational.

PSE&G employed the principle of "prudent avoidance," a precautionary principle stating that reasonable efforts to minimize potential risks should be taken when the actual magnitude of the risks is unknown, which requires that this type of project minimize EMF levels by limiting exposures that can be avoided with reasonable investments of money and effort. The Board agrees with PSE&G's application of this principle. The Board **HEREBY DETERMINES** that the design and routing of the Project incorporates reasonable efforts to manage EMF exposure.

G. Cost Allocation

In determining whether the Project is "reasonably necessary for the service, convenience or welfare of the public," the Board must consider the cost that New Jersey electricity customers will bear in connection with the Project. Construing this standard under the predecessor to N.J.S.A. 40:55D-19, the New Jersey Supreme Court stated:

> Alternative sites or methods and their comparative advantages and disadvantages to all interests involved, including cost, must be considered in determining such reasonable necessity.
>
> [In re Public Service Electric & Gas Co., supra, 35 N.J. at 377.]

The Board is cognizant that a decision as to whether the Project is "reasonably necessary for the service, convenience or welfare of the public" must include consideration of the cost of the Project to New Jersey electricity customers.

The estimated cost for the Project is $340-$390 million. The Board concludes, based on the testimony and evidence concerning the expected costs of the Project and the direct and indirect effects the Project will have on the economy, that the costs are reasonable. The Board also bases its conclusion on the scope and scale of the work involved as demonstrated by several of

the witnesses and as illustrated in many of the exhibits. The Board **HEREBY DETERMINES** that the cost projections and countervailing economic benefits weigh in favor of approving the Project.

ADDITIONAL FINDINGS AND RECOMMENDATIONS

As a procedural matter, the Board **HEREBY ADOPTS**, in their entirety, all preliminary Orders previously issued by Commissioner Fiordaliso during the pendency of this matter.

Additionally, for the reasons set forth herein, the Board **HEREBY GRANTS** the motions for participation filed by New York SMSA Limited Partnership, d/b/a Verizon Wireless ("Verizon"), Spirit Spectrum L.P. and Nextel of New York, Inc. ("Spirit") and T-Mobile Northeast LLC, d/b/a T-Mobile ("T-Mobile") (collectively referred to herein as the "Carriers") limited to the extent that each Carrier has already filed a brief or other correspondence in support of its position.. Further, the Board **HEREBY ACKNOWLEDGES** the Carriers' executed Stipulation and **HEREBY ORDERS** PSE&G to abide by its terms to the full extent of the Board's authority.

After a thorough review of the record in this proceeding, the Board **HEREBY FINDS**:

1) That the Project is necessary to provide safe, adequate, and reliable electric service in New Jersey and in the PJM region;
2) That the Project is reasonably necessary for the service, convenience and welfare of the public;
3) That PSE&G considered alternative routes for the Project;
4) That PSE&G considered alternative methods to alleviate the projected reliability criteria violations;
5) That the planned Route, along PSE&G's existing ROW, is a reasonable route considering the alternatives;
6) That the Project as proposed, including the switching stations, is to be designed and constructed in accordance with all applicable industry standards in a manner that will minimize adverse impacts upon the environment, to the extent known or predictable;
7) That based upon the record in this proceeding, the Project will not be adverse to the public health and welfare;
8) That the Project can be constructed, installed, and operated without substantial detriment to the public good and without causing undue economic injury to neighboring property owners;
9) That, in light of the reliability issues identified in this proceeding, there is no reasonable, practical, and permanent alternative to the construction and operation of the Project that would have any less adverse impact upon the environment, surrounding community, or local land use ordinances;
10) That PSE&G conducted a good faith, reasonable, and extensive analysis of alternative methods for the Project, and the Project represents the most effect and robust solution to the expected reliability criteria violations;
11) That PSE&G will take necessary steps to ensure that the Company and local fire and safety officials are adequately prepared in the unlikely event of an emergency;
12) That PSE&G's amended Project cost estimate is provided with a sufficient degree of confidence which provides the Board with a proper basis upon which to assess the impact of the costs to the public;
13) That the findings contained within this Order are the result of a thorough and complete review of the record in this proceeding. The Board's findings are limited to the facts and

circumstances of this particular Project along this particular route and shall not be construed as a determination by this Board on any other application.

Therefore, the Board **HEREBY DETERMINES**, in accordance with N.J.S.A. 40:55D-19, that the proposed Project is reasonably necessary for the service, convenience, and welfare of the public in order to enable PSE&G to continue to provide safe, adequate, and reliable service to its customers; that PSE&G should be able to construct and begin local operation of the Project, as proposed and modified by the Board in this Order and that the Local Land Use and Zoning Ordinance, and any other Ordinance, rule or regulation promulgated under the auspices of the Municipal Land Use Act of the State of New Jersey shall not apply to the construction, installation, and operation of the Project.

Accordingly, the Board **HEREBY ORDERS** that neither N.J.S.A. 40:55D-1 et seq., nor any other governmental ordinances or regulations, permits or license requirements made under the authority of N.J.S.A. 40:55D-1 et seq. shall apply to the siting, installation, construction, or operation of the Project, as proposed and modified in this Order. The Board, however, is cognizant that portions of the Project are located within areas governed by the New Jersey Department of Environmental Protection, for instance. This Order shall not be construed as a certificate, license, consent, or permit to construct or disturb any land within the jurisdiction of these areas. Should PSE&G need to obtain any approval or authorization to proceed from these entities or any other entity as may be required by law or regulations, it is required to do so.

This Order is applicable only to the route as proposed by PSE&G. Should PSEG determine that additional modifications to the Project route are required, because of the actions of another agency or for any other reason, it must request further approval from this Board.

The Board **FURTHER ORDERS** that:

1) PSE&G continue to optimize access road and tower locations as well as the type of tower structure in consultation with the appropriate officials and agencies in order to minimize the environmental and community impacts to the greatest extent practicable;
2) PSE&G work on a continuing basis with the appropriate fire and safety officials to ensure that adequate precautions are taken and measures are in place in the event of an emergency as a result of the construction or operation of the Project;
3) PSE&G develop and implement an avian protection plan in conjunction with guidance from the United States Fish & Wildlife Services;
4) PSE&G minimize the visual impact of all transmission structures to the extent practicable;
5) PSE&G conduct a survey of EMF field readings during peak demand once the Project is operational, to ensure that the estimated readings are accurate. PSE&G shall report those findings to the Board as soon as practicable after the Project is operational, and in no event more than 12 months after the construction is complete. If the actual readings are substantially greater than the estimated readings testified to in this proceeding, the Board will take appropriate action;
6) PSE&G comply with the New Jersey audible noise requirements;
7) PSE&G compensate property owners for any and all physical property damages that may result from construction of the Project;
8) PSE&G continue to work in good faith with the Carriers with whom the Company has reached a Stipulation concerning the matters outlined in the Carriers; Motions; and

9) PSE&G report to the Board the findings of PJM's next completed RTEP. If that RTEP deems that this Project may no longer appear to be necessary, or can be delayed significantly, the Boards authority to reopen this matter remains.

DATED: 6/18/12

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BY:

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PRESIDENT

JEANNE M. FOX
COMMISSIONER

JOSEPH L. FIORDALISO
COMMISSIONER

NICHOLAS ASSELTA
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MARY-ANNA HOLDEN
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ATTEST:

KRISTI IZZO
SECRETARY

I HEREBY CERTIFY that the within document is a true copy of the original in the files of the Board of Public Utilities

PUBLIC SERVICE ELECTRIC AND GAS COMPANY
NORTH CENTRAL RELIABILITY PROJECT
BPU DOCKET NO. EO 11050323

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