State of New Jersey

OFFICE OF ADMINISTRATIVE LAW

INITIAL DECISION

OAL DKT. NO. PUC 12098-16

AGENCY DKT. NO. EO16080750

I/M/O PETITION OF JERSEY CENTRAL POWER AND LIGHT COMPANY PURSUANT TO N.J.S.A. 40:55D-19 FOR A DETERMINATION THAT THE MONMOUTH COUNTY RELIABILITY PROJECT IS REASONABLY NECESSARY FOR THE SERVICE, CONVENIENCE OR WELFARE OF THE PUBLIC.

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Lauren M. Lepkoski, Esq., for petitioner Jersey Central Power and Light Company (FirstEnergy Service Company Legal Department, attorneys)

Alex Moreau, **Renee Greenberg** and **Patricia Krogman**, Deputy Attorneys General, for respondent Staff of the Board of Public Utilities (Gurbir S. Gewal, Attorney General of New Jersey, attorneys)

James Glassen and **Henry Ogden**, Assistant Deputy Rate Counsel, for respondent Division of Rate Counsel (Stefanie A. Brand, Director)

William K. Mosca, Jr., Esq., **John D. Coyle**, Esq., and **Murray E. Bevan**, Esq., for intervenors Joint Municipal Group (Bevan, Mosca & Giuditta, attorneys)

Peter Dickson, Esq., for intervenor Residents Against Giant Electric, Inc. (Potter and Dickson, attorneys)

Michael D. Fitzgerald, Esq., for intervenor County of Monmouth (Monmouth County Counsel, attorneys)

Jeffrey R. Merlino, Esq., for intervenor Middletown Township Board of Education (Sciarrillo, Cornell, Merlino, McKeever & Osborne, attorneys)

Douglas J. Kovats, Esq. and **Michael J. Gross**, Esq., for intervenors Hazlet Township Board of Education and Holmdel Township Board of Education (Kenney, Gross, Kovats & Parton, attorneys)

Record Closed: December 15, 2017 Decided: March 8, 2018

BEFORE **GAIL M. COOKSON,** ALJ:

STATEMENT OF THE CASE

Jersey Central Power & Light Company (JCP&L, Company, or petitioner), based in Morristown, is a wholly-owned subsidiary of FirstEnergy Service Company (FirstEnergy), headquartered in Akron, Ohio. JCP&L is an electric utility as defined within Title 48 of the New Jersey Statutes and, as such, is subject to the jurisdiction of the New Jersey Board of Public Utilities (Board or BPU). Thus, it is responsible for ensuring safe, adequate and proper utility service to 1.1 million customers in thirteen (13) counties in New Jersey, separated into two distinct franchise areas. It 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. Additionally, JCP&L is a transmission owner in PJM Interconnection, LLC (PJM), the regional transmission grid operator and planner, and a signatory to the PJM Consolidated Transmission Owners Agreement (TOA).

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PROCEDURAL HISTORY

Filing and Transmittal

On August 9, 2016, JCP&L filed a petition with the Board for a determination that its Monmouth County Reliability Project (MCRP or Project) is necessary for the service, convenience and welfare of the public and requested the Board issue an Order 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 pursuant to N.J.S.A. 40:55D-19 (Petition).

According to the Petition, PJM has determined through its Regional Transmission Expansion Planning (RTEP) process that the Project is necessary by June 1, 2016[1], to retain reliability for the entire regional transmission grid, and specifically for New Jersey. More specifically, the Project was approved by PJM solely to address a P7 projected

[1] The Project in-service date was initially adjusted to June 1, 2017, and then June 1, 2019, in order to accommodate these contested proceedings.

reliability criteria violation identified by PJM in its 2011 RTEP process. As discussed in greater detail below, a P7 event would be the loss of two-230 kV transmission lines on a common structure failing at the same time, and causing a voltage collapse, i.e., blackout. Here, it would be the loss of the two lines that feed into Red Bank. The MCRP is proposed to follow predominantly in the New Jersey Transit (NJT) right-of-way (ROW) on the North Jersey Shore commuter line through the Monmouth municipalities of Aberdeen, Hazlet, Holmdel, Middletown, and Red Bank.

The matter was transmitted to the Office of Administrative Law (OAL) on August 11, 2016, for hearing as a contested case pursuant to N.J.S.A. 52:14B-1 to -15 and N.J.S.A. 52:14F-1 to -13. It was assigned to the undersigned on August 16, 2016. I convened the first of several case management telephone conferences on September 15, 2016, with the initial parties of JCP&L, Rate Counsel and BPU Staff. As detailed below, additional parties were added to future conferences once each was granted intervenor status. Under cover of September 21, 2016, I issued the Case Management Order setting forth the procedural protocols for the pre-filing of responsive and rebuttal testimony, and discovery deadlines that would govern the matter at the OAL. Hearing dates were also established.

Motions to Intervene and/or Participate

Four of the five affected municipalities – Aberdeen, Hazlet, Holmdel and Middletown (hereinafter "Joint Municipal Group" (JMG)) – were granted leave to intervene in these proceedings by Order entered on September 21, 2016, and later supplemented.

Residents Against Giant Electric, LLC (RAGE), a citizen action group, also moved to intervene. An Order was entered granting that application on October 5, 2016.

The County of Monmouth also filed for intervenor status which was granted by Order entered on November 4, 2016. Prior to the hearings, the County of Monmouth substituted counsel and joined the JMG for consolidated representation.

The Boards of Education of Middletown, Hazlet, and Holmdel separately moved to intervene or participate in this matter. Orders dated December 14, 2016, January 12, and February 8, 2017, granted those public entities status in this case.

Pre-Hearing Procedural Motions

Prior to the hearings, several motions were filed and adjudicated with respect to the timing of discovery deadlines or the timeline for the filing of pre-filed testimony, including the Case Management Order. All prior Orders are incorporated herein.

Pre-Hearing Evidential Motions

Several motions were filed before the hearing to strike all or portions of other parties' pre-filed direct testimony. There was also a Motion to Dismiss the JCP&L Petition filed by the JMG and joined in by several other respondent or intervenor parties. The motion was premised predominantly upon the basis that JCP&L did not yet have the right to utilize the NJT ROW, without which the MCRP would not be able to proceed. Accordingly, it was argued that the MCRP application was premature and that public and private funds should not have to be spend opposing it. I denied the motion under Order dated January 13, 2017, on the grounds that the standard to dismiss a case was a high hurdle, which the respondents/intervenors had not cleared. The decision on the motion to dismiss was appealed to the BPU on an interlocutory basis. The agency determined to not hear the dismissal argument prior to the return of the entire case to it for final decision.[2]

Public Hearings

A public hearing was scheduled with the consent of all parties for January 25, 2017, at 7:00 p.m. at Middletown High School Auditorium, Middletown, New Jersey. The undersigned and counsel established some guidelines for how the public would be

[2] 2017 N.J. PUC LEXIS 69 (March 24, 2017)
http://www.state.nj.us/bpu/pdf/boardorders/2017/20170324/3-24-17-2G.pdf

accommodated and the public hearing conducted. It was expected that a large number of citizens would be attending. In anticipation of such, an overflow room in the cafeteria was designated and the high school agreed to set up a real-time video feed. Sign-in-procedures, press credentials, and security were also discussed ahead of the hearing.

At the public hearing, it is estimated that over 1,300 people came, not all of whom could be accommodated inside. Of those persons who signed in and were seated, approximately 10% indicated a desire to speak. On the evening of January 25, 2017, I was solely responsible for the determination of the order of speakers. I made and announced my decision at the beginning of the evening. I permitted parties to make statements, followed by publicly-elected officials, then representatives from environmental, community, and labor organizations. Thereafter, I took oral statements from the general public until approximately 11:15 p.m. Several times during the evening I reminded the audience that written statements were permitted and equally effective in conveying one's opinion on the MCRP to myself and the BPU.

Nearing the close of the public hearing, the general public lobbied me to hold another public hearing for those who did not get the opportunity to either enter the auditorium and/or speak. I took that request under serious consideration. On February 8, 2017, I entered an Order establishing a second public hearing to be held in late March. In order to meet the vocal requests of the community, as well as to accommodate the schedules of the public buildings that might potentially fulfill the needs for this public hearing, it was agreed that the second public would be held on Wednesday, March 25, 2017, starting earlier at 5:30 p.m., at Brookdale Community College, Collins Arena, Lincroft, New Jersey. Once again, I controlled the order of speakers and conferenced with the parties concerning security, safety, press, and other logistical concerns. This hearing was predominated by speakers from the general public. The hearing did not conclude until 11:05 p.m.

The vast majority of the commenters at each public hearing were opposed to the Project, including every elected official who spoke or provided a statement on those evenings. Major opposition was primarily based on health and safety issues related to electromagnetic fields (EMF), aesthetic concerns, property value concerns, and

environmental concerns. Those backing the MCRP primarily based that support on reliability and economic concerns, and were primarily from businesses not in the five impacted municipalities on a form letter prepared by the New Jersey Chamber of Commerce for its members. The oral comments have been transcribed and the thousands of written comments submitted were tabulated as best as could be through the assistance of representatives of both the Company and RAGE, under my direction. They will be submitted to the Board as part of the record for their consideration. The prepared summary of written statements indicates that eighty-three (83%) percent were opposed to the MCRP; and, seventeen (17%) percent in favor. Approximately twenty-five (25%) percent of the statements opposing the Project were form letters; and ninety-two (92%) percent of the statements in favor of the Project were form letters, of which eighty-eight (88%) percent were not from the impacted area. [ALJ-1.]

A total of 364 people also attended the open house meetings sponsored by the Company before the filing of the Petition. Of the approximately 500 comments received during that public outreach, Sparhawk testified that the concerns could be grouped into three major categories: (1) concern about EMFs; (2) real estate property value impacts; and (3) general route selection questions. As a result of these meetings, JCP&L made the one modification of moving the HVTL of the MCRP to the other side of the tracks between Normandy Road and Navesink River Road, as discussed below.

Plenary Hearings

Plenary hearings were conducted before the undersigned at the OAL in Newark on the following dates: April 4, 5, 6, 7, 10, 11, 12, and July 6 and 7, 2017.[3] Insofar as initial, responsive, and rebuttal testimonies were presented in advance in written format,

[3] Transcripts of the plenary hearings at the OAL shall be identified as follows:
Transcript of hearing April 4, 2017: “1T page number: line number”
Transcript of hearing April 5, 2017: “2T page number: line number”
Transcript of hearing April 6, 2017: “3T page number: line number”
Transcript of hearing April 7, 2017: “4T page number: line number”
Transcript of hearing April 10, 2017, morning: “5T page number: line number”
Transcript of hearing April 10, 2017, afternoon: “6T page number: line number”
Transcript of hearing April 11, 2017: "7T page number: line number”
Transcript of hearing April 12, 2017: “8T page number: line number”
Transcript of hearing July 6, 2017: “9T page number: line number”
Transcript of hearing July 7, 2017: “10T page number: line number”

cross-examination took place encompassing the pre-filed testimony of each witness at the same time. In addition, some witnesses were presented as a single panel. Certain portions of the proceedings were closed to the general public and anyone who had not signed a Non-Disclosure Agreement (NDA). In addition, some short portions were closed to anyone who was not certified in Critical Energy Infrastructure Information (CEII) protocols, with the exception of counsel who were permitted to remain as officers of the court, under my direction.

Site Visit

On Wednesday, June 7, 2017, counsel, a limited number of representatives for each party, and I undertook a visit to the proposed location of the MCRP. Specific locations were discussed with input from any interested party, but I ultimately decided in advance of the trip where the group would stop along the route. Any discussions were informal, limited, and off the record. I took some photographs for my own edification but those also will not be made part of the record. In total, we made approximately seventeen (17) representative stops along the proposed route of the MCRP.

Post-Hearing Evidence Rulings

Parties were provided the opportunity after the last day of evidentiary hearings to submit exhibit lists and to move, through informal written application, any documents that had not yet been offered into evidence. Thereafter, all parties were given the opportunity to object to the admission into evidence of any other party's exhibits. After receipt of the lists of all proposed exhibits and all responsive positions, I entered an Order on August 30, 2017, allowing some exhibits, disallowing others, and taking judicial notice of two documents. Probably the most significant determination contained therein was to strike or suppress large portions of the rejoinder testimony of JCP&L witness Lawrence A. Hozempa. This Order is also incorporated by reference herein.

In light of the date of the Order and its substance, the post-hearing briefing schedule was adjusted to allow time for an interlocutory appeal by JCP&L and reconciliation of briefing arguments with the final evidential record. The appeal was filed

with the BPU on September 7, 2017. On September 22, 2017, the agency determined not to review the ruling on an interlocutory basis.[4] Thereafter, all parties agreed on a schedule for the filing of their initial post-hearing briefs by October 23, 2017, and submission of their responsive post-hearing briefs three weeks thereafter.

A motion to strike portions of the Company's post-hearing reply brief were made by RAGE and supported by Rate Counsel and the JMG. These portions were alleged to be directly related to the portions of Hozempa's rejoinder testimony stricken from the record. The Company opposed the motion, arguing that the other parties had opened the door in such a manner as to authorize it to complete various aspects of the previously stricken rejoinder testimony. In the alternative, the Company suggested that any reliance by any party on stricken testimony should itself be redacted from the briefs. After all positions were submitted, I entered a ruling on December 4, 2017. I required all parties, on or before December 15, 2017, to redact from their initial and reply briefs any portion that referred directly to stricken Hozempa testimony, on which date the record would be deemed closed.

A request to extend the time within which the Initial Decision would be due was made on my behalf from the OAL to the Board prior to January 29, 2018, seeking until March 15, 2018, to issue this decision, which request was approved.[5]

All Orders previously entered during these ongoing proceedings at the OAL are incorporated by reference herein.

[4] http://www.state.nj.us/bpu/pdf/boardorders/2017/20170922/9-22-17-2S.pdf
[5] http://www.nj.gov/bpu/pdf/boardorders/2018/20180131/1-31-18-LSA.pdf

SUMMARY OF TESTIMONY PRESENTED

Testimony was pre-filed with the Company's Petition, and for other parties on dates that were agreed upon and/or ordered. Testimony was often presented in panels of two or three witnesses who had subject areas in common.

Before setting forth the substance of the testimony in the record, the following descriptions of the current JCP&L Transmission System in the Monmouth County region and the proposed MCRP, broken down into segments, were referenced universally by the parties throughout the proceedings. The initial sponsoring witnesses for these narratives and corresponding visual exhibits were Theodore R. Krauss (JC-3) and Scott M. Humphrys (JC-2).

Overview of JCP&L Monmouth Service Territory

Scott M. Humphrys is employed by FirstEnergy as a Transmission Services Specialist III in the Transmission Engineering Department. He has been employed in that Department since May 2008 in various titles. His current responsibilities include providing support for FirstEnergy and its subsidiaries in efforts to site new transmission facilities, by assisting with efforts in developing transmission line route siting studies, transmission substation siting studies, and associated regulatory filings. He has provided testimony previously before the Ohio Power Siting Board in support of several FirstEnergy transmission projects.

The JCP&L Red Bank Substation, located in Red Bank Borough, is currently supplied by two 230 kV circuits, the Atlantic-Red Bank No. 1 230 kV (S1033) and the Atlantic-Red Bank No. 1 230 kV (T2020) Transmission Lines. The MCRP involves the construction of a new 230 kV transmission line between JCP&L's 230 kV transmission line serving the NJT Aberdeen Substation and JCP&L's 230 kV transmission line serving the NJT Red Bank Substation, as well as the upgrades and expansion of the existing Taylor Lane Substation. Existing infrastructure will be used to connect the NJT Red Bank substation to the Red Bank Substation.

As discussed in much more detail below by other witnesses, Humphrys outlined that during its 2011 RTEP process, PJM identified the need for a third 230 kV circuit into the JCP&L Red Bank Substation. The third 230 kV circuit is intended to mitigate the identified reliability criteria violations under certain North American Electric Reliability Corporation (NERC) Category P7 (previously NERC Category C) contingencies. The total Project cost as set forth in the Petition is approximately $111,000,000, which includes construction at the Taylor Lane Substation (approximately $6,900,000)[6], and overheads.

Humphrys stated that the Company expects to submit applications for the collateral permits no earlier than the third quarter of 2016. Many of the permits for the Project require that final detailed engineering drawings be complete. Detailed engineering began in March 2015 and is expected to be completed in October 2018. JCP&L anticipates that construction will begin in 2018 and is estimated to take approximately nine to twelve (9-12) months. Humphrys' only other direct testimony was to introduce the other witnesses sponsored by Petitioner.

Description of the MCRP

Theodore R. Krauss is employed by FirstEnergy as its General Manager of Transmission Engineering. He began his career in August 1979 at the Cleveland Electric Illuminating Company, a predecessor to FirstEnergy. Thus, he has spent his entire career to date with FirstEnergy or its predecessors. Krauss has never testified in a New Jersey utility proceeding but he has testified before the Ohio Power Siting Board on several transmission line projects. His testimony is presented by the Company in order to describe JCP&L's plans for designing, engineering, and constructing, as well as operating and maintaining, the MCRP. Krauss is also sponsoring exhibits that depict preliminary engineering proposed cross-sections of the Project.

Krauss initially explained that JCP&L's transmission line naming nomenclature typically identifies lines based on the substations with breakers to which the line

[6] This figure was initially set forth as $4 million in the Petition. Its correction did not appear to impact the $111 million total project costs.

connects. Once it is installed, the name of the transmission line that is proposed will refer to the substations with a breaker position at the end of transmission line circuit the Project creates. These substations are JCP&L's Freneau and JCP&L's Red Bank and JCP&L's Taylor Lane. Therefore, the name of the MCRP installed transmission line will be the Freneau-Taylor Lane 230 kV Transmission Line and the Red Bank-Taylor Lane 230 kV Transmission Line.

The new 230 kV circuit utilizes existing 230 kV transmission lines at both ends of the circuit with the Project's proposed construction of a new 230 kV transmission line in the middle portion of the circuit. Adjacent to the northern end of the Project is the existing 230 kV transmission lines between JCP&L's Freneau Substation and NJT's Aberdeen Substation; and at the southern end is the existing 230 kV transmission lines between JCP&L's Red Bank Substation and NJT's Red Bank Substation. The Project's proposed new 230 kV transmission line construction forms the rest of the new circuit between NJT's Aberdeen substation and NJT's Red Bank Substation. JCP&L's Taylor Lane Substation is located along the route of the Project's new 230 kV transmission line construction. As part of the Project, the Taylor Lane Substation will be expanded and the new 230 kV transmission line construction will be looped into the Taylor Lane Substation.

Krauss sponsored the exhibits and testimony utilized throughout these hearings as the description of the various segments of the MCRP, thusly:

<u>Freneau–Taylor Lane 230 kV Transmission Line Section</u>:

Exhibit TRK-Segment 1: Preliminary engineering rendering for Segment 1 of the proposed right-of-way ("ROW") corridor cross section from the existing NJT Aberdeen Substation to 0.05 mile east of Line Road, approximately 0.3 mile (approximately 3 monopoles ## 15583-15585);

Exhibit TRK-Segment 2: Preliminary engineering rendering for Segment 2 of the proposed ROW corridor cross section from 0.05 mile east of Line Road to the south

bound inner lane of the Garden State Parkway (“GSP”), approximately 0.3 mile (approximately 3 monopoles ## 15586-15588);

Exhibit TRK-Segment 3: Preliminary engineering rendering for Segment 3 of the proposed ROW corridor cross section from the south bound inner lane of the GSP to 0.01 mile east of the north bound outer lane of the GSP, approximately 0.2 mile (approximately 2 monopoles ## 15589-15590);

Exhibit TRK-Segment 4: Preliminary engineering rendering for Segment 4 of the proposed ROW corridor cross section from 0.1 mile north of the north bound outer lane of the GSP to 0.05 mile east of Bethany Road, approximately 1.1 miles (approximately 13 monopoles ## 15591-15603);

Exhibit TRK-Segment 5: Preliminary engineering rendering for Segment 5 of the proposed ROW corridor cross section from 0.05 mile east of Bethany Road to 0.4 mile east of Bethany Road, approximately 0.4 mile (approximately 4 monopoles ## 15604-15607);

Exhibit TRK-Segment 6: Preliminary engineering rendering for Segment 6 of the proposed ROW corridor cross section from 0.4 mile east of Bethany Road to 0.7 mile east of Bethany Road, approximately 0.3 mile (approximately 3 monopoles ## 15608-15610);

Exhibit TRK-Segment 7: Preliminary engineering rendering for Segment 7 of the proposed ROW corridor cross section from 0.7 mile east of Bethany Road to 0.5 mile north of Laurel Avenue, approximately 0.8 mile (approximately 10 monopoles ## 15611-15620);

Exhibit TRK-Segment 8: Preliminary engineering rendering for Segment 8 of the proposed ROW corridor cross section from 0.5 mile north of Laurel Avenue to Laurel Avenue, approximately 0.6 mile (approximately 8 monopoles ## 15621-15626);

Exhibit TRK-Segment 9: Preliminary engineering rendering for Segment 9 of the proposed ROW corridor cross section from Laurel Avenue to Taylor Lane Substation Loop Point, approximately 0.3 mile (approximately 3 monopoles ## 15627-15629);

Exhibit TRK-Segment 9A: Preliminary engineering rendering for Segment 9A of the proposed ROW corridor cross section from Taylor Lane Substation Loop Point to Taylor Lane Substation, approximately 0.2 mile (approximately 2 monopoles ## 15630-15631);

Red Bank–Taylor Lane 230 kV Transmission Line Section:

Exhibit TRK-Segment 10: Preliminary engineering rendering for Segment 10 of the proposed ROW corridor cross section from Taylor Lane Substation Loop Point to AT&T Facility, approximately 0.2 mile (approximately 3 monopoles ## 15632-15634);

Exhibit TRK-Segment 11: Preliminary engineering rendering for Segment 11 of the proposed ROW corridor cross section from AT&T Facility to Normandy Road, approximately 2.5 miles (approximately 26 monopoles ## 15635-15660);

Exhibit TRK-Segment 12: Preliminary engineering rendering for Segment 12 of the proposed ROW corridor cross section from Normandy Road to 0.15 mile south of Navesink River Road, approximately 1.6 miles (approximately 17 monopoles ## 15661-15677);

Exhibit TRK-Segment 12-Option: Preliminary engineering rendering for Segment 12 of an option of the proposed ROW corridor cross section from Normandy Road to 0.15 mile east of Navesink River Road, approximately 1.6 miles[7] (approximately 17 monopoles ## 15661-15677);

[7] Krauss explained that access for construction and later for maintenance was preferable from the original Segment 12. The option creates a slightly larger buffer to residences but will require more access rights for construction, with unknown success presently outside the condemnation process. [TRK-3 at 16.]

Exhibit TRK-Segment 13: Preliminary engineering rendering for Segment 13 of the proposed ROW corridor cross section from 0.15 mile south of Navesink River Road to Chestnut Street, approximately 0.8 mile (approximately 6 monopoles ## 15678-15683);

Exhibit TRK-Segment 14: Preliminary engineering rendering for Segment 14 of the proposed ROW corridor cross section from Chestnut Street to the existing NJT Red Bank Substation, approximately 0.2 mile (approximately 3 monopoles ## 15684-15686);

Exhibit TRK-15: Project Overview Map and detailed mapping that depicts the proposed transmission line route; and

Exhibit TRK-16: Preliminary Project Construction Access Maps.

In his continued testimony, Krauss added that JCP&L will supplement breakers within the existing property line at JCP&L's Freneau and JCP&L's Red Bank Substations; however, that work does not require zoning or siting approval and is, therefore, not included within the scope of the Petition. In addition, Krauss stated that JCP&L would only rebuild certain portions of the existing sub-transmission circuits. The Company will be rebuilding 34.5 kV circuit structures within Segment Nos. 5, 6, 7, 8 and 14. The portions of the 34.5 kV sub-transmission circuits that are proposed to be rebuilt are located in the narrower areas of the NJT ROW such that it is not wide enough for separate 34.5 kV and 230 kV pole lines. Accordingly, in those segments, JCP&L plans to place the 34.5 kV circuits on the same poles as the new 230 kV circuit in an underbuild configuration. The existing 34.5 kV circuits will remain in service after the Project is placed in service. In general, Krauss stated that the existing ROW is approximately 100 feet in width[8], some of which includes the existing sub-transmission lines.

[8] Attached as exhibits to Krauss' testimony are schematics of the proposed cross-sections of each segment of the MCRP. These are marked "Preliminary – Not for Construction." Segments 1, 3 through 5, 7, and 10 through 12 indicate 100' NJT ROW consisting of segments with +/- noted, specifically, the lengths marked 15', 26' and 41'. In other words, the definite track span of 18' has 41' +/- on either side of the track edges to make up the alleged 100' span of the NJT ROW. With few exceptions, the monopoles of the proposed MCRP are represented on these drawings as being 26' +/- from the track edge, 15' +/- from the NJT ROW edge (without accounting for the size of the monopole base), and 8'-19' from the closest NJT catenary supports. Segment 2 indicates a 140' NJT ROW with +/- segments of 35', 26' and

With respect to the construction phase of the MCRP, Krauss stated that the construction of the MCRP will be undertaken mostly through contractors with oversight by internal (JCP&L) and external (Burns & McDonnell) project managers and other personnel. The Company plans to use existing ROW access routes, where available. Where there is no current access, JCP&L will need to locate access points and negotiate with property owners for the right to access these properties. The needs of the NJT commuter rail service will also be taken into consideration. Construction lay-down areas that are not adjacent to or part of the structure lay-down area will be determined as part of the detailed design effort that has not taken place yet. JCP&L anticipates that JCP&L's Freneau, Taylor Lane, and Red Bank Substations, as well as existing JCP&L ROW, will be used as part of the Company's construction lay-down areas. Construction will entail the usual permits for environmental and soil conservation controls. JCP&L will attempt to avoid construction of additional permanent access roads. Where access routes are needed for construction, the routes will be re-graded to approximate pre-construction contours and re-vegetated.

Krauss provided testimony and rebuttal testimony on the question as to why JCP&L did not design the MCRP to go underground in order to avoid some of the impacts of concern to the affected communities. Krauss stated that NJT and JCP&L discussed the issue and determined in the spring of 2016 that an underground HVTL would not be a compatible shared use of NJT's ROW, especially during construction and maintenance periods. The prevailing opinion was that NJT's rail traffic has the potential to create ground vibrations that will increase the complexity of the shoring needed for the excavations necessary to install an underground transmission line and its associated duct banks and manholes. Additionally, the installation of shoring for the excavations needed for installation of an underground circuit and its maintenance activities has the potential to cause excessive vibrations on NJT's facilities. Further,

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61'. Segments 6 and 8 indicate a 40' JCP&L easement that supplements the NJT ROW. Segment 9 indicates a 10' +/- placement for the monopole off the NJT ROW into JCP&L property of unknown width. Segment 10 indicates placement for the monopole of 110' +/- off the edge of JCP&L property. At Segment 13, the NJT ROW is only 65' +/- in width at its narrowest with apparently one to five monopoles being constructed very close to the catenary supports and the NJT ROW edge. Segment 14 has similar NJT ROW spacing as first indicated above in this note but with only a minimum of 8' indicated between the monopole and the NJT ROW edge.

JCP&L believes that NJT will not agree to an underground installation due to these concerns with the stability of the railroad bed.

Krauss continued that underground lines could cause more environmental impacts during construction and repairs or maintenance events. A complex repair of an underground line may take weeks to implement, whereas a complex repair of an overhead transmission line may take only a few days. It was also estimated that the cost of the Project could be approximately four to ten (4-10) times as much to construct this line underground.[9]

Kyle Whisner presented an overview description of the MCRP from an engineering perspective. Whisner is a Senior Transmission Engineer in the Overhead Transmission Department of Burns & McDonnell Engineering Company Inc. (Burns & McDonnell). Whisner described the MCRP as relying upon the installation of single steel monopoles. The monopoles will have davit arms with suspension type insulators installed in a Vee-String configuration. In segments that require underbuilt 34.5 kV circuits, the 34.5 kV circuits will be mounted on davit arms approximately twenty-five (25) feet below the lowest 230 kV conductor. Monopoles require large construction support equipment on site for erection of the segmented pieces constructed offsite. The monopoles also require supportive foundational structures, which had not been determined as of the filing of the Petition. Foundation types will be determined after completion of a subsurface investigation. The foundations being considered for this project are helical piles and/or micropiles to minimize excavations and disturbance next to the rail line. Concrete caisson type foundations may also be used depending on the design requirements.

Whisner described the type of line construction that would be needed for the MCRP transmission project. Transmission lines transmit three-phase electrical power. Each phase requires one or more conductors. A single-circuit transmission line

[9] Krauss referred most questions concerning the issue of magnetic fields to Kyle G. King but did state in response to public concerns that, although the earth blocks the electric field from underground transmission lines, the earth does not block magnetic fields. At one meter above ground, the magnetic field could be higher with underground construction than with the proposed overhead transmission line, but the magnetic field level would diminish quickly with distance from the underground line.

structure must be capable of supporting three phases. Thus, the Company will be installing a single circuit 230 kV monopole that will have one set of three phases arranged vertically on the structure, using one conductor per phase.

The 230-kV circuit for this Project will be utilizing a single 1590 kcmil 54/19 Aluminum Conductor Steel Reinforced "Falcon" conductor per phase that is 1.545 inches in diameter, weighs approximately 10,782 pounds per mile, and has a rated breaking strength of 54,500 pounds. The 54/19 designation indicates the stranding of the conductor, with the 54 representing the outer 54 aluminum wires and the 19 representing the inner 19 steel wires. "Shield wires" are one or two smaller steel or aluminum cables or fiber optic cables that are suspended above the upper conductor. The shield wires are intended to intercept lightning strikes, which would electrically interfere with the power system if they were to strike the conductors directly. The shield wires may also have a fiber optic communications capability for use in controlling the operation of the transmission system.

Whisner also set forth the height range for the MCRP monopoles at 100 feet to approximately 210 feet tall.[10] The tallest structures are expected to be required to span the Navesink River (Segment 13) and to be approximately 190 to 210 feet tall. The height will be determined by consulting various applicable codes (e.g., NESC) and engineering for property constraints and surrounding terrain or obstacles. Whisner stated that while JCP&L currently uses some existing monopole structures similar to those proposed for the MCRP, most of them have pole heights of just over eighty (80') feet. Whisner acknowledged that the monopoles in the Red Bank vicinity after the Navesink River is crossed will be placed five (5') feet within the NJT ROW, necessitating the acquisition of ten (10') feet of private property to establish a sixty (60') foot corridor, with forty-five (45') feet on the trackside of the monopoles. [JC-4 Rebuttal at 7 and note 7.]

[10] As set forth on the Krauss schematics (JC-3, Attachment TRK Segments), there are proposed to be 3 structures within a height range of 100'–160' +/-, 34 structures within a height range of 110'–140' +/-, 42 structures within a height range of 110'–150' +/-, 2 structures within a height range of 110'–160' +/-, 6 structures within a height range of 125'–160' +/-, 2 structures within a height range of 130'–150' +/-, 23 structures within a height range of 130'–170' +/-, 6 structures within a height range of 130'–210' +/-, and 3 structures within a height range of 150'–180' +/-. Thus, the proposed MCRP could install 121 monopoles over its 9.7 mile length, with an average height range of 116'-155'. But see note 16 infra.

Whisner explained that the ultimate or final design of the MCRP would be dependent upon further analysis of topography, stream and road crossings, railroad corridor constraints, and avoidance of wetlands. In general, the minimum NESC conductor to ground clearance on public access areas is 22.5 feet, although the minimum requirements vary depending on what the conductor is traveling over. NESC Code clearances are different for, among others, bodies of water, railroad crossings, and crossing over other types of structures, such as buildings. NJT requires ten (10') feet additional clearance (greater than the NESC minimum) over their rail line, as well as minimum working clearance to their catenary wires. JCP&L will meet or exceed all NESC or NJT requirements. In addition, Whisner noted some additional FAA constraints. The current proposed design will likely have two structures on either side of the Navesink River that exceed two hundred (200') feet above ground line. These structures will most likely need to obtain a determination from the FAA with respect to any conditions of marking and lighting the structures and the span between.

In rebuttal to the case of the intervenors, Whisner testified that RAGE witness Basch's photoshopped representations of the MCRP were misleading in terms of his sizing of the monopoles and their bases, and the placement of trees and other structures. He explained with respect to each Basch exhibit in more detail how those exhibits misrepresented vegetation removal, size and position of conductors on the poles, and the poles themselves. For example, Whisner described the proposed conductor placement as depicted by Basch Exhibit Two, a portion of Segment 13, as on the wrong side of the monopole.

By contrast, Whisner sponsored his own photoshopped representations of how the Project will look in the landscape after completion. He visited each of the locations depicted in the Basch Exhibits and as described in Basch's testimony. In each instance, Whisner took photos at approximately the same location and facing in the same direction, but used the widest field of vision he could. The location and orientation of the camera was documented in relation to existing objects and the heights of existing objects in the photo. The photos, location and orientation information, proposed preliminary pole and wire locations, dimensions and heights, and vegetation removal

recommendations were then transmitted by him to Trinity Animation Inc., a subcontractor of Burns and McDonnell, for computer integration. Some adjustments for obscured views were then made. [KEW Exh. 37, 38.]

In addition, Whisner criticized Lanzalotta's description of the Project's monopole heights as significantly greater than those of an Atlantic City Electric project. Whisner commented that the latter project qualified its own projected heights because of obstructions or other requirements that could require its monopoles to be taller than one hundred thirty (130') feet. Further, Whisner explained that the Company did not calculate monopole heights for the eliminated routes because it was unnecessary to reach that level of detail in view of other reasons for their non-consideration.

In rebuttal to the case of the respondent Rate Counsel and the intervenors[11], Humphrys presented pre-filed rebuttal testimony with respect to certain limited aspects of the pre-filed direct testimony of P. Jeffrey Palermo and Peter J. Lanzalotta.[12] Specifically, he critiqued Palermo for his lack of trust in the Company's estimate of $111 million for the Project. Humphrys reiterated that the estimation was sufficiently specific. He also refuted Palermo's lower cost estimate for Alternate Route F because he failed to take into account the rebuilding of existing double HVTLs that would be needed along that route. With respect to the testimony of Lanzalotta, Humphrys restated that cost estimates for non-viable electrical alternatives would have been a waste of effort.

It was clarified on cross-examination that none of the above three witnesses, who were presented on this first panel, had much, if any, role to play in the siting or route studies, which were mostly undertaken by the outside engineering group. On cross-examination of Humphrys, he confirmed that alternatives to the MCRP considered by the Company were rejected not because they were "not viable" for solving the P7 violation but because they did not provide the same level of "robustness." Whisner, who

[11] In his pre-filed Rebuttal Testimony, Krauss only referred to the pre-filed testimony of Moshe Bonder on behalf of the JMG. Insofar as Bonder was withdrawn as a witness, this Rebuttal Testimony will not be summarized.

[12] Humphrys also presented a counter argument to the testimony of Tara Corcoran-Clark on the issue of characterizations of public comments, but I have already stricken her direct testimony in an earlier motion so this aspect of his rebuttal will not be summarized.

had also characterized other Company testimony on alternative routes as being rejected because they were not viable, admitted to the incorrectness of that on cross-examination. It was also noted that the person with the "project manager" responsibilities for the MCRP was not being presented as a witness in this hearing.

Humphrys was asked to explain the jump in the cost of the Project from the $22 million originally presented to PJM to the $111 million present price tag. He stated that it was due in large part to the generic nature of the original proposal as a "very conceptual 8 mile[13] transmission line with an undefined route," (JC-2 Rebuttal, Attachment S-MCRP-10), as well as an increased number of monopoles for the unspecified additional length of 1.7 miles. [1T96:17-98:10.] With respect to providing the original cost estimates of the Project to PJM, Humphrys identified a document prepared April 26, 2011. [RAGE-18.] This project estimate was for an eight-mile new transmission line, to be placed in service on or about September 1, 2015. It did not include any estimates for overhead costs or contingencies. This document produced a "Total Plant Addition (Direct Cost)" of $19,880,000, increased to $22,113,000 for the future construction date. Humphrys also stated that the Petition's estimate of $111 million has not been updated, and he acknowledged that JCP&L had not prepared cost estimates of any alternatives preliminarily considered by the Company or those suggested during these proceedings by other parties.

Whisner was questioned on cross-examination with a 2014 *.kmz file (KMZ)[14] that had been provided to NJT by Burns & McDonnell, with some engineering input from him or others at JCP&L. He explained how Google Earth™ interfaces with transmission line design software to create the *.kmz file marked at the hearing as JMG-2. He explained that this iteration of the KMZ file was preliminary when it was sent to NJT. Even if other iterations have been created, of which there is at least one from 2016

[13] While the 2011 estimate was for a "generic" eight-mile long HVTL, it was never explained where that figure came from. I note that the Preferred Routes A and B were, at over ten miles long, always longer than eight miles. Neither of the other two potential corridors eliminated early in the second phase study were eight miles, as Corridor E was 8.7 and Corridor O was 7.1. [PWS-2, Route Selection Study at 27, Table 3.] Query whether the loop into the Taylor Lane Substation was not included.

[14] *.kmz is a file extension that stands for Keyhole Markup Zipped File Format for Google Earth™. As Whisner stated, transmission line design most commonly uses software known as Power Line Systems Computer-Aided Drafting and Design (PLS-CAD). [1T112:5-19.]

[JMG-3], none would be of a final design because there is no final design yet. Apparently, the biggest open questions are where the actual monopoles will be placed, for which NJT input will be necessary. For example, there presently is a plan to utilize 104 monopoles, while the 2014 KMZ file depicted 105 monopoles; further, one segment switched track sides between those versions, as described earlier.

During the hearing, it was disclosed that there was a 2017 file sent to NJT on February 14, 2017 (JMG-4), that was subsequently paired (overlaid) with the 2014 KMZ file. [JMG-5.] These visual files were viewed at the hearing in a confidential session[15]. To aid understanding, the exhibit that illustrated the cross-sections of each segment were on hand simultaneously. [JC-3; Attachment TRK Segments.] It was also disclosed upon my questioning that the KMZ file depiction of a monopole's height, otherwise referenced in written documentation as only within a broad height range (see note 10, supra.), was represented as a definite but preliminary design height based upon the preliminary engineering requirements of each particular location. [1T143:7-145:10.] Thus, in theory and in a preliminary manner, the specific height of each monopole along the MCRP was known or knowable, and was also visually depicted in a KMZ file. [ALJ-1, Exh. RAGE-JCPL-15 (CEII).][16]

On further cross-examination, Whisner was asked a series of questions comparing his rebuttal composite photographs to Response to Discovery RAGE-JCPL-15 (CEII) in order to be able to pinpoint the height of each depicted monopole given by him to the vendor Trinity. [1T166-175.] In other cross-examination, Whisner conceded that he is not a photographic or human visual perception expert, and that any statement by him as to the greater "accuracy" encompassed by a wider lens field of vision was a lay opinion only. The same would be true of any opinion he stated as to how a typical human eye would view the same scene (post-MCRP). He stated that he tried to match

[15] While the 2014 KMZ file was obtained under OPRA from NJT, the Company argued that the 2016 and 2017 KMZ files produced in discovery were CEII confidential. I reserved on that issue but took the precaution of viewing the KMZ files on a monitor with any members of the public excused. At the April 5, 2017, hearing, counsel for JCP&L announced that the Company would waive any confidentiality objection on the KMZ files. [2T13:22-14:18.]

[16] Those preliminary engineering plans (CEII)(undated) set forth 104 monopole heights at the following specific heights - number of poles: 105' – 1; 110' – 5; 115' – 8; 120' – 19; 125' – 16; 130' – 11; 135' – 8; 140' – 7; 145' – 10; 150' – 4; 155' – 8; 160' – 4; 165' – 1; 210' – 2. The average of the monopoles on these engineering plans is 135 feet.

his view through the lens to the positions utilized by RAGE witness Basch. [1T226-234.] Whisner corrected, however, for any monopole placement errors in Basch's composites where the latter's depictions sometimes were outside the ROW.

Both Humphrys and Krauss confirmed that their engineering area had only limited input into the planning aspects of the Project. Any transmission project has to be viable electrically, and then has to be routed where the HVTL can be viably located. Once the route is selected based upon planning criteria, then, and only then, do they start to create the preliminary design of the monopole route, the monopoles, conductor arms, etc.

One or more members of this panel also confirmed that NJT was not provided with any design documents that went to the question of placing the Project underground. Whisner, who is an overhead transmission engineer, explained that as of March 2016 (JC-3 Rebuttal TRK-17), NJT had not provided any input into the potential difficulties of constructing the line underground.[17] This was a subject that JCP&L anticipated would be asked at public hearings, for which it wanted to be prepared. Its staff had opined, however, that it had concerns about even the small excavations required for the MCRP. [1T199:18-200:18.] Prior to any meetings with the public, JCP&L obtained a short negative response to the MCRP being constructed underground. [TR-1.]

Need for the MCRP

Petitioner presented the testimony of Mark L. Sims, who is employed by PJM as the Manager of the System Planning Division, Transmission Planning Department, assigned to conduct the transmission planning of the PJM electrical area. That area encompasses JCP&L, other FirstEnergy companies, and other electric utilities in the region. Sims received both a Bachelor of Science in Electrical Engineering and a Master of Engineering Degree in Systems Engineering from Pennsylvania State

[17] Separately, I asked the panel whether any of them had attended Project meetings with NJT. Only Whisner responded in the affirmative. He recalled his first such meeting likely being in May 2013. [1T241:2-11.]

University, in 1999 and 2003, respectively. He began employment with PJM in 1999 as an Engineer in the System Planning Division. With an interim promotion, Sims moved into his current assignment in 2009.

Sims' responsibilities include managing the PJM employees responsible for analyzing PJM's transmission system to assure the future reliability of the PJM system and related systems to which it is interconnected. His team also assesses the performance of transmission reliability studies to determine the compliance with reliability criteria established by NERC, PJM, and the individual electric utility, if any. It is not disputed that PJM is regulated by the Federal Energy Regulatory Commission (FERC), and as such, PJM is responsible for the planning, operation, and reliability of the interstate electric transmission systems in all or parts of thirteen (13) states and the District of Columbia.[18]

In his capacity with PJM, Sims also coordinates reliability analyses with other transmission organizations. The PJM system serves approximately sixty (60) million customers. PJM dispatches more than 185,000 megawatts (MW) of generation capacity over more than 65,000 miles of transmission lines – a system that serves approximately twenty (20%) percent of the United States economy. PJM presently has more than eight hundred (800) members. These members/customers include power generators, transmission owners, electricity distributors, power marketers, and large consumers.

By way of further but necessary background, Sims explained that PJM prepares the RTEP each year in order to analyze the electric supply needs of the customers in the PJM Region. PJM evaluates the aggregate needs across its system, identifying potential problems on both a local and regional level. Reliability problems flow through the system without regard to the boundaries of states or transmission owner service territories. Sims stated that by identifying problems on a regional basis, PJM is able to focus on the most effective regional solutions. Short-term or near-focus system needs

[18] The PJM Region includes all or parts of Delaware, the District of Columbia, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia and West Virginia.

are defined by a five-year planning horizon, while long lead-time transmission options require a planning horizon of fifteen years. The RTEP also looks at the prospective needs of the system and the future projections of supply and delivery capacity.[19] These planning horizons are reviewed during periodic "retool" studies that review the time periods covered in previous baseline assessments. For each of the near-term years, PJM issues updates to the previous baseline assessments as needed to account for planned generation or demand response modifications, changes in transmission topology, and updated load forecasts.

Sims testified as to the legal relationship between PJM's RTEP processes and the NERC/FERC regulatory framework thusly:

> Historically, compliance with Reliability Standards developed by NERC was considered voluntary. The Energy Policy Act of 2005 ("EPAct 2005"), however, enacted after the 2003 Blackout, established a mandatory compliance and enforcement regime for Reliability Standards under the oversight of FERC. Pursuant to EPAct 2005, FERC designated NERC as the "Electric Reliability Organization" for the United States and NERC then proposed various Reliability Standards, most of which have been approved by FERC. PJM plans and operates the reliability of the transmission system to the FERC-approved NERC Reliability Standards. NERC uses the Functional Model structure to assign responsibility and authority for the maintenance, operation and planning of Bulk Electric System transmission facilities.
>
> [JC-9 at 7.]

As the designated entity for NERC's planning functions, PJM is required to perform annual transmission system performance assessments and develop a corresponding Corrective Action Plan. NERC Reliability Standards require that the bulk electric system (BES), (i.e., greater than 100 kV), be designed to operate under approved thermal and voltage criteria during anticipated peak loading conditions and in consideration of

[19] Sims noted that currently the RTEP process also affords an opportunity for other resource providers, including generators and merchant developers, to address identified system needs in a manner that might delay or even obviate the transmission solution first identified in the RTEP process. See discussion of FERC Order 1000, infra. at note 28, and pgs. 143-44.

credible outages of elements on the BES. Once transmission upgrades have been identified and then approved by the PJM Board, PJM designates the transmission owner that owns the transmission facilities to construct the enhancement or expansion specified in the RTEP. Sims explained that the transmission owner is required to acknowledge and accept the designation of construction responsibility and propose a preliminary schedule for completing the enhancement or expansion.

Sims presented PJM's perspective on the stated need for the MCRP to meet existing and future demand for electric service and to maintain the stability and reliability of the JCP&L system. He testified in detail on the RTEP planning process. The first step in the RTEP process is to develop a powerflow case for the current year plus the five-year horizon. During this step, PJM models the expected future system conditions. Development of the future powerflow case requires PJM to make a number of assumptions about the future state of the system. For example, PJM must make some assumptions regarding load forecasts, the development or retirement of generation, transmission, and demand response resources, and electricity transfer levels between portions of the grid. Those assumptions are documented and then vetted through the PJM stakeholder process with the Transmission Expansion Advisory Committee (TEAC). PJM next completes scenario and sensitivity studies to supplement the base powerflow analysis to ensure that planning decisions consider additional possible future conditions or scenarios on the BES.

Sims described the adjustments that have been made in the RTEP process in recent years. As a result of the economic recession, PJM has been approved to move beyond a "bright line" test of transmission reliability and needs. Sims explained that recent dramatic swings in economic load forecasts, the growth in demand-side resources, the uncertainties surrounding "at-risk" generation due to changes in environmental regulations, and evolving public policies have impeded PJM's ability to plan for its system with any certainty. The "retool" studies assist in obtaining clarity in the forecast planning process.

Sims discussed the relevant violations of NERC Reliability Standards identified in the RTEP planning process and how such violations support the need for the Project.

In general, NERC Reliability Standards require that PJM identify the "critical system conditions" against which the transmission system must be evaluated to ensure that it meets the performance criteria specified in those standards. PJM establishes the critical system conditions in part through the application of its generator deliverability, load deliverability, and common mode outage test procedures. NERC Reliability Standards require PJM to test various types of events to ensure that the system meets the performance criteria in the standards. For purposes of this hearing, the types of events fall into three main categories of A, B, and C.

NERC Category A criteria require that, with all facilities in service, equipment thermal ratings and system voltage limits are respected, and that the system is stable. NERC Category B criteria impose similar requirements with one facility removed from service. This is referred to as the "n minus 1" or "n-1" criterion. These criteria ensure that the system continues to remain reliable following the instantaneous outage of a transmission element. NERC Category C criteria require the system to be stable and within applicable equipment thermal ratings and system voltage limits for a range of more severe contingency events. Such events include second contingencies, involving the loss of one system element followed by system readjustments, and then the loss of a second system element. This is referred to as the "n minus 1 minus 1" or "n-1-1" criterion. Category C also includes common mode outage events, such as the loss of two circuits on a single tower line, or a single faulted system element followed by a circuit breaker failing to operate, which is referred to as a stuck breaker. For both Category B and C, equipment thermal ratings must be maintained, and system voltage limits must remain within their prescribed maximum voltage deviation and absolute magnitude.

In order to determine if a system meets the reliability standards, PJM conducts studies that subjects the transmission system to specific transmission system conditions. The load deliverability test examines defined load zones within the PJM Region and considers the ability of the transmission system to deliver adequate power to each load zone during a generation capacity emergency. The generator deliverability test evaluates the capability of the transmission system to assure that capacity resources can be delivered to the remainder of the PJM system at peak load. Sims

stated that both tests are conducted through a computer simulation. In addition, he explained that PJM also evaluates the system for the simultaneous loss of multiple elements such as the loss of a double circuit tower line which would remove two lines from service. This can be thought of as a laboratory "stress test" of a utility's transmission system. A "voltage collapse" violation of NERC reliability standards generally means an unstable system condition where a local or widespread loss of load is experienced as system voltages decrease catastrophically, generally known as a "blackout." The computer simulations of a voltage collapse results in a "non-converged" case, which means that the computer tried multiple iterations of a solution to no avail.

Following this general review of the PJM processes, Sims discussed in more detail the studies conducted of JCP&L's transmission system during its 2011 RTEP. Sims supervised the creation of the base cases, the analyses conducted including model development, the preparation of the generator deliverability, load deliverability and common mode outage tests, the identification of violations of NERC Reliability Standards, the scenario studies, and the formulation of solutions to any identified reliability violations.

Sims stated that the need for the MCRP had been identified as part of the 2011 RTEP to address potential local voltage collapse on the JCP&L 34.5 kV system for the loss of the Atlantic - Red Bank S1033 & T2020 230 kV lines. The loss of the Atlantic-Red Bank S1033 & T2020 230 kV circuits is described as a common mode outage. This type of outage is defined as one of two or more automatic outages with the same initiating cause, where the outages are not consequences of each other, and which occur nearly simultaneously (i.e., within cycles or seconds of one another). In this case, the loss of both Atlantic-Red Bank 230 kV circuits is classified as a double circuit tower line outage due to their configuration as two adjacent circuits on a common structure, or a P7 event. Subsequent "retool" studies, which used updated assumptions based on the latest available information, continued to show the need for the Project within the planning horizon. The potential NERC reliability standard violation on the JCP&L system near Red Bank was forecasted to occur in 2016. Sims set forth that PJM considers these violations to be significant and to present operational and reliability concerns in New Jersey, including the Monmouth County area.

Sims summarized his understanding of the MCRP as consisting of a new 230 kV transmission line between the endpoints of the existing JCP&L's 230 kV line serving the NJT Aberdeen Substation and JCP&L's 230 kV line serving NJT's Red Bank Substation. The new transmission line would provide an essential backup in the supply of electricity into Red Bank should the P7 event occur. He stated that the Project will also encompass the expansion of JCP&L's Taylor Lane Substation and upgrades to the Freneau and Red Bank Substations.

Lawrence A. Hozempa was presented as an additional witness by the Company on the need for the proposed MCRP. He graduated in 1986 from Pennsylvania State University with a Bachelor of Science Degree in Electrical Engineering, and is a licensed Professional Engineer in New Jersey, Virginia, Pennsylvania, Maryland and West Virginia. Hozempa began his engineering career with West Penn Power Company, a local power electric utility, and has stayed within that company or its successors through and including its merger with FirstEnergy. Hozempa is now a Manager of Transmission Operations in the Energy Delivery Transmission Operation Services (EDTOS) Department of FirstEnergy in its West Virginia offices, with responsibility for its south transmission zone.[20]

Hozempa manages the FirstEnergy staff who determine compliance with reliability criteria established by the NERC, as well as with reliability and operational criteria established by PJM and JCP&L. He also coordinates with neighboring transmission owners, in conjunction with PJM, on the analysis of the transmission system from a regional perspective. He has filed or adopted written testimony before the BPU on behalf of JCP&L in the Oceanview and Montville-Whippany HVTL matters, and in several other jurisdictions.

Hozempa provided an overview of the JCP&L system, customer base, and transmission and distribution circuits, which are divided between its Northern Region

[20] At the time of his initial pre-filed testimony, Hozempa was Manager Transmission Planning. He stated that his promotion did not impact the testimony he presented.

(Morris et al. counties) and Central Region (Monmouth et al. counties).[21] He summarized that the JCP&L BES transmission in the area is designed with three nominal voltages; 500 kV, 230 kV, and 115 kV. There are approximately 60 substations connecting to the BES, with approximately 18 pole-miles of 500 KV circuits, 594 pole-miles of 230 kV circuits, and 150 pole-miles of 115 kV circuits.

Hozempa supplemented the description of the Project that has already been discussed above by commenting that it will provide a new 230 kV source into both the JCP&L Freneau and JCP&L Red Bank Substations to supplement the 230 kV looped sources that exist today. It will also provide switchable backup to the NJT Aberdeen and NJT Red Bank Substations. Besides the line construction, which is the majority of the project, work at the JCP&L Freneau, JCP&L Red Bank, and JCP&L Taylor Lane Substations will be required. At the JCP&L Freneau Substation, two 230 kV breakers will be installed to create a ring bus. At the JCP&L Red Bank Substation, a 230 kV breaker will be installed in the existing bus. At the JCP&L Taylor Lane Substation, a 230 kV bus with a 230 kV breaker will be installed.

The purpose of the work being done at Taylor Lane is to provide a sectionalizing, or switching point, on the line between the JCP&L Freneau Substation and the JCP&L Red Bank Substation. Since both the NJT Aberdeen and the NJT Red Bank Substations will be served from the new line, the breakers at the JCP&L Freneau Substation and the JCP&L Red Bank Substation would operate to isolate the line. By installing the 230 kV bus and the 230 kV breaker at the JCP&L Taylor Lane Substation, the new line will effectively become two segments. That way, if there is a fault on the line, only one segment of the line will be interrupted, and only one of the NJT substations will lose electric service.

[21] As was evident at varying times during the hearings, and as I confess now, it is difficult for me to understand how the two separate regions of JCP&L service territory play into the summer peak load forecast and reliability analysis. That is, should the Central Region have a separately identified summer peak load because it is as distinct from the Northern Region as JCP&L is distinct from PSE&G? [See, e.g., 2T159:19-160:9; 3T74:17-75:11.] Eventually, near the end of the hearings, Hozempa and I had a colloquy in which he tutored me on how the P7 contingencies are run and then the impacted buses are isolated in the powerflow so that the Company could discern that the problem was into Red Bank. [10T15:20-23:12.]

Hozempa reiterated that NERC reliability standards require that the BES be designed to operate under approved thermal and voltage criteria during anticipated peak loading conditions and in consideration of credible outages of elements on the bulk electric system. He defined the P7 violation at the center of this proceeding with more specificity:

> NERC Category P2 through P7 contingencies, previously known as Category C contingencies, are events resulting in the loss of any generator followed by a P1 contingency, double-circuit bulk electric system transmission line (i.e., common structure), bi-polar DC line, faulted circuit breaker, fault plus stuck breaker, failure of primary relay protection, or the combination of a single generating unit, transmission line, transformer, circuit breaker or capacitor followed by the loss of another single generating unit, transmission line, transformer, circuit breaker or capacitor (i.e., N-1-1). For these contingencies, thermal loading shall not exceed the seasonal emergency rating of any networked facility; violate either the maximum deviation or the emergency minimum or maximum voltage criteria. Similar to the NERC Category P1, planning criteria allow for plus-or-minus 8 percent voltage deviation and 0.92 per unit as the minimum voltage and 1.05 per unit as the maximum voltage for 230 kV facilities within the networked bulk electric system.
>
> In addition, the transmission planning criteria for PJM and JCP&L stipulates that for any NERC Category P1 through P7 event, the associated loss of load will be limited to less than 300 MW due to a Federal reporting requirement for major system incidents on electric power systems.
>
> [JC-8 at 12-13.]

Hozempa provided a second description of the 2011 RTEP process during which the P7 violation was noted during the computer model simulation on the JCP&L system. JCP&L confirmed this contingency may result in more than 700 MW of load loss, well above the 300 MW loss of load criterion limit, which violates the JCP&L planning criteria as well as PJM planning criteria. There are additional limits that also comprise a P7 violation. Specifically, or to state it conversely, if the following do not occur during modeling of a P7 contingency, there is no NERC violation if (1) there is no voltage collapse; (2) the voltages are within acceptable limits; (3) there are no thermal line overloads; and (4) the load lost is 300 MW or less.

As stated by Sims, PJM confirmed that the JCP&L-proposed Project will adequately address the reliability criteria violation. [JC-9 at 17-18.] PJM presented the Project, with its price tag of $22.1 million, as prepared on April 26, 2011, at the September 8, 2011, TEAC meeting during which that body reviewed it as a solution to the P7 violation. [JC-8, Exh. LAH-2.] The PJM Board of Managers approved the Project at their subsequent meeting on October 18, 2011. PJM established a June 1, 2016, required in-service date, but then adjusted that to June 1, 2017. While PJM has not officially adjusted the timing of the Project again, PJM now lists the projected in-service date as June 1, 2019.[22]

Hozempa and Sims were cross-examined as a panel. Hozempa explained that JCP&L, as a transmission owner, provides some of the assumptions that go into PJM's RTEP process. That information includes working with the load analysis subcommittee and determining load forecast. It further includes accurately identifying the transmission network models, e.g., breaker locations, common structure locations; and then double-checking to make sure any violations from the RTEP model are projected based on accurate assumptions. [2T41:18-42:8.] Hozempa also agreed, in general, that the JCP&L transmission power infrastructure reliability has improved over the last five years [2T45:18-46:11.]

On questioning by Rate Counsel, Hozempa was asked to provide more details of the five-year horizon timeframe of the present P7 violation. During the 2011 RTEP, the summer peak load projected for 2016 and used in the contingency analysis was 6,942 MW. Hozempa was asked to explain the load forecast reports provided by PJM, as summarized on Exhibit JMG-7. He clarified that the 2011 RTEP uses a forecast from the beginning of 2011 for 2011, and not actual loads even for that first year in the model. In 2012, a new forecast would be made for that year and years going forward, etc. But it was not the 2012 forecasts that were modeled in the 2011 RTEP. [2T57:2-14.] In response to questions, Hozempa noted that by 2014, the 2016 peak load forecast was down to 6,584 MW; by 2015, it was 6,362 MW; by 2016, the 2016 summer

[22] http://www.pjm.com/planning/rtep-upgrades-status/construct-status.aspx

forecast was 5,968 MW. [2T23:14-24:17.] As shown below, the actual peak load reached in 2016 was 5,955 MW.

Sims was able to set forth what were the actual summer peak loads from the relevant years from PJM records:

2012 6,220 MW;
2013 6,379 MW;
2014 5,637 MW;
2015 5,819 MW;
2016 5,955 MW.

[2T68:1-69:25.]

Sims admitted that the actual peak loads for the five-year window never approached those forecasted in the 2011 RTEP. [2T873-6.] Going backwards in yearly projected forecasts (i.e., not actual), the 2010 RTEP had projected 7,323 MW for 2016.

In 2011, the interim annual projected peak load forecasts used in the 2011 RTEP were:

2012 6,551 MW;
2013 6,720 MW;
2014 6,804 MW;
2015 6,885 MW;
2016 6,942 MW.

[2T58:18-61:25.]

On further cross-examination, Sims could not characterize the factors that would account for an approximately 1,400 MW difference between the 2010 forecast and the actual peak load that materialized six (6) years later, but he did think that the single

biggest factor would probably be economics.[23] [2T76:24.] Sims also explained that a forecast may look like an exact number,[24] and it is provided to the RTEP by the PJM Resource Adequacy Department; nevertheless, once the forecast load is plugged into the process, PJM does not undertake a sensitivity analysis to determine the line below and above which violations do not or do occur. [2T81:17-18.] In other words, during the 2011 RTEP at issue herein, PJM did not determine at what exact peak load the P7 violation no longer occurs or is solved such that there is no need for a solution. Sims admitted that the P7 violation could be eliminated by a lower load, stating: "But at some point, yes, if you lower the load far enough the problem is likely to go away." [2T92:1-20.]

During cross-examination, it was also disclosed that Hozempa failed to note in his direct testimony that he had performed a cascading analysis in early 2016 at a system load value of 5,918 MW, which is a load level in excess of an intervenor's expert witness's observed load. This analysis by Hozempa produced a stable system; that is, where the powerflow resolved at that peak load and there was no voltage collapse. [JMG-17.] Yet, and despite the earlier testimony about the lack of a sensitivity analysis, Sims stated that PJM and JCP&L are always doing additional analysis and that such analysis validated the continuing need for the Project. [2T88:14-25.] PJM has done an RTEP using forecasted peak loads every year since 2010, and the common structure P7 event outage led to a voltage collapse in each year. Sims defined this process as a "retool study" undertaken with updated assumptions. He stated that at 5,955 MW,[25] the 2016 retool study still confirmed the P7 violation in that year and each of the next four years in the five-year horizon. [2T96:4-97:23.]

[23] PJM's decreasing forecast of peak load growth for JCP&L reflects "increasingly efficient use of electricity, increases in self generation, changes in demand response resources, and changes to the load forecast model." [RC-2 Confidential at 8.]

[24] As stated earlier, the forecast is referred to as the 50/50 Summer Peak Load because it represents the point at which there is a 50%-50% chance of it being higher or lower; in other words, a type of average. [2T83:8-10.]

[25] While typically the Retool Study only uses forecast loads, Sims testified that PJM used the actual peak number of 5,955 MW in 2016. [2T197:9-23.]

Sims confirmed, however, that PJM did not run any type of alternative or hypothetical analysis to see if there is some scenario under which the problem no longer exists. [2T198:13-199:2.] PJM did not produce any documentation of the results of each subsequent annual retool study because none of them showed "changes requiring cancellation or modification to originally identified solutions." [2T99:20-25.] If there are no such changes, the TEAC does not have to be re-presented with the issue of the transmission project. Nevertheless, the retool study is based on a computer analysis undertaken by PJM staff whether it results in a new PowerPoint presentation to TEAC or not.[26]

Cross-examination and questioning from the bench also probed the issue as to why this potential P7 voltage collapse event was not identified earlier than November 2010. Neither Sims nor Hozempa was able to answer that question. In addition, while it might seem that a peak load forecast difference of 1,000 MW should result in a voltage collapse with a loss of less than 700 MW, Sims explained that the loss does not react mathematically in sync with the forecast because there are a lot of elements or "moving parts." [2T127:5-128:12.] Hozempa described the dynamic simulation undertaken by FirstEnergy upon notice of the non-convergence by PJM. The Company demonstrated that the loss of 230 kV into Red Bank results in the underlying 34.5 kV system overloading significantly, with lines overloading and voltage dropping catastrophically. [2T132:16-133:14.]

Sims conceded, however, that a new transmission project is not necessarily the only way to resolve a NERC violation. The RTEP process permits other resource providers, including generators, merchant developers, and demand response providers to address the identified system need and suggest a non-transmission solution. [2T147:15-148:3.] As a follow-up to that line of testimony, I asked:

[26] A colloquy followed on the record about the production of the actual powerflow cases that were run for the retool studies during discovery. It appears that petitioner produced the most recent retool powerflow case to Lanzalotta during the week just before the hearings commences. [2T103:17-105:22.] Earlier powerflow cases were provided in earlier discovery responses. Apparently, and unbeknownst to me until April 5, 2017, it requires expensive proprietary software to be able to open up the file. On the basis of the untimeliness of the oral motion to compel the discovery in a different format or to have extensive testimony stricken, I denied the motion without prejudice to it being renewed if counsel believed that was warranted after further review of what was delivered and when. [2T108:8-12.]

> JUDGE COOKSON: Can you give me an example of how – and all I can think of is at the moment that if someone were to come along, a third-party ABC generator project and build, with all kinds of permits, a wind farm off of the Jersey shore to tie into the Red Bank load area, that that would be something that would change the way you would view the need for this project?
>
> * * *
>
> MR. SIMS: If the hypothetical wind project fixed the problem and they, per our process, if they proceeded far enough [through] the process and followed certain agreements, following our procedures, we would then model them in the case. And when we perform the simulation without the MCRP project, we would no longer see the violation.
>
> [2T149:6-23.]

On continued cross-examination of this panel, Hozempa added additional information to the general overlay of the transmission grid in this area. He explained that the Eaton Crest Substation receives power through a tap of the Atlantic-Red Bank 230 kV line for service to just the pocket of load right around Eaton Crest. No lines run from Eaton Crest into Red Bank. [2T115:13-117:19.] There is also, of course, a 34.5 kV network that underlies the entire transmission system. With respect to questioning about whether JCP&L considered an alternative 230 kV line running from Atlantic to Red Bank and/or through Eaton Crest, Hozempa indicated that the Company had not done so. He opined that it would require a triple 230 kV line in a common corridor – a likely NERC violation, or that it was not a suitable solution – Eaton Crest does not serve the greater area network. Hozempa stated that the Company had not studied and did not know whether additional new 34.5 kV line(s) and transformer capacity into Eaton Crest would be an alternative means of solving the P7 violation. [2T166:7-167:12.]

Hozempa also confirmed that the Company had not prepared any cost estimates for any electrical alternatives, including smart inverters, smart grid technology, or distributed generation. [2T36:19-37:9.] He also stated in his rebuttal testimony that employing a special protection system (SPS) to shed some customer load in order to avoid crossing the 300 MW threshold criteria of the NERC violation was not acceptable

in the view of the Company, notwithstanding that the standards allow for some load loss. [2T209:2-25.] Hozempa distinguished between merely avoiding a P7 violation and having a "reasonable" approach, notwithstanding that the Board is being asked to approve this Project because of the reliability criteria violation and not as a "reasonable" Project. [2T211:2-14.]

In response to a question as to whether JCP&L had evaluated any short-term mitigation strategy that would obviate or mitigate a voltage collapse while this Project or any other more robust solution was being planned and built, or if reduced demands result in reduced peak loads even further, Hozempa remarked that the Company had not done any such evaluation. [2T164:11-21.]

Peter J. Lanzalotta was presented as an expert witness by Rate Counsel on the issue of the need for the MCRP. Lanzalotta is a Principal of Lanzalotta & Associates LLC, Hilton Head Island, South Carolina. He is a graduate of Rensselaer Polytechnic Institute, where he received a Bachelor of Science Degree in Electric Power Engineering. In addition, he holds a Master's Degree in Business Administration with a concentration in Finance from Loyola College in Baltimore. Prior to forming his own company, Lanzalotta was a partner of Whitfield Russell Associates, with which he had been associated since March 1982. His areas of expertise include electric system planning and operation. He is a registered Professional Engineer in the states of Maryland and Connecticut.

Lanzalotta has been involved with the planning and operation of electric utility systems as an employee or consultant to a number of privately- and publicly-owned electric utilities and government agencies involved in the regulation of electric utilities over a period exceeding thirty years. He has presented expert testimony before the FERC and before regulatory commissions and other judicial and legislative bodies in twenty-two (22) states, the District of Columbia, and the Provinces of Alberta and Ontario. His clients have included utilities, state regulatory agencies, state ratepayer advocates, independent power producers, industrial consumers, the United States Government, environmental interest groups, and various city and state government agencies. As with other expert witnesses on the issue of the PJM/NERC need for the

Project, Lanzalotta detailed the RTEP and other steps in the regulatory and reliability planning processes that take place over the short and long-term horizon. Therefore, I shall not summarize that portion of his pre-filed direct testimony.

Lanzalotta testified that the need for the MCRP, which was initially determined in 2011, has been diminishing ever since. PJM planning rules, recently amended to help reduce, or even eliminate, project cancellations due to changing conditions, have supposedly re-affirmed the need for this project. Notwithstanding that, Lanzalotta stated that the date of this need appears to be uncertain at best. In addition, there are a number of technical approaches to improving reliability that the Company has failed to consider, such as a static var compensator (SVC), a static synchronous compensator (STATCOM), distributed generation, smart invertors, or smart grid technologies that may potentially avoid or mitigate the P7 violation that drives the need for the Project.

Lanzalotta detailed that since the 2011 RTEP, forecast peak loads for the Company have decreased significantly. His attached exhibit (PJL-4) shows an excerpt from the 2012 PJM load forecast which depicts the summer peak load forecast for PJM's Mid-Atlantic zone, which includes JCP&L. As shown therein, the PJM 2012 peak load forecast for JCP&L for the year 2016, in which the voltage collapse was first observed, was 6,696 MW. Since the time of that forecast, JCP&L future forecasted peak loads have been decreasing. Lanzalotta stated that he would expect the probability of a voltage collapse from the common mode P7 contingency to decrease as the Company's projected peak load decreases. The JCP&L 2016 peak load forecast decreased down to 5,968 MW, a decrease of 738 MW in the next year's forecast. This decreasing forecast of peak load growth reflects increasingly efficient use of electricity, increases in self-generation, changes in demand response resources, and changes to the load forecast model. The 2016 PJM Load Forecast now projects a summer peak load for JCP&L of 6,255 MW in the year 2031, the furthest projected year in the 15-year planning horizon used by PJM. The load level from the 2012 PJM load forecast at which the voltage collapse was modelled to occur, i.e., 6,696 MW in 2016, is never reached by JCP&L in any of the 15 years, through 2031, as reflected in the 2016 load forecast. [Exh. PJL-5.] Lanzalotta also set forth that the preliminary 2017 Load

Forecast Report for JCP&L lowers the 2031 forecast peak for JCP&L from 6,255 MW down to 6,219 MW, and projects a peak load in 2032 of 6,277 MW. [Exh. PJL-9.]

Lanzalotta explained that in early 2012, PJM changed its Operating Agreement to move away from use of a "bright line" test to determine the need for transmission system reinforcements or additions. Under this approach, for example, when loading of a particular system element reached 100% of its operating limit in transmission planning studies, a system modification was required to lower that loading level. If, however, the loading of that element only reached 99%, no modification was required. According to him, PJM believed that this "bright line" test encouraged what it calls "the whipsaw effect of taking projects in and out of the RTEP due to changing conditions." By way of example, Sims had specifically mentioned the cancellations of the PATH and MAPP transmission projects that were initiated and later cancelled, earlier in this decade, due to such changing conditions.

The "bright line" approach was replaced by the current approach which allows for flexible transmission planning criteria, expanding PJM's analyses beyond a strict application of the reliability criteria. This approach would permit PJM to go beyond the strict NERC reliability criteria: (i) using sensitivity analyses; (ii) changing the modeling assumptions; (iii) changing the planning scenarios; (iv) taking public policy objectives into consideration; and (v) taking potential changes in expected future conditions into consideration, as well as including other considerations. [RC-2 at 10.] Given this planning flexibility, the likelihood of a project cancellation is substantially reduced, if not completely eliminated; however, the MCRP appears to come under a bright line perspective. PJM does not want to consider flexible analysis that could lead to cancellation. Lanzalotta also discussed non-transmission alternatives in his re-filed testimony, which will be discussed in the next section below.

Lanzalotta was given leave to orally supplement his pre-filed responsive testimony to address issues raised by the Company's pre-filed rebuttal testimony. He mainly stressed that the Company had failed to evaluate fully any alternatives other than the MCRP. Without a full set of information on other transmission alternatives, one cannot really compare costs, visual impacts, levels of reliability, and safety

considerations. Lanzalotta stated that he did what he could in terms of analysis but there were data, time and cost constraints. In addition, he suggested that the burden of proof was on the Company and it also was in a better position to undertake that analysis. [3T15:2-16:12.]

On cross-examination by JCP&L, Lanzalotta confirmed that he had reviewed the Company's studies but had not prepared any voltage collapse or powerflow studies himself. Lanzalotta remarked that his review of JCP&L's studies and data revealed that there is a load number in a steady state voltage study at which point it appears that the voltage will not collapse, namely, 5,862.9 MW. [3T38:5-19.] On questioning by JCP&L, he admitted that load is just one factor –

> [I]t [is] difficult to take any specific peak load level and, looking just at that, say whether or not there was going to be a voltage collapse. There's thousands of pieces of data that are in this load flow program, and they all have an effect to some extent on whether or not there's a voltage collapse.
>
> [3T56:5-11.]

As follow-up, Lanzalotta was asked to give an explanation of what he did that derived the load of 5,862.9. He responded that he has Siemans software – PPS/E -- used also by PJM to view the "saved case" provided in response to Discovery RCR-ENG-16. [RC-3 (CEII).] FirstEnergy, however, uses a GE software program that would have needed a special conversion which he did not own. Instead, he ran a subroutine, specified area 228 which is listed as JCP&L, and ran a load report. Lanzalotta was ordered to produce that one-page load flow work analysis to all parties, marked as Confidential (CEII). [RC-4.]

With respect to peak load forecasting,[27] Lanzalotta also agreed with the Company that just mathematically calculating the percentage by which PJM summer peak load forecasts were "off" compared to actual loads does not guarantee future

[27] Lanzalotta also engaged in some simple calculations on the stand as to the variations between PJM forecasted loads and JCP&L actual loads which I noted at the time could be performed by anyone with a calculator. [3T43-53.]

forecast accuracies one way or the other. Nevertheless, the consistency of past forecast projections being too high should make one pause and raise questions about future projections if based on same methodology.

Intervenor RAGE presented the testimony of P. Jeffrey Palermo who analyzed the proposed MCRP and identified a range of alternatives not considered by JCP&L. Palermo is employed as an Executive Consultant with PJP Consulting, a power system engineering consulting firm he founded in 2014. He has consulted in the energy industry since 1979 with several firms for projects in the United States and in over thirty (30) countries. Palermo has developed transmission and generation expansion plans, economic and financial evaluations, blackout analyses, pooling and coordination studies, inter-company contract evaluations, reviews and comparisons of national planning and pooling practices, and has also been responsible for the implementation of the resulting plans. Palermo earned a Bachelor's Degree in Electrical Engineering in 1975 and a Master's Degree in Electrical Engineering in 1977, both from Northeastern University. He also earned a Master's Degree in Business Administration from the University of North Florida in 1978. He is a registered Professional Engineer in Florida.

Palermo outlined his associations in professional organizations. He has been a member since 1976 of Conférence Internationale des Grande Réseaux Electriques (CIGRÉ), and its planning and operating committees since 1985. CIGRÉ is an international organization, which, among its activities, discusses and compares planning methods and future plans. He is also the US representative regarding power system development and economics and served as a member of the task force that developed the CIGRÉ Power System Reliability Analysis Guide. Recently, Palermo convened a CIGRÉ Working Group tasked with reviewing the future of reliability considering new developments in customer flexibility and communication. He is also a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), where he has been involved with system planning and operating activities.

Early in his career, Palermo has evaluated electric system blackouts beginning with a 1976 blackout that occurred in Jacksonville, Florida, and several other blackouts there over the next two years. Subsequently, he evaluated blackouts in France, New

York, California, Delaware, Idaho, Oregon, Pennsylvania, New Jersey, Ontario, Malaysia, and Australia. Palermo has evaluated and developed transmission plans in approximately forty (40) states, provinces and territories in North America that included a wide range of system analyses using a variety of steady-state and dynamic system analysis tools and techniques. He has represented all sectors of the utility industry, ranging from regulatory agencies, such as the Federal Energy Regulatory Commission, to state commissions, large and small public or private utilities, cooperatives, transmission developers, and independent power producers, and for various intervener groups, as well as many stakeholder groups. Palermo has testified before FERC and numerous regulatory bodies, although not the BPU.

As have other witnesses in this proceeding, Palermo described the types of violations under the former and current NERC reliability standards. Palermo explained that the reliability standards are applied essentially in three steps – before, during, and after a potential contingency. Acceptable conditions following the contingency in the NERC criteria allow the loss of firm load as long as it is limited to an area by a protection system operation designed to isolate the fault. He acknowledged that PJM found that powerflow models testing the P7 contingency over several study years did not converge. This usually indicates a voltage collapse or "blackout." PJM considers a voltage collapse to be an uncontrolled outage, which is not allowed by the NERC criteria. Both PJM and JCP&L have additional criteria where the loss of load for a P7 contingency must be limited to less than 300 MW to avoid a federal reporting requirement for more extensive outages. JCP&L found that the relevant contingency would cause the loss of more than 700 MW of load. Palermo explained, however, that if the voltage collapse were controlled and if the resulting loss of load were less than 300 MW, it would not violate the PJM or JCP&L criteria, and there would be no need for the Project.

Palermo also described the RTEP and TEAC processes used by PJM to confirm criteria violations and the powerflow analyses conducted by it and JCP&L to verify the solution to them. In his initial testimony, he did not doubt the powerflow results although he was not able to see them. Palermo also stated, however, that neither PJM nor JCP&L seem to have made any further investigations to either confirm, or understand

the nature of, this apparent voltage collapse. From the results of the powerflow analysis, Palermo explained that JCP&L could determine a non-convergence but the extent of the affected area in Monmouth County would have required a different analysis. The results of the powerflow analysis, according to Palermo, are most useful in showing the number of iterations the computer model tried, the power mismatches, and the bus locations.

Palermo also noted that since 2011, when the MCRP was first proposed, the PJM process has changed due to the recent ruling by FERC (FERC Order 1000[28]) that allows third parties to propose solutions to criteria violations that PJM identifies. Powerflow studies are commonly used to expose criteria violations, where non-converging results indicate a voltage collapse. While PJM evaluates the system for criteria violations, it is the members and other third parties who identify and develop solutions. PJM validates that any proposed solutions mitigate the criteria violations, as well as determining if the solution introduces new criteria violations. Palermo seemed to question whether PJM should have opened up the P7 violation on JCP&L's system to third-parties for competitive solutions.

With respect to the details of this specific P7 violation, both PJM and JCP&L claim that the extreme contingency causes the loss of more than 700 MW of customer load. In addition, Palermo noted that Hozempa had identified the area affected by the outage in his Exhibit LAH-4 — a fairly large area that extends from north of Oceanview around to the north and east of Aberdeen. Palermo was of the opinion that it is unclear how this area was determined from a powerflow case. It is obvious that following the outage there will be no 230 kV power feeding either Red Bank or NJT Red Bank. However, the non-convergent powerflow gives no indication as to how this affects the load in the area these two substations serve or any of the other 230 kV substations in the area.

Palermo went on to explain the limitations of a powerflow analysis, even with the professional programs of PJM. Non-convergent powerflow results will be nearly useless

[28] Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, Docket No. RM10-23-000; Order No. 1000, 136 FERC ¶ 61,051 (July 21, 2011) (FERC Order 1000).

in the area where the voltage collapse occurs. In the area where the collapse occurs, the powerflowing into a bus may be as much as 100 MW different from the powerflowing out—normally, the power in should equal the power out. By definition, the results make no sense and cannot be used. As stated earlier in his testimony, the only uses for non-convergent cases is to see how many tries the model made before the result diverged. Yet, he also concurred that in most cases, the areas and buses with largest mismatches are the places where there is the biggest problem. The voltages and powerflow results in the problem area in such a case are otherwise meaningless. Using an unrelated PJM example, Palermo explained a 2012 powerflow analysis that demonstrated non-convergence spreading with each iteration. For each, the table's columns show the real power (MW) mismatch, mismatched mega volt ampere reactive (MVar), mismatched voltage, and mismatched angle, and corresponding bus numbers with the largest mismatches for each.

Palermo also explained that the powerflow model is limited by the fact that there is no "visibility" into the 34.5 kV network. It appears that the 230 kV substations in the area—Red Bank, NJT Red Bank, Aberdeen, Atlantic and Oceanview—supply an interconnected 34.5 kV network but the PJM powerflow model, even though it encompassed over 100,000 buses, does not generally include elements with voltages below 100 kV. Even if the powerflow model included the 34.5 kV network, it would still not be very helpful. When a voltage collapse occurs in the real world, the extent of the outage is limited either by the configuration of the network or protective system actions.

Many distribution systems are not interconnected; they are radially connected to their main supply source. When power is lost from the main source, all power is lost in the radial system, but no other areas are directly affected. A radial system is something like a gated residential community where there is only one entrance. If the two Red Bank substations were configured in this way, only about 400 MW of load would have been lost because the outage would have been limited to the radial distribution systems connected to these two substations.

By contrast, the JCP&L 34.5 kV system here is an interconnected network. In such a configuration, all the 230 kV substations involved are serving portions of all loads

in the area through the 34.5 kV network. This would be like the network of local roads that connect multiple gated communities. These local roads provide optional paths to move among the gated communities and the rest of the world. There would be access via other paths even when one of these local roads was closed. Palermo stated that an interconnected system offers more flexibility than the radial system. Following a fault at 230 kV bulk transmission source one, hypothetically, the remaining load would be too much for 230 kV bulk transmission source two to supply. In such a case, the breaker just 'south' of substation one could open to reduce the total load on 230 kV bulk transmission source two. In that case, the extent of the outage is limited by the protective system—the breakers. This configuration will not naturally limit the extent of the outage; the protective system must be designed affirmatively to operate so as to limit the extent of the outage. Such an interconnected 34.5 kV system must be protected by relays and circuit breakers. These devices are designed to sense overloads and voltage problems in the system and to open circuit breakers to protect the system from a total collapse. It is these protective devices that limit the extent of the outage in a networked system. This should be the case with the 34.5 kV system in the Red Bank area. According to Palermo, a 34.5 kV protection system designed to respond to a voltage collapse event should make the event a "controllable" outage under PJM criteria.

Palermo also testified as to a third issue concerning reliance upon the PJM powerflow study; namely, that it is a steady-state 'snapshot' of a stable system.[29] A powerflow model cannot evaluate the actions and characteristics of the protective relays and circuit breakers in a voltage collapse situation. Nor can it simulate the various swings and gyrations of the voltages and currents that occur during a voltage collapse event. This must be modeled using a dynamic model[30] that includes the operating characteristics of the protective devices in the seconds following the extreme

[29] I might use an analogy to a financial balance sheet and an income statement.

[30] This type of model allows the user to see what changes occur on the system in great detail recognizing the dynamic nature of the way the system behaves. Both PJM and JCP&L have access to the necessary dynamic modeling data and tools. It is required to determine how quickly the voltage collapse occurs. As detailed in the record of motion determinations, this suggestion that a dynamic powerflow study was required in order to identify the impacts of relays and other protective devices was not, inter alia, taken up by the Company in a timely manner and would have necessitated considerable delay in these proceedings, perhaps even a cold re-boot.

contingency. Determining which protective devices operate, and when, is very important because it will show the extent of the outage within the interconnected 34.5 kV system.[31]

Lastly in his direct testimony, Palermo reviewed two historic transmission service failures – in 2008 and 2010 – that Hozempa stated would have been prevented or reduced in their impacts if the MCRP had been in place. Again, Palermo was inhibited in his review due to the lack of necessary and specific details from the Company concerning these two events. Moreover, in view of some impacts during the 2010 event into areas serviced by Oceanview and Atlantic Substations, Palermo found Hozempa's conclusory statements inexplicable. Palermo presented a hypothetical reconfiguration of circuits and breakers, without the introduction of any new equipment, that would have resolved those failure events for approximately $100,000. I will defer discussion of the remainder of Palermo's testimony until the section on the consideration of alternatives to the MCRP.

Hozempa presented rejoinder testimony and was cross-examined on that following the completion of the respondents' and intervenors' cases. I allowed cross-examination to be conducted but reserved on the motion of Rate Counsel, JMG and RAGE to strike all or substantial portions of the written rejoinder testimony. Ultimately, as set forth above, I did strike some significant sections of Hozempa's rejoinder report. Accordingly, I will only summarize herein both the rejoinder report and the cross-examination that relates to the portions remaining in the record.

With respect to the paramount issue of the need for the MCRP, Hozempa disputed the testimony or implications from the testimony of Lanzalotta that there was a peak load (5,862.9 MW) below which the P7 event would not occur, and that JCP&L load has been reduced to that point. He criticized Lanzalotta's approach because he had not performed a powerflow analysis under the 2016 PJM Retool Study parameters. There are fundamental assumptions of the load, generation resources, and

[31] Not only did Palermo note that neither PJM and/or JCP&L conducted the dynamic analysis in support of its claimed P7 violation but he also commented that there was not an analysis undertaken of the reduced level of peak load at which the violation would clear.

transmission system elements that are also incorporated in the powerflow model. As was already explained during earlier testimony, Hozempa's rejoinder restates that additional analyses can be performed on the powerflow model to observe the response of the powerflow model to certain conditions. One of the primary modes of testing is contingency analysis. Contingency analysis testing consists of removing certain transmission elements from the model and observing the system response. NERC requires that certain specific contingencies be tested, including the P7 contingency.

Hozempa also criticized the powerflow study undertaken by Palermo because it did not include a cascade analysis after the contingency analysis, consistent with the FirstEnergy planning criteria. Hozempa directed a confirming powerflow study that did match the results of Palermo, including the eleven overloaded circuits – three at over 125% and eight at over 100%. The rejoinder report asserts that the cascade analysis not run by Palermo would demonstrate a voltage collapse notwithstanding his STATCOM solution (to be discussed in more detail in the next section). Hozempa also disagreed with Palermo's estimate that only 70 MW of load would need to be shed, stating that it could be three to four times that amount. Similarly, he cast doubt on the other two means of obviating the overloaded circuits, stating that radial reconfiguration just moves the stress points of the system, and the actions necessary to reconductor the circuits have been greatly underestimated.

During some supplemental oral rejoinder, Hozempa stated that the peak load number referenced in Lanzalotta's testimony of 5,869.2 MW was merely the peak load put into the 2016 Summer Retool Study by PJM. He explained that that level represents the load connected to the relevant buses in the Jersey Central area in the powerflow model. [10T14:9-15:15.] He also criticized the feasibility of Palermo's solutions. Sims supplemented in small measure on the issue of using either automatic load shedding or an SPS to resolve the P7 violation pursuant to PJM manuals. [10T52:10-54:14.]

On cross-examination on JCP&L's rejoinder testimony, Hozempa was asked to explain the results of an earlier 2016 dynamic powerflow analysis the Company ran. He stated that a dynamic analysis very rarely fails to come up with a solution because it

responds much better to the contingencies in the model. [10T66:8-67:3.] Hozempa further explained that a cascade analysis is first done in the steady state model and if a flag is triggered, it might lead to follow-up in a dynamic model. [10T72:4-73:21.] As supported by an email from Hozempa to Sims, dated July 15, 2016, (JMG-17), it seems that he obtained a stable system at peak load of 5,918 MW but only after consequential load loss and low voltage at-risk load loss of almost 700 MW. [10T77:16-78:23.]

As stated, testimony of several witnesses encompassed and integrated both the factual underpinning to the NERC violation that justified the MCRP, as well as alternative solutions to the P7 contingency. Perhaps artificially, I have chosen to address the cross-examination, rebuttal and rejoinder testimony on those issues below irrespective of the chronology at the hearings.

Alternatives to the MCRP

Peter W. Sparhawk filed testimony on behalf of the Company on the issues of the route study and route selection.[32] He is an Associate Vice President in the Power and Energy Business Unit of The Louis Berger Group, Inc. (Berger). Sparhawk served as the MCRP Project Manager for Berger's team and as a member of the Route Selection Study Team. He has previously been a witness for Berger and JCP&L on the Whippany-Montville 230 kV Transmission Project, and on three projects in Pennsylvania for PPL Electric Utilities. Sparhawk earned a Bachelor Degree in History in 1985 and completed an environmental management certificate program during 1996.

Sparhawk set forth the structure, purpose and goal of the Route Selection Study. The overall goal was to gain a detailed understanding of the opportunities and constraints in the service area and to facilitate the development of alternative routes to provide a 230 kV source to the JCP&L Red Bank Substation. The study then evaluated potential impacts associated with the alternative routes, and, ultimately, identified a preferred route for the MCRP. Sparhawk stated that the preferred route was the one that minimized the overall effect of the transmission line on the natural and human environment, avoided unreasonable and circuitous routes and unreasonable costs, and minimized special design requirements. The team undertook an initial Corridor Screening Study, followed by a comprehensive Route Selection Study.[33] The Corridor Screening narrowed the list of potential routes down, and then those potential routes were further "refined and assembled" into the "Alternative Routes," from which the Preferred Route was identified.

Sparhawk detailed that several types of guidelines were utilized during the Corridor Screening Study by the team, including the BPU preference for the use of

[32] Sparhawk also pre-filed Rebuttal Testimony (JC-7 Rebuttal), but it was solely directed to JMG witness Moshe Bonder's pre-riled testimony, who ultimately did not testify at the hearings. Accordingly, it will not be summarized herein.

[33] It would be fair to say that all participants in these proceedings occasionally used "corridor" and "route" interchangeably, notwithstanding carefully identifying them by their alpha designations. In general, the distinction between a corridor and a route was explained by Sparhawk as meaning that precise 100-foot-wide ROW routes were not developed. [JC-7 Rebuttal at 2.] Hence, the reference to "high level" or perhaps fly-over review. The latter is not meant in an "executive" sense. Suffice it to say that this Initial Decision will also occasionally use corridor or route interchangeably.

existing ROWs whenever practical, feasible and safe. Specifically, Sparhawk testified that the team attempted to minimize the following:

- Route length, circuitousness, cost, and special design requirements;
- The removal or substantial interference with the use of existing residences;
- The removal of existing barns, garages, commercial buildings, and other nonresidential structures;
- Substantial interference with the use and operation of existing schools, recognized places of worship, cemeteries, and facilities used for cultural, historical, and recreational purposes;
- Substantial interference with economic activities, including agricultural activities;
- Creation of new linear ROW;
- Crossing of designated public resource lands, such as national and state forests and parks, large camps and other recreation lands, designated battlefields, nature preserves or other designated historic resources and sites, and conservation areas;
- Crossing of large lakes and large wetland complexes, critical habitat, and other unique or distinct natural resources; and
- Substantial visual impact on residential areas and public resources.

Sparhawk further described large area routing constraints (e.g., developments, federal facilities, parks), small area routing constraints (e.g., buildings, cemeteries, wetlands), and opportunity features (e.g., shared corridors). The potential corridors, which Sparhawk stated numbered seventeen (17), thereafter were evaluated at a "high level for potential fatal flaws" using a selected set of criteria. Direct connections and shared corridors, as well as tap-in locations off existing 230 kV lines, were used to find those potential corridors. Sparhawk testified that the seventeen (17) possibilities were quickly narrowed to four (4) after this high level review.

The four corridors were identified by the Berger/JCP&L team as the feasible short-list contenders eligible for further detailed study in the Route Selection Study. The first two have been identified as beginning at the NJT Aberdeen substation and generally following Highway 35 (Route A), or beginning at the NJT Aberdeen substation and following the NJT ROW (Route B). Both of these corridors were seen by the team as also providing an opportunity to connect to JCP&L's Taylor Lane substation, providing additional system reliability. The other two corridors (Routes E and O) tap JCP&L's existing Raritan River – Atlantic 230 kV transmission line south and west of the Aberdeen – Red Bank corridors. While shorter than the other two corridors, these would require the acquisition of substantially more ROW, according to Sparhawk.

During the Route Selection Study, Sparhawk stated that the team zoomed in more than the high level corridor study had but utilized the same constraint and opportunity criteria. For this effort, field work was included for reviewing the potential routes from public points of access and verifying and documenting locations of residences and other small area constraints. The field investigations resulted in small changes to the potential routes. A significant result of this Study was the elimination of the two routes that tapped the Raritan River – Atlantic 230 kV transmission line because they would have required acquisition of a switching yard property adjacent to the existing 230 kV line, would require more ROW than the Aberdeen options, and would not provide an opportunity to route a new line into the Taylor Lane Substation.

Routes A and B were further analyzed by the team for constructability and relative engineering challenges. Major factors that affect constructability include, but are not limited to, steep topography, condensed ROWs, high turn angles, proximity to major highways, accessibility, and cost. Minor factors can include construction access, logistics of obtaining necessary easements, safety factors, and time and materials costs. Environmental impacts were also part of the Route Selection Study of the two preferred routes. Although Route B would traverse more wetlands than Route A, Sparhawk testified that Route B requires less tree clearing then Route A. In addition, the former's tree clearing will occur adjacent to the railway, which minimizes the creation of new edge habitat. In its land use and human impact considerations, the team found that Route A crosses developed areas for the greatest distance (9.4 miles

or 89 percent of its length), while Route B crosses developed areas for 5.3 miles or approximately 55 percent of its total length. Wetlands and forest cover represent the second and third largest land uses within 1,000 feet of the alternate routes, respectively.

The ROW for Route A would cross more parcels compared to Route B (257 and 31, respectively). Route B would only require acquisition of twenty-five (25) feet of additional ROW from fifteen (15) parcels in or near Red Bank. While Route B can be constructed and operated almost entirely within existing railroad ROW, JCP&L would have to acquire approximately 0.5 miles of new, 100-foot-wide ROW for Route A. In addition, where Route A parallels Highway 35, JCP&L would need to acquire partial ROW with NJDOT in order to share forty-five (45) feet of road ROW.

With respect specifically to residential parcels, Route A would traverse within 75 feet of twenty-two (22) residences. Further, seven (7) residential structures are located within the proposed ROW for Route A, generally located along Route 35 in the vicinity of Minnisink Boulevard. The existing 34.5 kV transmission line ROW would need to be expanded to accommodate the 230 kV transmission line. In this area, the new 230 kV transmission line would be rebuilt outside the existing New Jersey Department of Transportation (NJDOT) ROW as 230 kV/34.5 kV steel structures parallel to Highway 35. Residents in this area would be temporarily impacted during construction, but the overall use of the ROW would not significantly change. To reduce impacts to six (6) residences within this segment of the route, Route A could be rebuilt as a 230 kV/34.5 kV within the NJDOT's Highway 35 ROW. On a case-by-case basis, NJDOT may allow longitudinal installation of steel transmission structures on highway ROW, as well as allowing the placement of the structures closer to the roadway, only in circumstances in which public safety is not compromised. However, the remaining three residential buildings would still be located within forty-five (45) feet of the proposed centerline of the proposed 230 kV transmission line. In addition, seventy-three (73) commercial buildings are located within the 100-foot-wide ROW of Route A.

Route B would traverse within 250, 100, and 75 feet of the highest number of residences (458, 96, and 53 residences, respectively). Installing a transmission line within the existing NJT ROW would result in a greater change to the existing land use

compared to installing a transmission line within a new ROW for Route A. The new transmission lines will be constructed on new double-circuit cantilever steel monopole structures along the existing ROW. Residents in this area will be temporarily impacted during construction. Sparhawk touched upon vegetation management when he stated that any tree outside of the ROW with greater than twenty-five (25%) percent of its crown extending into the corridor shall be removed. Trees located outside the ROW which are deemed Priority Trees shall be removed. In areas affected by the removal of trees, it may be possible to lessen or mitigate potential aesthetic impacts by the planting of compatible species or installation of fencing. There was separate vegetation management testimony offered by the Company below.

As has been stated above, Sparhawk commented that the majority of the proposed transmission line would be constructed on steel monopole structures approximately 110 to 170 feet tall; however, a few structures crossing the Navesink River will be close to 200 feet in height. Portions of each route would involve rebuilding the existing 34.5 kV transmission line to carry the new 230 kV line.

Sparhawk described the relative aesthetic or visual impacts of alternate Routes A and B, thusly:

> Paralleling a highway can increase visual impacts, as structures would be more frequent due to the curves in the road and structures would be visible for long periods of time while driving the roadway. While highway ROWs can be considered previous disturbance to the land, the addition of a transmission line would create new vertical structures that could be seen for longer distances. In addition, Route A would be constructed adjacent to neighborhoods resulting in visual impacts to the residences. Route B and Route B Option uses existing NJT ROW for nearly its entire length and minimizes visual impacts due to the currently diminished scenic integrity of the corridor from the existing vertical structures and cleared ROW.
>
> [JC-7 at 22.]

The Route Selection Study also compared Routes A and B for their potential impact on cultural or architectural resources that were within a half mile of the MCRP

ROW centerline. Sparhawk stated that Berger also examined the National and State Register of Historic Places during this aspect of the team's analysis. Alternative Route A directly crosses the GSP Historic District, the Naval Weapons Station Earle Historic District, and the New Jersey Southern Railroad. While there are an additional twenty-one (21) historic National and/or State register listed or eligible properties and five (5) previously recorded archaeological sites within that half-mile radius of this route, the proposed ROW is highly developed and is parallel to a state highway. By contrast, twenty-three (23) National and/or State register listed or eligible historic properties and seven (7) archaeological sites are within a half mile of Route B. The Route will directly cross the GSP Historic District, the Middletown Village Historic District,[34] the Naval Weapons Earle Historic District, the New Jersey Southern Railroad District, the Navesink River Bridge, the Dorsett's Creek Bridge, and an archaeological site. Despite these distinctions, the study team considered both Preferred Routes to have the same moderate overall potential impact on cultural resources.

Sparhawk summarized that Alternate Route B could be constructed almost entirely within the existing NJT ROW and, therefore, would result in minimal changes to the existing land use and viewshed. No significant additional ROW is needed to construct Route B. Only approximately twenty-five (25) feet of new ROW would be required for 0.4 miles, or 1.2 acres, for Route B. In addition to needing additional ROW, Route A would potentially involve the displacement of six to nine (6 - 9) residential structures and multiple commercial buildings in order to safely construct and operate the new 230 kV line.

Ultimately, Alternate Route B became the Preferred Route and is the proposed MCRP. Sparhawk noted that the existing railroad ROW is approximately 100 feet in width. An option was added to Alternative Route B to place the HVTL on the opposite side of the NJT ROW between Normandy Road and Navesink River Road in response

[34] Middletown is one of the oldest settlements in New Jersey. Monmouth County was organized into municipalities in 1693 when its 3 original townships were formed. One, Middletown, then embraced all of Monmouth County north of the Navesink River and east of Freehold Township. The present-day NJT North Jersey Coast Line, along which this Project is proposed to run, was established in 1875. https://www.middletownnj.org/249/History

to public comments received during the open houses. The Taylor Lane tie-in was proposed to follow alternate Loop 1.

Sparhawk drew a distinction from the "high level" estimate of 1803 parcels that were within the Route B corridor and the detailed assessment that Route B – the preferred and ultimately selected route for the MCRP – would only cross thirty-one (31) parcels, most of which were owned by NJT. Of the fifteen (15) privately-held parcels, they are all located between the Navesink River and Chestnut Street in Red Bank where, as stated, JCP&L will need to acquire twenty-five (25) feet of additional ROW for a distance of approximately 0.4 mile. The expanded ROW would restrict development through these fifteen (15) parcels to ensure that future development does not violate NERC building clearance requirements. He also confirmed that there are seventy-three (73) historic properties located within half a mile of the MCRP, but he did not think that those properties would be "crossed" by the Project.

Sparhawk noted that the Company conducted a further review of Routes E and O only in preparation for his rebuttal testimony but not prior to the filing of the Petition. Therein he stated that, similar to Routes A and B, the Routing Team attempted to minimize impacts by maximizing the use of shared road ROW and avoiding residences and commercial buildings to the extent feasible. Preliminary alignments for Route E and O assumed structures would be placed approximately five (5) feet outside of the roadway ROW, also similar to Routes A and B. Based on these refined routes, it is estimated that Route E would cross between 215 and 225 parcels, while Route O would cross between 150 and 160 parcels. This does not include the acquisition of property necessary for the required switching stations.

Sparhawk concluded that regardless of the Company's ability to construct a loop into the Taylor Lane Substation, Routes A, B, E, and O would parallel existing infrastructure. Route B can be constructed almost entirely within NJT's existing ROW while Routes A, E, and O would require the acquisition of new and/or partial ROW resulting in larger impacts to residential and commercial properties located adjacent to highway/roadways.

On cross-examination, Sparhawk clarified that his own involvement on the MCRP began sometime in 2012 but ramped up in 2013. Krauss would have been the JCP&L contact who engaged Berger. [5T94:9-95:1.] Sparhawk was first questioned about Berger invoices to JCP&L for this Project. Therein, it shows that Berger began what it denominated the "Red Bank Substation 230 kV Transmission Corridor Feasibility Study, Purchase Order #45327109, dated 1/25/2010." [Exh. RAGE-42.] Sparhawk explained that this purchase order was for the Potential Corridor Study that took place between February 2010 and March 2011.[35] Its purpose was to identify possible corridors for a third source of 230 kV power into Red Bank from Atlantic or Aberdeen substations, or through a tie-in (or tap) from the 230 kV line to the west. [5T99:18-101:4.] Yet, in January 2010, there was no NERC P7 violation identified by PJM. [5T102:4-103:7.] While Sparhawk was not involved at the time, he was aware of the history of the Project earlier in the 1980s and the fact that a similar route was one of the obvious options for this 2010 corridor study. This initial study resulted in the map and list of potential corridors within which routes would be later developed. [5T108:14-109:20.]

Sparhawk provided additional details to the method and results of both the corridor and route studies on cross-examination. Corridors E and O were designed to dovetail into Corridor K. They did not get eliminated from consideration until after the Route Selection Study commenced. He explained that the basis for their elimination was that both would require significant new ROW acquisition and facilities to tap into the existing north-south 230 kV transmission line. In addition, neither of these corridors would provide an "opportunity to construct a new transmission loop to the Taylor Lane substation." [5T110:5-111:22.] Sparhawk would not characterize that as the primary reason for the rejection of Corridors E and O because he was sure they would have been rejected ultimately. [5T112:16-113:13.] Nevertheless, when asked how much more ROW acquisition would be needed for Corridors E and O, Sparhawk admitted that that level of detail – quantification of necessary ROW acquisitions -- was never examined except for the preferred Routes A and B. They were determined to be not

[35] Purchase Order #45327109 was for billing to JCP&L from Berger through September 25, 2010, under invoice date October 10, 2010. [Exh. RAGE-42 at 31.] On April 27, 2011, a new Purchase Order #45368405 was initiated, signaling the start of the Route Selection Study, which continued until the filing of the Petition. [Id. at 33, 283.]

worth pursuing early in the process. [5T114:21-115:18.] Sparhawk did confirm that any corridor that created a route into Red Bank for a 230 kV transmission line would, by definition, solve the P7 violation. [5T119:14-120:6.]

During probing of each corridor, Sparhawk repeated that any acquisition acreage listed in the tables included in the study would have been approximate because that level of detail was not undertaken for any corridors except Corridors A and B, which were converted into routes for detailed analysis. With both Corridors E and O, the earliest to be removed from the Route Selection Study, a switching station would be required for the tap into the Raritan-Atlantic HVTL but Berger was never provided with cost estimates, and the location and ability to construct that facility was not part of the study. Corridors C, D, K and L were eliminated because the GSP would "generally" prohibit them being located parallel or longitudinally within the ROW to that highway. Sparhawk could not identify whether and what the exceptions to the NJDOT guidelines would be. [5T130:17-132:9.] He also stated that because K was eliminated early in the process, there was no analysis by Berger of the terrain or development along the three and one-half (3.5) miles parallel to the GSP.

Sparhawk reiterated from his direct testimony that corridors M and N were eliminated because they would have to traverse a portion of the U.S. Government Normandy Road.[36] It was undisputed, however, that two double 230 kV transmission lines connect into the Atlantic substation, which is entirely situated in Earle Naval Weapons Station. [JC-7, Exh. PWS-2 Cover, Fig. 1; JMG-10.] He could not explain historically whether the substation and HVTLs came before the federal government

[36] I note that the Naval Station website states:

> Mainside and Waterfront [sites] are connected by a 15-mile corridor with a rail line and parallel roadway; both government owned and protected. This roadway, named Normandy Road, has seven crossings to facilitate east-west passage by the civilian population. The rail line is connected directly with spurs of CONRAIL, permitting efficient movement of ordnance on and off the station.
>
> [https://www.cnic.navy.mil/regions/cnrma/installations/nws_earle/about/installation_guide/getting_here.html]

For some unique commentary on Normandy Road's reputation, see http://weirdnj.com/stories/roads-less-traveled/normandy-road/.

owned the property, came after, or an exception was issued. Sparhawk stated that it was not unusual for transmission infrastructure to traverse federal property but he thought these might be more sensitive (ordnance) government lands. Nevertheless, he acknowledged that Berger never studied the issues or locations in any detail. [6T9:5-12:23.] Similarly, there was no consideration of a corridor that would cross the GSP instead of traversing alongside it for a distance even though at least one – Corridor N – accomplished that. [6T19:8-20:16.]

Sparhawk could not elaborate on why Corridor H was eliminated other than the reason written into the study, namely, that there was a timing issue with the JCP&L in-service date for the P7 violation solution. Corridor H would require a two-step process of first buttressing the 230 kV support into the Oceanview Substation. The report noted, however, that additional 230 kV support there was under consideration to alleviate other NERC violations between Larrabee, Atlantic and Oceanview.[37] Sparhawk also reiterated that these eliminated corridors would require more real property acquisition for the ROW.

Sparhawk distinguished several corridors that were eliminated because they could cause additional NERC violations; specifically, they relied upon extensive co-location with other existing 230 kV transmission lines. [6T26:1-7.] Those were Corridors F, I, J1 and J2. He also confirmed that Eaton Crest Substation was never considered as part of any viable option to solve the P7 violation. Sparhawk was not sure if that one was a 230 kV substation. [6T49:3-24.] He also indicated that there were no cost estimates for any of these routes and only a high-level approximation of ROW acquisition needs. [6T51:21-52:4.] Nor were any routes examined for a potential of underground construction, at the direction of the Company. [6T55:3-7.] On continued cross-examination, Sparhawk conceded that these corridors were included in the analysis even though they were quickly discarded for reasons that were obvious from the beginning. [6T66:18-68:18.]

[37] I noted at the hearing, and again while preparing this decision: That footnote "seems to be saying that Route H could actually end up serving a second reliability project, even if in the future. Which seemed to sound like a positive, not a negative. If you took the timing out of it, it sounded it was a double solution." [6T24:2-9.]

Upon further questioning, Sparhawk stated that the ability to loop into the Taylor Lane Substation was considered a "bonus benefit" by the Company during the Route Selection Study. [6T80:6-25.] It was also the Company that had provided potential Corridors A and B to Berger at the inception of the study. [6T84:13-85:5.] Ultimately, Sparhawk clarified that the corridor portion of the study was completed in March 2011. This was the end of the Potential Corridor Study, and the balance of the work, up to the filing of the Petition, was the Route Selection Study, the initial results of which were concluded in early 2012. [6T84:1-8.] In reality, all but Routes A and B were eliminated no later than the fall of 2011 and more likely in the summer. [6T89:4-8.] Notwithstanding what the Berger team was doing, by 2014, if not 2013, JCP&L was already engaged in procuring significant detailed engineering designs from Burns & McDonnell for the MCRP. This was before the Route Selection Study was finalized by the Berger team and before Route B was selected as the preferred route.[38]

RAGE returned to the issue of the Berger invoices with Sparhawk. In light of Sparhawk's estimate that Routes E and O were eliminated by late summer 2011, he agreed it was fair to calculate that $36,480 had been the approximate amount spent by Berger on the review of the potential corridors before they were down to just A and B. [7T23:21-24:20.] In trying to focus just on the amount of money that was spent by JCP&L for Berger to review potential corridors, Sparhawk responded that the top two line items of the invoices for the first project order were the appropriate numbers to utilize. Accordingly, the witness was taken through those early invoices. By April 24, 2010, Berger had completed the "Task 100" of "Project Initiation and Kickoff," in the amount of $5,339.00, the bulk of which was expended in February 2010. [RAGE-42 at 3, 11.] By May 29, 2010, Berger had completed the "Task 200" of "Data Gathering and Constraint Mapping" aspect of the Potential Corridor Study, in the amount of $20,160.00. [Id. at 15.] Using the combination of both those aspects, Sparhawk agreed that those figures equate to an average of $1,470.58 for each of the seventeen (17)

[38] The Company was also already involved in detailed discussions with NJT about how the MCRP would be configured and built along the ROW. For example, Whisner, an engineer with Burns & McDonnell, first met with NJT in May 2013, the first of about a dozen such meetings. [JC-4 at 1; 1T241:5-242:3.] Wetlands delineation for the Project was also undertaken by Berger in 2013. [5T57:1-7.]

corridors, or approximately fifteen (15) hours of time invested in analysis of each potential corridor.[39] [7T48:2-51:3.]

Palermo, an expert presented by RAGE on the need for the Project, also provided pre-filed testimony on whether there were better alternatives to the MCRP. He reviewed the Company's testimony and documentation of same, including the Route Selection Study, and noted that no powerflow analysis of any alternative was undertaken by the Company or PJM. There were four alternative 230 kV lines into Red Bank on the narrowed list but apparently no technical studies were undertaken of them because they were considered by JCP&L to lack the appropriate level of "robustness." Palermo could not find any definition for that term and was unfamiliar with its use generally in the transmission industry.

Palermo described the selection process of the Company thusly:

> JCP&L identified the obvious solution, confirmed that it eliminated the criteria violation, and pretty much stopped there. They did not seem to consider options that would cost less and have smaller impacts on the residents of the area. The contingency that drives the need to take some action is rare and extreme. JCP&L did not consider combinations of smaller steps that could reduce or eliminate the load loss. They also dismissed some options out of hand without evaluating them.
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> [RAGE-1 at 23.]

Palermo's primary focus for an alternative to the MCRP was on non-transmission line solutions. Palermo explained that voltage collapse events occur very quickly in most cases but the measure of exactly how quickly can limit the range of preventive

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[39] I undertook a simple calculation of the number of hours at each of Berger's distinct hourly rates, then divided by 17 to derive the hours and cost per corridor:

113 hrs./17 = 6.65 hrs. at $130 = $864
40 hrs./17 = 2.35 hrs. at $ 70 = $165
64 hrs./17 = 3.76 hrs. at $ 95 = $358
40 hrs./17 = 2.35 hrs. at $ 48 = $113
15.11 $1500

Over 60% of both time and money expended was at the senior or project manager level. [RAGE-42 at 4, 8, 12, 16.] Further, Sparhawk could identify very little of that time as field work. [7T62:7-64:24.]

options that might be available. In the transmission world, there is a large difference between a millisecond and ten to thirty (10-30) seconds. Because the studies that might have confirmed that analysis in Red Bank were not conducted, Palermo analyzed an alternative that would boost voltage within thousands of a second.

Palermo stated that potential options that the Company could have considered include an SVC and a STATCOM. They are widely used in PJM's region, and around the US and the world. It appears that JCP&L has an SVC installed in the 230 kV Atlantic Substation. These are used in combination with shunt capacitors and shunt reactors to control voltage, the former having more relevance here. It is not uncommon for capacitors to be turned on, for example, at the beginning of the peak summer season. These types of banked capacitors can be regulated manually, remotely, or on timers, but standing alone, are not intended or designed to operate in the fractions of a second required to be effective in a very rapid voltage collapse situation.

Both SVCs and STATCOMs are designed to operate very rapidly by providing variable amounts of both shunt capacitive and reactive support. They use power electronics to rapidly control shunt capacitors and reactors, thereby controlling low or high voltages. They can provide fast-acting reactive power on electric transmission systems by regulating voltage, power factor, harmonics, and stabilizing the system, as Palermo illustrated in several figures. The primary difference between SVCs and STATCOMs is that the latter are based on more modern technology, with faster response, more flexible configurations, and a smaller physical footprint. SVCs are still preferred in the industry for voltages above 230 kV, and are less expensive, but as stated, take up more space. Palermo opined, to a reasonable degree of engineering certainty, that either an SVC or STATCOM would eliminate the voltage collapse from occurring in Red Bank even in the event of the P7 contingency. At a minimum, these devices will delay the voltage collapse so that other devices have time to react. Depending on the thermal capability of the 34.5 kV system, some of the reconfiguration methods that are effective in ten to thirty (10-30) seconds may also be supplemental and/or necessary, such as use of an SPS.

As described by Palermo, an SPS would activate various circuit breakers and switches in Monmouth County that would prevent or limit the extent of the voltage collapse in milliseconds. It might involve some loss of load, but should limit it to less than the 300MW threshold used by PJM and JCP&L. The actions would shift some of the load connected to Red Bank to other supply sources. The specifics would require a detailed powerflow study and a dynamic study by PJM or JCP&L, to which Palermo did not have access, to identify the efficacy of different reconfiguration options. The results would be highly dependent on the configuration of the existing 34.5 kV network in the area. As presently configured and without an SPS, the current network of 34.5 kV/12.5 kV substations actually works against reliability in the face of an extreme contingency, according to Palermo.

Installation of an SPS would allow the system to quickly reconfigure to remove overloads and minimize the extent of the outage, as was discussed above regarding networked sub-transmission systems.[40] The SPS would signal selected 34.5 kV breakers or switches to separate the 34.5 kV loops fed from Red Bank from the 34.5 kV lines connected to the Aberdeen, Atlantic and Oceanview Substations. This would immediately limit the outage to less than about 400 MW — the peak load served by the 230 kV circuits into Red Bank. Palermo further opined, within a reasonable degree of engineering certainty, that that the system likely could be designed to limit the outage to less than 300 MW by keeping some of the Red Bank load connected to Aberdeen, Atlantic and Oceanview. An SPS that limited the lost load to less than 300 MW would not violate NERC or PJM planning criteria. Thus, Palermo was of the opinion, within a reasonable degree of engineering certainty, that the SPS would, possibly in combination with a STATCOM, prevent the voltage collapse. In such a case, a STATCOM would either prevent the voltage collapse or delay the voltage collapse long enough for an SPS to disconnect the Red Bank load in the 34.5 kV network from that served from the other 230 kV substations in Monmouth County.

[40] Palermo noted that that JCP&L assumed there would be no protective actions within the 34.5 kV network connected to Red Bank and that most of the 34.5 kV networked system would be lost. Protective devices at the Aberdeen, Atlantic, and Oceanview Substations would limit the extent of the outage.

Palermo noted that even with a P7 contingency, the JCP&L network circuits would not overload if the STATCOMs were in place at a time other than during summer peak load. Overloading becomes a risk only when network load is at or near its peak, and peak loading conditions only occur about 500 hours per year. There are 8,760 hours in a year (24 multiplied by 365 in non-leap years), so the potential thermal overloading of circuits would only be an issue 5.7% of the time each year, and only if the P7 contingency actually occurred then, which has not occurred in the forty-three (43) years since the common tower was installed. Palermo argues that the highly unlikely nature of this scenario supports looking for a load-shedding and/or virtual network reconfiguration strategy he outlined.

Palermo concluded his direct testimony by stating that a P7 violation does show up between Atlantic and Red Bank in 2019 under the conditions studied and the assumptions used by PJM and JCP&L. He also stated that it is unclear if the criteria will still be violated in 2019 with the declining actual loads in the Red Bank area, which would change those tested assumptions. Palermo also concluded that JCP&L spent little or no time evaluating the non-transmission alternatives or how the existing 34.5 kV protection system would perform. Rather, JCP&L appears to have just assumed the extent of the networked 34.5 kV load that would be lost would only be arrested by circuit breakers at Aberdeen, Atlantic and Oceanview.

Palermo also presented oral sur-rebuttal testimony at the hearing in response to the rebuttal testimony of Hozempa. Subsequent to his own pre-filed testimony, Palermo did undertake a powerflow study of his conceptual alternatives to resolving the P7 violation.[41] First, he verified the data set referred to as the 2016 summer assessment case provided by the Company. Specifically, Palermo relied upon the studies used in the confidential 2016 Summer Assessment case provided by JCP&L in response to JMG-JCPL-24, Attachment JMG-JCPL-24-G. In other words, Palermo utilized the same assumptions from 2016 that PJM and JCP&L did in their powerflow studies, notwithstanding that the summer peak load contained therein has been questioned. He

[41] At the hearing on April 12, 2017, objections to Palermo's newly undertaken powerflow study were considered. Rather than reject the testimony, I adjusted certain rulings and deadlines in order to provide the Company a cure for the lateness of this new but relevant information. [8T75:8-99:22.]

reviewed the base case (non-contingency) solution, the voltage report for specific buses, and the related circuit elements with percent loading. Palermo explained that if the contingency case comes close to the same voltage ratings, then it represents a case that is not a violation. Under his direction, the powerflow study undertaken also replicated the P7 non-convergence; i.e., likely voltage collapse. Thus, Palermo understood that they were running the powerflow correctly by being able to duplicate both the base and the P7 contingency cases. [8T105:6-23.]

Having verified the two case studies run by JCP&L, Palermo then ran the powerflow analysis for his alternative solutions outlined in his initial testimony. The specific contingency was simulated as described by JCP&L. In executing the powerflow model, transformer taps and switched capacitor banks were "locked." These devices are used to help control system voltages; however, they usually take several seconds to several minutes to operate. Locking transformer taps and switched capacitors is standard practice in evaluating possible voltage-collapse conditions using powerflow models. [8T110:4-112:5.] Unlike in the base case, the alternative solution case with two 50 MVar STATCOMS converged in ten iterations, indicating no voltage collapse. He found, as in the base case, that there are no voltages above 110% or below 90% of normal. There are six buses with voltages above 105%, but they are the same six found in the base case. The voltages are either the same as those in the base case or within ±0.02% of the base case—a very small change. In addition, there was no loss of load. Therefore, the three of the four NERC criteria are met with Palermo's alternative plugged into the model. [8T113:16-114:12.]

Next, Palermo focused on the eleven (11) circuits that were found to be thermally overloaded during his alternative powerflow study that must be addressed if the STATCOM solution is to satisfy the violation criteria.[42] Palermo evaluated how to rectify those eleven (11) circuits with three potential solutions: (1) shed approximately 80 MW of customer load to avoid the circuit overloads; (2) reconfiguration of the 34.5 kW system; or (3) upgrade the overloaded circuits to increase their thermal capacities.

[42] Palermo presented his oral sur-rebuttal in generic terms first and then proceeded in a closed session to discuss details that are CEII confidential. Those details will not be summarized herein. [8T130:9-148:14.]

Palermo estimated that the three possible solutions would cost $0 million, $1-2 million, or $5-10 million respectively. [8T115:4-117:25.]

Palermo could provisionally discuss the upgrading of the circuits, even with the limitations of what information he had at his disposal. He determined that, in most cases, installing larger conductors on the existing poles should be enough. There are other pieces of ancillary equipment such as disconnect switches, wave traps, and various measuring equipment that might also need to be upgraded. The costs for these devices, is much less than the likely conductor costs. There are three circuits that are very heavily loaded—more than 135% of their ratings. These may require some new construction on the 34.5 kV network. The other eight overloaded circuits can probably be mitigated by conductor upgrades since they are loaded to less than about 120%.

Palermo also estimated the costs of his alternative solutions to include $10 million for each of the two required STATCOMS, and approximately $10 million for the necessary 34.5 kV upgrades — about $2 million for reconductoring and about $8 million for new 34.5 kV construction. Together with the cost of the STATCOMS, Palermo concluded that this alternative would cost about $25-30 million, or one-quarter of the currently estimated costs of the MCRP. [8T118:17-120:18.] Palermo stated that he had a high degree of confidence in the way the powerflow studies were undertaken that are consistent with standard practice in such studies and, therefore, he had a high degree of confidence in these results. [8T150:23-152:2.]

Palermo was cross-examined with respect to his pre-filed testimony, and his sur-rebuttal testimony and powerflow analyses after JCP&L had the opportunity to obtain some additional information and discovery, as noted above. He agreed that if and when PJM identifies a P7 violation that a system has to be set up to prevent a voltage collapse from occurring. [9T61:12-25.] He also agreed that at least one of the main points of ensuring reliability on the transmission facilities over 100kV, also known as the BES, is to ensure that the distribution systems do not experience outages which in turn impact the customers. [9T62:21-64:24.] Palermo was questioned on the number of customers that might be interrupted if shedding customer load was used as a means of avoiding the full P7 blackout, a scenario that he himself characterized as the least

desirable solution but which involved must lower load losses under his alternative than the Company's analysis. [9T71:2-73:14.] Such load shedding would be manually configured if a P7 event was occurring. Nevertheless, he also repeated that the P7 event not only has to occur but it has to occur during a summer peak load period, which constitutes only a very small percentage of the hours in a year. [9T74:2-75:25.]

Palermo was questioned on whether the Company operators could react quickly enough to a P7 event, assuming (not in evidence) that the reaction time had to be within seconds and not minutes. In that event, Palermo explained that the Company would need to install an SPS in advance of the outage. As with his earlier testimony, an SPS would only need to be armed if the load reached or approached a peak level. Palermo himself assumed that JCP&L must already have a process for shedding load. [9T77:4-78:18.] He was also questioned on his alternative reconfiguration solution to the overloaded 34.5 kV circuits, which he characterized as a reasonable solution in light of the likelihood of a P7 event. [9T84:3-85:13.] His idea is to break portions of the 34.5 kV system into a radial rather than a network one, but he agreed that sturdiness may be the trade-off in such a change. [9T86:3-87:19.] Palermo stated that a radial distribution system is flexible because it can still have options that allow the operation of switches and devices as necessary when conditions arise. [9T88:2-89:10.]

With respect to his third alternative solution to the 34.5 kV system overload that still occurs in conjunction with his STATCOM proposal, Palermo was questioned on installing larger conductors on the existing poles. He responded that he did not have all the information necessary to evaluate the type and size of those larger conductors. Palermo was certain that pole height would not be an issue as the voltage would still be 34.5 kV. [9T92:10-23.] He also rejected the suggested notion that there would be anything more than a nominal impact from these upgraded conductors on the other Monmouth County distribution facilities. [9T94:21-96:6.] Palermo stepped back his rebuttal testimony to the extent that therein he suggested some new circuit construction for the three circuits that are overloaded the greatest would be needed. Instead, he testified on cross-examination of his sur-rebuttal report that those would most likely only need larger conductors. [9T96:18-97:9.]

On further cross-examination by JCP&L, Palermo was taken through the specifics of space and price considerations for his two STATCOMs. His comparative use of information from a Dominion Power utility project in Virginia was conceded to be an estimate. Nevertheless, while land acquisition costs would be higher in New Jersey, the Dominion STATCOMS were connected to 230 kV facilities whereas Red Bank would be connecting to 34.5 kV system. Palermo acknowledged that there were more details that would need to be evaluated for this proposal to be implemented. [9T103:2-104:11.]

JMG also conducted cross-examination of Palermo concerning the impact that lower peak loads would have on the P7 violation. Palermo reiterated that there does come a point at which there would be no voltage collapse even if the P7 event occurred, if the peak load gets low enough. Again, if the P7 event occurs on off-peak times, there is also no voltage collapse because there would be no overloaded circuits or the other elements of a NERC violation; i.e., the circuits would have capacity to accommodate the event because they are not strained to the max (peak). [9T125:1-13.] Palermo also stated that STATCOMs are about the size of a transport container or a mobile home. [9T128:15-20.] He detailed some of the electrical and communication equipment that would be essential to deployment of a STATCOM. At the Dominion Power site where 500 MVars of STATCOMs were installed, Palermo testified that the cost was $95 million. JCP&L would only need 100 MVars – two 50-MVar STATCOMS – but as smaller is not proportionally cheaper, Palermo estimated $20 million for both of the units. The site at the Red Bank substation looked to be able to accommodate the STATCOMs with the acquisition of additional adjacent parcels. [9T136:2-137:25.] It appears that one 100-MVar STATCOM might be feasible and easier to locate but the system connections are then less flexible. [9T139:6-141:1.]

Palermo provided further qualifications on his potential solutions to the thermal overload NERC criteria that also needs to be addressed to achieve a resolution of the P7 violation. He agreed that the load loss could be more than 70 MW but cannot be manually shed under NERC regulations. Load could be automatically shed and would still, in his estimation, be under the 300 MW loss limit; however, shedding load is still a last resort option. Moreover, automatic shedding would be accomplished through an

SPS, which is Palermo's preferred answer anyway. He was of the opinion that an SPS would cost several, but less than, ten million dollars. [9T145:6-147:11.]

With respect to the risk of a P7 event occurring, Palermo explained the information provided on the PJM public website with respect to loads for every hour of every day. He reviewed this data for 2013-2016, and discerned that there are only a small percentage of days in the summer months when for some number of hours, the system exceeded 4800 MW. Palermo further detailed that at 4800 MW, which is about 69% of the peak load used in the 2016 summer peak load powerflow analysis, none of the circuits would be overloaded.[43] At that load level, if the P7 event occurred, you might need the STATCOMS but none of the circuits would be overloaded, including the worst one that was loaded to 144.6% in the powerflow study. [9T184:13-186:4.] Historically, Palermo calculated that the worst historical case would equate to two (2%) percent of the time being high enough that the P7 event would create an overload on the system, or a 1-in-45 chance. [9T186:15-187:19.] Nevertheless, Palermo made it clear that JCP&L has an obligation to mitigate the P7 violation without regard to its likelihood. Rather, it was his opinion that the degree of risk should inform the extent and appropriateness of any proposed solution. [9T188:7-22.]

Palermo further stated that the lines associated with the eleven overloaded circuits would not need to be reconstructed if JCP&L upgraded the conductors to the new standard on the eight, presumably older, circuits, and upgraded to larger conductors for the worst three circuits. [9T198:25-201:18.]

Rate Counsel also presented testimony through Lanzalotta on the issue of whether JCP&L had adequately considered transmission alternatives to the MCRP. These alternatives included:

(i) extending a 230 kV tap off the Atlantic-Raritan River 230 kV line;

[43] Palermo also calculated that at 6,000 MW, none of the subject circuits would be overloaded beyond the 125% seasonal rating. He concluded, therefore, that no cascading analysis was required. Again, he also calculated the historical hours when the JCP&L load would exceed the 4,800 MW and 6,000 MW limits, and accordingly, the risk of the P7 event occurring at a point when the circuits would become overloaded. [9T194:12-197:17; RAGE-57.]

(ii) constructing a third 230 kV line from Atlantic;

(iii) extending a 230 kV line from Oceanview substation; or

(iv) tapping the Freneau-NJT Aberdeen 230 kV line.

The alternatives were evaluated based on their ability to address immediate and future reliability needs in the Red Bank area and surrounding areas. Each of these alternatives would remedy the NERC violation that is driving the need for the Project, i.e., the voltage collapse. So, these alternatives were judged, in part, by how well they addressed reliability needs other than this NERC violation. Lanzalotta understood that the Potential Corridor Study considered that these alternatives will be exposed to potential faults. This "shortcoming" is shared to some extent by all the overhead alternatives, including the Project. Another reliability shortcoming attributed by the Company to all of these alternatives is that they do not provide a second supply line to some substations that currently have only a radial supply. The Project is credited with providing a second supply line to the NJT Aberdeen and NJT Red Bank Substations. The alternative of building a third 230 kV transmission line from Atlantic Substation to Red Bank was rejected because it added a transmission line to an existing transmission ROW, thereby increasing exposure of the electric system to events affecting the Atlantic to Red Bank ROW.

The Company did not develop cost estimates for these alternatives, so Lanzalotta found it difficult to say how much the Company would spend for the additional benefits the Company attributes to the Project. Since the terms and conditions under which NJT may grant the Company access to its ROW are as yet unknown, the development of information about these alternatives would be needed to compare these alternatives based on cost. In addition, Lanzalotta commented on the possible and considerable height differentials between the HVTL alternatives. He noted that the Company did not perform any detailed design analysis on the transmission alternatives, so it has not been possible to compare tower heights for each of the transmission alternatives with those proposed for the Project. If any of the transmission alternatives have monopole heights more in line with typical HVTLs in New Jersey that are not run over catenary rail lines, this would represent a big decrease in tower

heights, along with potential cost savings and reduced visual impacts that a significantly shorter transmission line could reflect.

Lanzalotta also presented testimony on the issue of non-transmission alternatives, which the Company had failed to even consider. While it may be apparent that a new transmission line into Red Bank would address the violation, it is not apparent that a new transmission line would be required in order to do so, or that a new transmission line is the only reasonable alternative. Lanzalotta stated that a voltage collapse of the type involved in this case is typically driven by a shortage of reactive power. Reactive power is a component of electric power that is required to supply inductive loads, such as air conditioning compressors, elevator drives, and industrial motors. The outage of the two 230 kV transmission lines from Atlantic to Red Bank would cause an outage of the 230 kV to 34.5 kV transformers at Red Bank. These transformers feed into the 34.5 kV network in Monmouth County. Frequently, devices such as capacitors are used to provide additional voltage support in times of need, but, switching capacitors takes more time than is typically available in order to prevent a voltage collapse.

As did Palermo, Lanzalotta discussed approaches, other than building a new transmission line, to help control system voltage and to provide a very fast response to system voltage changes caused by faults or other causes. He provided, too, a description of the SVC. [Exh. PJL-3.] This equipment monitors and supports electric system voltage through reactive power management. An SVC is the preferred tool for dynamic reactive power support in high voltage transmission grids. Lanzalotta explained that due to its inherent capability for high-speed, cycle-by-cycle control of vars, it will counteract the often hazardous voltage depressions that follow in conjunction with faults on the grid.

Lanzalotta noted that the Company stated that distributed generation or smart inverters are market-driven responses which cannot be used by PJM as a solution to NERC violations. He was of the opinion that the Board should require an evaluation by the Company as to the ability of these and other technologies to enable the system to survive the NERC violation voltage collapse driving the Project. If these developing

technologies have the potential to help efficiently alleviate the NERC violation, then the Board can make an informed decision as the value of considering ways to integrate them into the Company's planning and operations in order to overcome or bypass the bureaucratic hurdles to their use in transmission system planning and/or operations.

At the conclusion of his pre-filed direct testimony, Lanzalotta recommend that the Board defer its review of the Project pending: (i) more detailed consideration of technologies regarding voltage management, such as an SVC or STACOM, and other developing technologies; (ii) development of more detail regarding alternative routes, their costs, and their impacts, such as tower heights; (iii) re-evaluation of load growth such that the load level at which the voltage problems have been observed in planning studies is forecast to occur within the planning horizon; and (iv) determination of whether NJT will allow use of its ROW and, if so, the terms and conditions under which the Company will be permitted to use the NJT ROW. There was no additional cross-examination on these points that requires summarization here.

On cross-examination of Hozempa on the portion of his testimony I have included in this section, he conceded that if JCP&L were to upgrade just the three worst of the overloaded circuits, the cascading analysis would stop. JCP&L might need to replace those substandard circuits in any event. [10T93:24-96:3.] An important part of the issue of the cost of reinforcing the eleven 34.5 kV circuits is whether they were otherwise due for reinforcement anyway.

> Palermo had the STATCOMs in there, you modeled the STATCOMs in there, you saw the overloads that he had in there. And then on Pages 10 through 14 you discuss the 3 possibilities that Mr. Palermo discussed about how to mitigate the line overloads. Correct?
>
> A (Hozempa) That is correct.
>
> Q So, Mr. Palermo's STATCOM recommendation here solves [the] voltage collapse itself. Correct?
>
> A (Hozempa) That is correct.

> Q It just leaves the issue of the three lines that are loaded above to 125 percent. Correct?
>
> A (Hozempa) That is correct.
>
> [10T98:17-99:21.]

With respect to the suggestion of using an SPS as a temporary and immediate stopgap in the event of a P7 event, Hozempa maintained that the capacity and operation of this particular 34.5 kV system would not allow its use. [10T110:20-112:23.]

With continued cross-examination of Sims on this last day of the hearings, it was asserted that the Palermo STATCOMS would prevent the voltage collapse but leave the issue of the thermal overloads on three circuits. PJM does not allow those to be cured through any load shedding. [10T130:4-131:10.] The loss of less than 300 MW may not be a criteria violation but it still is not an acceptable solution approach. In other words, if the loss of two lines on a common tower – the P7 event – does not result in the loss of more than 300 MW of load but does cause a voltage drop and voltage magnitude violations, then those system performance issues must still be resolved without shedding load as a strategy. [10T136:5-137:25.] Cross-examination of Hozempa's rejoinder testimony concluded with his statement that reconductoring alone cannot solve the problem, in disagreement with Palermo's conclusion to the contrary. [10T208:3-24.]

Electromagnetic Field (EMF)

Kyle G. King is President of K&R Consulting, an electric power engineering company he founded in 2004. Prior to starting that firm, he was the Director of the Electric Power Research Institute (EPRI), High Voltage Research and Test Center in Lenox, Massachusetts. During his tenure at EPRI, he was the Project Manager for many EPRI programs including Transmission Line EMF Management. He also co-authored EPRI's EMF series of handbooks. King has testified on behalf of PSE&G and JCP&L in six HVTL matters before the BPU, and on one occasion for a Connecticut utility. King has been a Licensed Professional Engineer in New York since 1993.

King presented testimony on behalf of the Company on his electrical engineering analysis of the existing lower voltage NJT railroad power and the existing JCP&L distribution lines, and then the effects of the proposed MCRP 230 kV transmission line. [KGK-2] King's analysis included the effects of electric fields, magnetic fields, audible noise, and radio noise associated with the Project. Each of these parameters was compared to the NJT ROW edges' levels along the fourteen unique line segments.

In general, King explained that electric fields are a vector quantity with both a magnitude and a direction. The direction corresponds to the direction that a positive charge would move in the field. Sources of electric fields are electrical charges. Transmission lines, distribution lines, house wiring, and appliances generate electric fields in their vicinity because of electrical charge (voltage) on energized conductors. Electric fields are typically described in units of volts-per-meter (V/m) or kilovolts-per-meter (kV/m). On the power system in North America, the voltage and charge on the energized conductors are cyclic (plus to minus to plus) at a rate of sixty (60) times per second. This changing voltage results in electric fields near sources that are also time-varying at a frequency of sixty (60-Hz) hertz.

King stated that the concentrated electric field at the surface of transmission line conductors may cause a phenomenon called corona. Corona results from the electrical breakdown or ionization of air in very strong electric fields at the surface of the conductor, and can be a source of audible noise, radio noise, and ultraviolet light. King was of the opinion that the conductor design selected for the proposed transmission lines are of sufficient diameter and spacing to limit the localized electrical stress on the air at the conductor surface and minimize corona related effects. Similar to electric fields, magnetic fields are a vector quantity characterized by both magnitude and direction. Electrical charges in motion (electrical currents) generate magnetic fields. In the case of transmission lines, distribution lines, house wiring, and appliances, the 60-Hz electric current flowing in the conductors generates a time-varying, 60-Hz magnetic field near these conductors. The strength of a magnetic field is measured in terms of magnetic lines of force per unit area, or magnetic flux density. The term "magnetic field," as used here, is synonymous with magnetic flux density and is expressed in units of milligauss (mG).

Magnetic fields are created by any device which produces, carries, or uses electrical energy. The National Institute of Environmental Health Sciences (NIEHS) has estimated the average level of background magnetic fields range from 0.5 to 5.0 mG in most homes. The NJDEP also lists typical magnetic field levels measured six inches away from common appliances. The NJDEP list, according to King, includes:

Hair dryer – 300 mG
Electric shaver - 100 mG
Blender - 70 mG
Can opener - 600 mG
Coffee maker - 7 mG
Microwave oven - 200 mG
Color TV (1 foot away) - 7 mG

New Jersey has no specific magnetic field limit for power lines. King stated, by way of comparison, that the typical levels of magnetic field in New York City Metro-North Commuter Railroad cars range from 40 to 60 mG, and increase to 90 to 145 mG during acceleration.

King represented that JCP&L has employed a policy of “prudent avoidance” on this Project through its use of existing electrified railroad ROW for the greatest length of the Project. Prudent avoidance is a precautionary principle or common sense strategy in risk management based upon a 1989 Carnegie Mellon proposal, under which reasonable efforts to minimize potential risks should be taken when the actual magnitude of the risks is unknown. He noted that public utility commissions in California, Colorado, Connecticut and Hawaii have adopted the prudent avoidance principle, as well as several international health organizations, including, but not limited to, the NIEHS and World Health Organization (WHO).

As part of his prepared testimony, King modeled the existing and proposed line configurations in order to estimate the expected levels of electric and magnetic fields of the MCRP during its first full year in operation. Utilizing a EPRI transmission line

software program, King calculated that the MCRP will meet all New Jersey regulations and guidelines for electric fields[44] and audible noise.[45] For his study of the impacts of the MCRP with respect to EMFs, King completed electric and magnetic field measurements at six locations along the edges of the existing HVTL ROWs in May 2015. He noted that the existing NJT corridor proposed for co-usage with the MCRP contains the NJT 25 kV (60 Hz) railroad traction power circuits, NJT 6.9 kV (100 Hz) railroad signal power lines, and various 34.5 kV, 12 kV, and 4.8 kV JCP&L distribution lines. His study then modeled three magnetic field cases: (1) no NJT train present; (2) NJT train accelerating on the northern track; and (3) NJT train accelerating on the southern track.

King's study calculated that EMFs measured along the edge of the NJT ROW will range from 2.4 to 154.7 mG when the MCRP is in service. The highest levels of magnetic field are located where low voltage distribution circuits are attached to the proposed transmission pole. The lower voltage circuits typically carry much higher currents than the transmission line and produce higher magnetic field levels. King then utilized Hozempa's data on the maximum conductor rating of the MCRP in order to describe the upper expected limit for magnetic field levels. The calculated edge of ROW magnetic field levels corresponding to the maximum possible current are between 39.1 mG and 163.5 mG. [KGK-2.]

Nevertheless, King testified that the conclusions reached by national and international scientific and health agencies from their evaluation of EMF research, and the guidelines for exposure they have recommended, make clear that exposures to EMF that people encounter in their daily life, including those from transmission lines like the Project, do not pose any recognized long-term health risks.

[44] King references in his testimony, as he has for prior public utility testimony, a 1981 NJDEP guideline of 3 kV/m for electric fields at the edge of a ROW. NJDEP, Final Report of the New Jersey Comparative Risk Project (March 2003), at 125. http://www.state.nj.us/dep/dsr/njcrp/elf-emf.pdf The actual guidance document could not be located by the undersigned.

[45] King cites to 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. His study indicates that the MCRP will emit a noise level of approximately 36.9 dBA.

During his rebuttal testimony, King responded to certain areas of the testimonies of intervenor witnesses David Carpenter and Donald Moliver. King reiterated that the Project's future magnetic field levels along the proposed ROW are similar to the existing lower voltage railroad power and distribution line field levels. He also stated that the existing and future magnetic field levels along the Project ROW are also similar to other recently approved transmission line projects in New Jersey. Existing low voltage power distribution lines and the electrified train corridor both produce magnetic field levels above 4 mG, with no trains present. The measured magnetic field levels along the edge of the Project's ROW will range from approximately 30 to 80 mG from the existing NJT North Jersey Coast rail line. Magnetic field levels of this magnitude are common near electrical appliances in everyday environments. King repeated that there is no state, national or international regulations or guidelines that limit EMFs from HVTL to the level advocated by Dr. Carpenter. In rebuttal to assumptions made by Dr. Moliver in his real estate appraisal report, King referenced his own report where the properly calculated values of magnetic field for the Project are presented. [Exh. JC-12/KGK-2, Tables 2 through 4, Figures 17 through 62.]

JCP&L presented the testimony of another individual on the issue of the impact of EMFs on the MCRP. William H. Bailey, Ph.D., is a Principal Scientist in the Center for Occupational and Environmental Health Risk Assessment in the Health Sciences practice of Exponent, an international scientific and engineering firm. Since 1986, he has been a visiting scientist at the Weill-Cornell University Medical College. During his long career, Dr. Bailey has lectured at Rutgers University, the City University of New York (Queens College), the University of Texas (San Antonio), and the Harvard School of Public Health in the field of bioelectromagnetics. Formerly, he was the Head of the Laboratory of Neuropharmacology and Environmental Toxicology at the New York State Institute for Basic Research in Staten Island, New York, and an Assistant Professor and National Institutes of Health postdoctoral fellow in Neurochemistry at The Rockefeller University in New York City. He holds the following degrees: Ph.D., Neuropsychology, City University of New York, 1975; M.B.A., University of Chicago, 1969; and B.A., Dartmouth College, 1966. In addition, Dr. Bailey completed a two-year post-doctoral fellowship in neurochemistry at The Rockefeller University under a grant from the National Institutes of Health.

Dr. Bailey has forty (40) years of training and experience in laboratory and epidemiologic research, health risk assessment, and comprehensive exposure analysis. Dr. Bailey has investigated exposures to alternating-current and EMFs, and has conducted research on potential health effects of EMFs. He stated that he has served as a consultant to numerous state, federal, and international agencies on transmission line health and safety issues. He has also published or presented more than 100 scientific papers and technical reports on this and related subjects. Dr. Bailey is currently involved in research on EMF exposure guidelines. As with several others, Dr. Bailey presented testimony on behalf of JCP&L previously on the Montville-Whippany 230 kV Project.

Here, Dr. Bailey presented his evaluation of the MCRP with respect to the levels of EMF associated with the operation of the power lines on the proposed route between the NJT Aberdeen Substation and the NJT Red Bank Substation before and after the addition of a new 230-kV transmission line. He also provided information about the current status of health-related research on EMF. Dr. Bailey reviewed the Petition, the proposed route segments, and the testimony of other witnesses for JCP&L. As summarized by him and others, the MCRP new 230-kV transmission line is to be constructed adjacent to the NJT rail corridor that already contains a 25-kV NJT line, 34.5-kV lines, lower voltage NJT signal lines, and JCP&L distribution lines.

Dr. Bailey concurred with King that the electric fields are low at the edge of the ROW and will be even lower once one gets past the buffer of shrubbery, trees, fences, buildings, etc. Dr. Bailey went on to state that the existing lines and especially the NJT track circuits (in most sections) are the major sources of magnetic fields both before and after the project. He opined that in certain of the line segments, the MCRP's increase in the magnetic field at the edges of the ROW above the magnetic field from the existing lines will be present but small—less than 10 mG. [Exh. KGK-2, Table 2.] Those variations would be due to specific types of lines on the ROW and their proximity to the ROW edges. When sections of the NJT track adjacent to the existing lines and proposed lines are energized intermittently due to trains running on tracks adjacent to

the electric lines, the magnetic field increases. Outside the ROW, the magnetic fields on all line segments diminish as distance increases from the ROW.

Guidelines for exposure of the public and workers to EMF have been recommended by the International Committee on Non-Ionizing Radiation Protection (ICNIRP) and other agencies. ICNIRP's exposure guidelines are published in Health Physics, the Journal of the Health Physics Society, of which Dr. Bailey is an Editor. The International Committee on Electromagnetic Safety, sponsored by the IEEE, also recommends consensus standards for the safe use of electromagnetic energy in the range of 0 Hz to 300 Gigahertz, which includes power frequency 60-Hz fields. In the latest guidelines published in December 2010, ICNIRP increased the screening value for magnetic fields at 60 Hz from 833 mG to 2,000 mG. Dr. Bailey stated that the addition of the MCRP to the NJT ROW will meet the guidelines set by these organizations for both the calculated electric fields and magnetic fields, even directly under the conductors. This is also the case when magnetic fields along the Project route are elevated by currents on lines when NJT trains are operating.

Dr. Bailey further explained that the MCRP lines are highly unlikely to cause any interference with implanted cardiac devices, such as pacemakers. He cited to a search conducted in April 2016 of the Manufacturer and User Facility Device Experience database,[46] maintained by the United States Food and Drug Administration, which has not identified any episodes of electromagnetic interference with implanted cardiac devices due to EMF from AC power lines. He was confident that the exposure levels will be safe even for workers directly under the HVTL, and thus certainly safe for residents further away in their homes, yards, or schools.

In addition, Dr. Bailey cited to numerous agencies with responsibility for public health that have performed weight-of-evidence reviews of EMF research to buttress his opinion that the MCRP will not expose the residents of these five towns to unacceptable levels of EMFs. According to Dr. Bailey, the scientific consensus is that the evidence is insufficient to conclude that EMF is a cause of any long-term health effect. As a group,

[46] https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfmaude/search.cfm

epidemiology studies have reported statistical associations between higher, average exposure levels to magnetic fields (greater than 3-4 mG) and childhood leukemia, although potential biases and other factors cannot be ruled out as the explanation. Other epidemiology studies do not provide strong evidence suggesting that EMF is the cause of cancer or other long-term adverse health effects. The research has not been able to confirm any mechanism to explain how magnetic fields could cause cancer or any other adverse health effect. In his testimony, Dr. Bailey quoted from a WHO report, which he considered to be the most comprehensive to date:

> Consistent epidemiological evidence suggests that chronic low-intensity ELF magnetic field exposure is associated with an increased risk of childhood leukaemia. However, the evidence for a causal relationship is limited, therefore exposure limits based upon epidemiological evidence are not recommended, but some precautionary measures are warranted. . . . Even when allowing for the legitimate desire of society to err on the side of safety, it is likely that it will be difficult to justify more than very low-cost measures to reduce exposure to ELF fields.
>
> ["Environmental Health Criteria 238: Extremely Low Frequency (ELF) Fields." Geneva, Switzerland: World Health Organization, 2007a., at 355-56, 366]

Dr. Bailey updated those conclusions with the 2014 WHO statement[47] that the current evidence does not confirm the existence of any health-related consequences from exposure to low levels of EMFs. He also reported that other weight-of-evidence reviews do not support a causal link between EMFs and adverse health effects.

King and Dr. Bailey were cross-examined as a panel. Dr. Bailey elaborated on the projects of the WHO in the area of the spectrum of electromagnetic fields, starting with review of literature in the 1980s and 1990s. [3T89:4-8.] WHO reviewed the 2002 IARC Report, in which Dr. Bailey participated, on the possible carcinogenic effects of EMFs on humans and continued in 2007 to update the data assessment in its own

[47] World Health Organization (WHO). "What Are Electromagnetic Fields? Summary of Health Effects." Geneva, Switzerland: World Health Organization, 2014. Available at http://www.who.int/peh-emf/about/WhatisEMF/en/

report. He tried to clarify the different periods of WHO's work covering a wider range of frequencies than just HVTLs. He also stated that he did not disagree with the primary research studies referenced in the reports in this record, but rather disagreed with the way in which those reports were reviewed and analyzed. [3T94:3-13.] Dr. Bailey was of the opinion that Dr. Carpenter had not provided a complete and balanced perspective of the larger literature in the field. [3T95:23-97:2.] Dr. Bailey did express his agreement with the 2002 IARC conclusion based on the criteria applied.

In response to additional cross-examination, Dr. Bailey was queried as to the age and extent of certain biographical representations he made in his resume. Specifically, any association with New York State Institute for Basic Research or the Rockefeller University was noted to be over forty years ago. Furthermore, Dr. Bailey was not an appointed lecturer at three of the universities cited but only gave one-to-two day lectures at those locations without university compensation. With respect to the Cornell University Medical College, the only academic association since 1991, Dr. Bailey referred to himself as a Visiting Fellow but was acting rather in the capacity of a consultant to the Department of Pharmacology to which he had donated neurochemistry equipment. [3T108:2-109:23.]

Dr. Bailey's employment for the last sixteen (16) years has been at Exponent, consulting to utilities and government. During such time, Dr. Bailey confirmed that he has never provided testimony that EMFs were an unacceptable risk for the activity the client was proposing. The same holds true for the period when he was the head of his own consulting firm from 1991 to 2000. He articulated again that the weight of the evidence and scientific literature did not support there being a health risk from the exposures that were associated with cases involving transmission lines. [3T125:1-25.] Dr. Bailey also restated that even studies that have found an association or link between EMFs and leukemia, dementia or other diseases are not demonstrating a causal relationship. [3T132:16-133:7.] He considered it speculative to suggest that future scientific studies might one day find such a causal connection, and that science does not engage in speculation or the degree of acceptability of any risk. [3T135:10-136:15.] Yet, Dr. Bailey admitted that such exposure "could cause cancer" and agreed

with the IARC's conclusions that "EMF fields are possibly carcinogenic to humans."[48] [3T99:17-24.]

In response to my own questioning about low-cost precautionary options recommended by WHO, Dr. Bailey indicated that siting lines away from areas of high population density is an example of such an option. [3T141:1-25.] King supplemented that response by stating that the co-location of the MCRP along the electrified NJT ROW could limit the overall public exposure, notwithstanding that there is no phase cancellation between those two very different sources of EMFs. [3T144:21-145:23.] Moreover, King asserted that EMF exposure from the MCRP will be a very small component of a household's total exposure. He suggested that persons who are concerned could mitigate EMF exposure a little by relocating furniture or appliances within their houses. [3T146:20-147:21.] King was further questioned on aspects of his resume which indicated his work in the energy industry has largely been on behalf of or funded by the electric power industry. His consulting firm also works primarily for that industry and large industrial clients. [3T150:7-25.]

David O. Carpenter is a public health physician and Director of the Institute for Health and the Environment at the State University of New York at Albany. He is also a Professor in the Department of Environmental Health Sciences within the School of Public Health. He has held these positions since 1998. The Institute has been designated as a Collaborating Centre of the WHO. Dr. Carpenter received his Bachelors' Degree in 1959 from Harvard University; and his Medical Degree in 1964 from Harvard Medical School. Dr. Carpenter served as a commissioned officer with the United States Public Health Service and then became Chairman of the Neurobiology Department at the Armed Forces Radiobiology Research Institute, a tri-service agency.

In 1980, and based in part upon his work on Love Canal and Three Mile Island population exposures to toxins, Dr. Carpenter was installed as the Director of the

[48] Studies show an increased risk between 3.23 and 4.74 times the average risk for cancer development depending on the proximity of living within 300 meters of a high-voltage power line, with the higher risk falling on those who lived in proximity to these lines within the first five (5) years of life. [RAGE Exh. 2 at 11.]

Wadsworth Center for Laboratories and Research of the New York State Department of Health, the third largest public health laboratory in the US. After five years in that position, Dr. Carpenter became the founding Dean responsible for all aspects of public health for the School of Public Health, a partnership between the Department of Health and the University at Albany. As Dean, Dr. Carpenter was given administrative responsibility for the New York State Power Lines Project, a five-million dollar study of the health effects of power line-frequency, also known as extra-low frequency electromagnetic fields (ELF-EMFs). After completion of the New York State Power Lines Project, he became the spokesperson for New York State on the issue of the human health effects of EMFs.

In his capacity for New York, Dr. Carpenter has served on several state and national committees on EMF issues, co-edited two books on EMFs, and served as the co-editor of the BioInitiative Report.[49] He has also testified before Congress (1990s, 2009) and the President's Cancer Panel (2010) on the health effects of exposure to EMFs and cancer. Dr. Carpenter has published a comprehensive review of the literature pertaining to EMF exposures in the peer-reviewed journal, "Reviews on Environmental Health," (2008), and second review in the same journal (2013), as well as reviews more focused on RF-EMF in 2014 and 2015, which summarize the current state of national and international research regarding electromagnetic field exposures and to recommend prudent public health policy.

Dr. Carpenter stated that it was his professional opinion, within a significant degree of medical and scientific certainty, as a public health physician, medical researcher, and educator specializing in the study of ionizing and non-ionizing radiation effects on biological systems, that there is strong scientific evidence that exposure to magnetic fields from power lines with an intensity greater than 4 mG is associated with an elevated risk of childhood leukemia. There is also strong scientific evidence that

[49] Dr. Carpenter set forth that the BioInitiative is a web-based encyclopedic review of the evidence that EMFs, such as those associated with power lines (ELF-EMFs), EMFs used for communication (radio, television, cell phones, etc.), as well as radiofrequency (RF), can have serious health impacts and that the scientific evidence should inform public health policy. It has published two reports in 2007 and 2012, on both of which Dr. Carpenter participated as part of the team of twenty-nine authors from ten countries, ten holding medical degrees (MDs), twenty-one PhDs, and three MsC, MAs or MPHs. www.bioinitiative.org.

lifetime exposure to magnetic fields over 2 mG is associated with an increased risk of neurodegenerative diseases in adults, particularly Alzheimer's disease. While there is a debate as to which mechanisms are responsible, there is a large body of evidence of ways in which magnetic fields affect tissue at a cellular level, which may be the basis for the development of cancer and neurodegenerative disease. In 2002, the IARC declared power line EMFs, which they refer to as extra-low frequency (ELF) EMFs, a Group 2B - possible human carcinogen.

In response to the Company's presentation, Dr. Carpenter criticized Dr. Bailey for placing too much emphasis on standards set by national and international bodies that are dominated by physicists and engineers who totally discount the strong evidence that comes from health studies documenting that exposure to ELF-EMF in excess of 4 mG results in human disease. In Dr. Carpenter's opinion, the standards set by these national and international bodies, including the Federal Communications Commission, are inadequate and fail to protect the health of the public. He disagreed with Dr. Bailey's characterization of a 10 mG increase at the edge of the ROW as "small." The 2007 WHO report, while questioning the experimental evidence of mechanism or causation, stated that the epidemiological data "show an association between ELF magnetic field exposure and an increased risk of childhood leukemia." Two other meta-analyses found a statistically significant elevated risk of childhood leukemia from exposure to magnetic fields. In epidemiology, a dose-dependent relationship is usually considered the gold standard in determining whether an association reflects a causal relationship. If an effect becomes more pronounced as the dose increases -- whether the dose is milligrams of a chemical or milligauss of a magnetic field – causation is much more likely. Several recent studies add to the conclusion that the relationship between magnetic field exposure and leukemia is strong by demonstrating this type of dose dependence.[50] The trend of increased risk based on closeness to the power line was statistically significant. Young childhood or fetal exposure has also been shown to

[50] Dr. Carpenter cited to Draper et al. (2005) that studied rates of leukemia in children in relation to proximity of their homes to high-voltage power lines. Therein, the investigators found a dose-dependent relationship with the relative risk being a sixty-nine (69%) percent increase for children living within 200 meters of a high voltage power line and the relative risk being twenty-three (23%) percent increase for children living from 200 to 600 meters from the line, as compared to those living more than 600 meters from the line.

increase the risk factor.

Citing a 2007 WHO Environmental Health Criteria ELF Monograph (#238), Dr. Carpenter stated that the number of cases of childhood leukemia worldwide that might be attributable to exposure can be estimated to range from 0.2% to 4.9% of the total annual incidence of leukemia cases. It should be noted that exposure to other household sources of magnetic fields also elevate the risk of childhood leukemia. Children will be exposed to magnetic fields from household wiring, proximity to electric appliances and exposures at school and play sites. The level of evidence definitively proving an association between exposure to magnetic fields and adult cancer is somewhat less consistent than the relation with childhood leukemia, but is strong nonetheless.

In reply to Dr. Bailey's testimony, Dr. Carpenter stated that there is no good animal model for scientific studies for childhood leukemia itself, as most animals get lymphomas, not leukemia. He noted that pet dogs living in homes characterized by high or very high wire codes, as compared with those in homes with low wire codes or buried power lines (surrogate measures of magnetic field strength), have increased rates of lymphoma at a level that is statistically significant, and that there is strong evidence of an association between EMF exposure and Alzheimer's disease at approximately two or three times the incidence in a control population. He also disagreed that the lack of a known causation mechanism between EMF exposure and the risk of leukemia is fatal to the implications for public health of the scientific research, as it is neither surprising nor significant. As with many environmental agents, it is often wrong to assume that only one mechanism of action exists, particularly where more than one disease is involved. It is more likely that multiple mechanisms of action would contribute to disease.

Dr. Carpenter accepted the post-Project edge of ROW magnetic field levels calculated by King of the maximum possible current as between 39.1 and 163.5 mG. In disagreement with Dr. Bailey, he would find these to be "outrageously" elevated magnetic fields that are certainly going to increase the risk of individuals living along the MCRP for cancer, Alzheimer's and other diseases. As a public health professional, he subscribes to the "precautionary principle" as enunciated by the United Nations Rio

Declaration, which is to take steps to prevent exposure and disease even when not all questions are answered as to the mechanism whereby an exposure causes disease. That precautionary principle suggests that high voltage lines be located as far from homes, schools and child care facilities as possible. In areas where avoidance is not possible, mitigation of EMF by placing lines underground and placing lines where phase cancellation can reduce magnetic fields may also reduce human health impacts. Magnetic fields are vectors that have a direction around a wire carrying current. When two wires carrying the same current in opposite directions are placed close together the magnetic fields cancel each other.

During his rebuttal testimony, Dr. Bailey reviewed the testimony of Dr. Carpenter and found his opinions to be extreme and not based on a careful and objective weighing of the scientific evidence. Dr. Bailey identified the elements that he considers forms a proper assessment of the literature, including consideration of all the available evidence and the evaluation of its quality. Among the small number of studies Dr. Carpenter has selected to support his argument, Dr. Bailey would have them found to be out-of-date, not representative of the other research studies on the topic, scientifically weak, and not replicated by other investigators. Dr. Bailey opined that Dr. Carpenter gave short shrift to experimental animal studies. He referenced the fact that public health authorities do not agree with Dr. Carpenter's conclusions regarding causation and have recommended no or only limited measures to minimize magnetic fields. Dr. Bailey considers the MCRP to be consistent with the recommendations of the WHO and the NIEHS in this regard.

Dr. Bailey also argued that Dr. Carpenter's testimony contains a number of errors that render his conclusions scientifically invalid. Moreover, Dr. Carpenter's conclusions are inconsistent with those of major reviews conducted by multidisciplinary expert panels on behalf of several well-respected national and international health and scientific agencies. The principal limitations of his testimony include, among others: a lack of understanding of the project-related exposures; the absence of clearly articulated methods for selecting and presenting studies; selective references to studies that he assumes support his conclusion, without considering earlier or more recent

studies; and the selective reporting from, and misreading of, scientific studies. Dr. Bailey went into further detail on each of these points of contention in greater detail.

Further, Dr. Bailey noted that King's chart shows that calculated magnetic field levels from the MCRP and other lines post-construction in 2019 are marginally higher than the existing lines at the northern edge of the ROW. There were two sections on the southern edge with slightly higher or lower EMF levels. The operation of the NJT rail line produces higher magnetic fields than from existing or proposed power lines at all northern and southern edges of the ROW. Whenever an electric train going in either direction enters the track circuit near the Project route, which King noted occurs according to the regular schedule[51] about sixty-eight (68) times per day during the week and about forty (40) times per day on weekends, the magnetic fields are increased. The magnetic field levels from the Project will be lower than the magnetic fields levels created by the trains when operating near the Project's route.

The generally accepted method for health risk evaluation (i.e., the evaluation of the scientific literature for evidence, for or against, a potential causal association between an environmental exposure and health outcomes), is the weight-of-evidence approach. This is a standard scientific method and is employed by regulatory, scientific, and health agencies worldwide. Dr. Bailey criticized Dr. Carpenter for not utilizing the weight-of-evidence approach, and would find that he "cherry-picks" the studies to get to his pre-conceived conclusions. Dr. Bailey considers the studies relied upon by Dr. Carpenter to be out-of-date and not peer-reviewed. The BioInitiative Report concludes that current exposure guidelines are inadequate and calls for up to a several thousand-fold reduction in ELF-EMF exposure limits. The BioInitiative report was completed in 2007 and then updated in 2012, and according to Dr. Bailey, were not peer-reviewed. The BioInitiative report did not employ the weight-of-evidence approach, and mostly, and selectively, references studies that suggest some biological or health effects without consideration given to the quality of the study. Dr. Bailey also questions the lack of a thorough review of in vivo laboratory animal studies of carcinogenicity.

[51] http://www.njtransit.com/pdf/rail/R0080.pdf I would note, as did some early testimony in the hearings, that the HVTL will be present all the time, while the train is operated infrequently, not at night, and passes by in matter of seconds. Plainly, nights and weekends are when more people will be in their homes.

In his rebuttal testimony, Dr. Bailey also emphasized the lack of causation evidence for how EMFs could impact health, notwithstanding some support for statistical association between EMFs and childhood leukemia. That is to say, Dr. Bailey stated that there are no generally accepted biophysical mechanism that could explain carcinogenic or other adverse health effects. Furthermore, an up-to-date summary of more recent studies that was published ten years after the last review cited by Dr. Carpenter do not clearly support his opinion that there is even a statistical association.[52] Thus, Dr. Bailey concludes that the scientifically superior results do not support Dr. Carpenter's claim that strong evidence supports extrapolations of his opinions to projections of actual excess cases of childhood leukemia due to magnetic fields.

Similarly, Dr. Bailey remarked that the epidemiologic evidence does not provide support for an association for any type of adult blood cancer and for breast cancer. The conclusion of the international agencies is that the overall evidence suggests that there is no association. Dr. Bailey critiqued a review cited by Dr. Carpenter that reported statistically significant associations for both female and male breast cancer. However, Dr. Bailey testified that the author concluded that the limitations inherent in the individual studies included in the summary analyses preclude any firm conclusion about causality. In addition, that review found any associational evidence to be premature as it could not be differentiated between real and artificial association. Similar results were reported by a Chinese study (Chen et al. 2013) that included twenty-three (23) case-control studies published between 1991 and 2007 in their meta-analysis and reported a small and barely statistically significant association between breast cancer and ELF magnetic-field exposure. Another recent epidemiologist (Feychting 2013) also reached the conclusion, based upon a review of twenty-nine (29) epidemiologic studies published between 1991 and 2013 of female breast cancer, including studies of

[52] For example, Dr. Bailey summarized: Bunch et al. (2014) updated and extended the study conducted by Draper et al. (2005). The update extended the study period by 13 years, included Scotland in addition to England and Wales, and included 132-kV lines in addition to 275-kV and 400-kV transmission lines. Bunch et al. is the largest study to date and it included over 53,000 childhood cancer cases, diagnosed between 1962 and 2008, and over 66,000 healthy children as controls. Overall, the authors reported no association with residential proximity to power lines with any of the voltage categories. In the overall analysis of the updated data, the statistical association that was reported in the earlier 2005 study was no longer apparent, according to Dr. Bailey.

residential and occupational exposure to magnetic fields, that there is increasing evidence-based confidence that ELFs do not cause breast cancer.[53] Further, Dr. Bailey stated that studies more recent than those reviewed by Dr. Carpenter also disputed any statistically significant association between EMFs and Alzheimer's, Parkinson, ALS or other neurodegenerative diseases.

In sum, Dr. Bailey faults Dr. Carpenter's reliance on a precautionary principle, routed in part in Principle 15 of the Rio Declaration,[54] which reads "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." It is expected that precautionary recommendations will be proportional to the perceived level of risk and that this perception is founded largely on the weight of the available scientific evidence, not minority or personal opinions, according to Dr. Bailey. The European Council and the WHO have supported its application with respect to EMFs only to the extent that very low-cost measures might be introduced in design and construction. The NIEHS has advised against aggressive regulatory concern as not warranted, emphasizing public education on reducing exposures to all kinds of ELF-EMFs.

Prior to his cross-examination, Dr. Carpenter was permitted some oral sur-rebuttal to Dr. Bailey's rebuttal testimony on the former's opinion that utility-funded studies on EMFs were not unbiased and objective, and therefore, not due the same weight as those funded by government or independent foundations. He maintained that there are genuine conflicts of interest that do disqualify a scientific report from being seriously considered. [7T70:5-12.] Dr. Carpenter also reacted to the criticism of Dr. Bailey that he gave too little consideration to experimental animal studies. He commented that there is research that supports his position that animal studies are not

[53] In his rebuttal testimony, Dr. Bailey supports his opinion herein additionally with Elliott et al. (2013), who compared the exposures of 29,202 women with breast cancer (and smaller numbers of adults with leukemia and brain cancer) to over 79,000 control women based on distance from residences to high-voltage transmission lines and calculated magnetic fields at the residences of both cases and controls. No differences in exposure between the cases and the controls (i.e., associations) based on distance or magnetic field calculations and breast cancer (or leukemia and brain cancer) were reported. [JC-13 Rebuttal at 41.]

[54] http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm

appropriate for the study of effects of EMFs on humans. For one reason, rats do not get leukemia but only suffer from lymphomas. [7T71:3-15.] In addition, Dr. Carpenter stated that the association of EMFs with childhood leukemia have been scientifically confirmed, notwithstanding that the scientific community may not have discerned how it happens. For these reasons, Dr. Carpenter opined that the recommendations of WHO and its Working Group, which downplay the need for protections for humans from EMF exposure, should not be heeded. [7T73:25-76:5.][55]

Dr. Carpenter was cross-examined by the Company with respect to his list of the recent epidemiological studies on the potential health effects of EMFs on humans, as well as his previously referenced meta-analyses that contained a comprehensive review of the data prior to 2000. He conceded that the NIEHS is a government-funded agency, but did not agree that the WHO is independent of utility industry funding. [7T92:5-94:19.] In reviewing his resume, Dr. Carpenter acknowledged that he has not done personal research, epidemiological studies, or laboratory work on EMFs. [7T97:6-98:12.]

Dr. Carpenter was also questioned on prior testimony he has provided in regulatory proceedings. In a 2009 Pennsylvania proceeding in which Pennsylvania Power and Light sought approval to construct a 500kV HVTL project called the Susquehanna/Roseland, Dr. Carpenter presented expert testimony on behalf of an intervenor to the same conclusion as he asserted herein. [7T109:8-113:4.] The Company attempted to use the findings of the Administrative Law Judge with respect to the non-persuasiveness of Dr. Carpenter's opinions on EMF to impeach his testimony herein. [7T122:22-123:12.] The cross-examination continued to the same effect from a Puget Sound Energy proceeding in 2012 wherein that court excluded the expert testimony of Dr. Carpenter under the gatekeeper role articulated in Frye.[56] [7T129:16-130:6.]

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[55] Dr. Carpenter also reiterated that the BioInitiative Report, criticized by Dr. Bailey, was the product of over thirty authors from seven countries who have done the most research in the field and were collectively frustrated by the lack of protection for human health evidenced by the WHO and other organizations. He also noted that sections have been peer-reviewed and published independently. [7T79:17-81:5.]

[56] Counsel for RAGE objected to this line of cross-examination on the grounds that it is not appropriate impeachment material but an argument to be included in a brief. I reserved on the objection at the

Dr. Carpenter was also queried with respect to the IARC declaration of various substances as possible human carcinogens; in this instance, Group 2B. In that grouping, IARC places EMFs but also processed meat and generic hot beverages. Dr. Carpenter stated that one of the main reasons for that categorization with respect to EMFs was the IARC's reliance on the lack of animal evidence. [7T131:11-134:24.]

As a non-engineer, Dr. Carpenter agreed that he had accepted the accuracy of King's calculation of the EMFs corresponding to the maximum possible current at the edge of the ROW. [7T137:4-16; KGK-2, Table 2.] He was asked to review the 2014 existing levels on that edge and the projected readings at the same locations for the post-MCRP future. Similar questions were asked in reference to the existing EMFs at the edge of the ROW while the track circuit is energized. [7T142:15-144:7.] Dr. Carpenter acknowledged that the existing EMF levels currently exceed 2 mG, in some cases by a substantial amount. [KGK-2, Tables 3-4.] He maintained that the precautionary principles cited by all groups in the field should give pause to installing the Project so close to residences. [7T152:13-19.] Yet, people have chosen to live in the area of the existing NJT in spite of its own level of EMFs along the ROW. [7T156:4-157:1.]

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hearing so that the record would be complete if I determined to leave this in. I now rule that the legal decisions issued in other jurisdictions are not proper factual impeachment of an expert witness because the extrinsic materials used by counsel for the Company with its cross-examination of Dr. Carpenter do not address his potential bias, untrustworthiness, or prior inconsistent testimony. N.J.R.E. 607-608. Credibility must be distinguished from persuasiveness or weight of an expert's opinion. Even in the context of legal argument, the regulatory decisions in Pennsylvania and Washington are at best persuasive and not binding authority in New Jersey. Accordingly, I summarize the cross-examination above but will not consider same in my Findings of Fact or Conclusions of Law.

Real Estate Impacts

Jerome J. McHale is the principal of J. McHale & Associates, Inc., a real estate appraisal and consulting firm. McHale is certified as a general appraiser and licensed as a real estate sales agent in New Jersey, and he is also MAI certified. He obtained a B.A. in Economics and Business Administration from Fort Lewis College. McHale has been providing real estate appraisals and consulting services since 1986. McHale has previously presented pre-filed testimony on behalf of JCP&L in its Oceanview 230 kV and Montville-Whippany 230 kV transmission project petitions, and prepared a real estate property analysis on behalf of Atlantic City Electric on a land use application it filed under N.J.S.A. 40:55D-19. In addition to his pre-filed testimony, McHale sponsored a Real Estate Appraisal Analysis for the Project, dated July 29, 2016 with a valuation date of March 2, 2016. [JJM-1.]

McHale's testimony contained his analysis of the market value impact of the MCRP on properties located bilaterally within 150' of the proposed transmission line. He subdivided the properties into three tiers: Tier I – properties that will be required to produce sufficient ROW for the Project to be completed; Tier II – properties outside the ROW that may need vegetation management or clearing; and Tier III – properties that will require JCP&L to acquire easement rights for its Priority Tree ROW. McHale concluded that there would be negligible impact on the sale and resale values of property abutting the MCRP subsequent to its completion because any such diminution in value has already been accounted for due to the presence of an active commuter rail line.

On cross-examination by Rate Counsel, McHale stated his belief that the real estate market – buyers and sellers - became aware of the hazards of EMFs in the 1970s after the Swedish study was published.[57] The real estate studies he cited in his direct testimony came after the 1970s so McHale considers them as taking the concerns about EMFs into account. He did not seem to take note of the 2002 study

[57] Again, I note that Dr. Moliver was presented as an expert in real estate appraisal, and his testimony referencing EMFs was derivative of Dr. Carpenter. He was not in a position to question the viability or strength on any EMF testimony in this matter. In this regard, the same can be said of the direct testimony of McHale.

contained in Dr. Bailey's testimony, to whom he deferred, as a date when public awareness would have grown. McHale remarked about buyers and sellers in the real estate market: "They're very much – in 2017 the market is very – is concerned about EMFs." [4T59:6-61:15; 64:8-66:13.] He could not differentiate, however, between the level of public concern in the 1970s and at the present time. [4T72:2-7.]

McHale was also queried about the potential that real estate brokers in Monmouth County might have to make a disclosure about the MCRP to prospective purchasers of the type used to disclose Superfund sites or nearby landfills. He stated that such a disclosure does not encourage a buyer but there are many other factors that go into a home purchase decision, including size, lot, bedrooms, and proximity to rail travel.[58] [4T83:3-22.] All those factors being equal, McHale conceded that such a disclosure notice would have the effect of discouraging a buyer. [4T86:9-18.] Further, the prudent real estate broker might need such a disclosure to protect themselves from litigation. [4T89:8-19.]

On continued cross-examination by RAGE, McHale confirmed that none of the ten studies he cited in his testimony nor that he could find anywhere else have reviewed the impact on real estate values of either a HVTL in a railroad ROW or the right of a railway to clear entirely its ROW. [4T94:4-22.] Further, McHale agreed that the North Jersey Coast Line operates only approximately once per hour in each direction, with the exception of the short rush-hour periods during weekdays when residences abutting the ROW would themselves be occupied. Nevertheless, all other things being equal, the house that abuts the ROW will on average sell for about five (5%) percent less than one across the street. When asked to identify a source for his contention about the negative effect of a rail line on property values, McHale could not identify any. [4T106:8-111:2.] He pointed to his own testimony and experience, but not any studies, in support of his opinion that residences that abut railways experience a slightly lower appraised value. [4T110:14-111:2.] He maintained his position that the MCRP will have no additional impact on values.

[58] McHale later differentiated between the presence of a commuter rail station, which he characterized as positive, and the railroad line, which he did not so characterize. [4T96:11-19.]

McHale's testimony with respect to the ten (10) studies upon which he premised his pre-filed report was also tested on cross-examination.[59] He referred to them as the ones that are most often cited in appraisal literature with respect to HVTL. [4T111:17-112:13.] He has reviewed many other articles and research over the course of his career. Nevertheless, while he touted a 2015 report by Chalmers, he did not include it in his testimony. In fact, McHale apparently copied the summaries of studies contained in that 2015 report in drafting his testimony, but did not cite it or provide it, except in response to a discovery request. [JJM-2 Rebuttal, Attached CD; 4T120:8-121:25.]

McHale conceded that he did not actually read the studies on the impact of HVTLs on residential real estate values that he referenced, could not confirm how many of them were peer reviewed, or that the summaries he relied upon were accurate. He has seen the ten cited studies referenced in other studies or literature so he accepted their accuracy. In fact, some of these studies are not published any longer or available. McHale could not refute the suggestion that other authors of studies that cite one or more of the commonly cited studies have also never read the underlying ones. [4T128:3-130:5.] Moreover, he has never been asked to peer review a draft article in professional publications and was not familiar with the entire peer review process. [4T13814-140:4.] Lastly, on the issue of the cited studies, McHale admitted on continued cross-examination that he utilized a general search engine that returned results for the terms "effect of HVTL at 15 ft" and followed a link to a New Hampshire Siting Commission webpage, copied the summaries, and deleted the attribution footer. [4T150:2153:12; Exh. RAGE-34.]

McHale was also questioned on one of the studies contained in the Appendix which he relied upon but which he did not include in his own report. Therein, the authors of that study found that properties adjacent to the easement and facing a HVTL structure experience an average decrease in value of 9.6%. [4T162:6-25; Exh. RAGE-

[59] McHale explained that it was his sole decision to limit the scope of his testimony to ten reports and no more. He repeated that those ten are the most well-known even though he continued to expound on how well-respected (and current) the Chalmers (2015) was from which he copied the summaries but to which he did not cite.

34.] On the subject of FHA "fall zones" for such mortgage approvals, McHale agreed that its regulations would measure a monopole fall zone as equivalent to its height. He remarked, however, that the houses on certain blocks he identified at the hearing as near the MCRP average $400,000, above the FHA threshold. [4T204:5-25.] McHale was shown other images taken from the 2017 *.kmz file (Exh. RAGE-25) and asked whether it was his opinion that a house that abuts the NJT ROW with trees presently screening it would see a diminution in property value after the MCRP is completed. He responded that the Project could have a negative one to six (1%-6%) percent effect on real estate but that the NJT ROW would offset that effect, resulting in no long-term negative impact. [4T181:6-21.]

Donald M. Dr. Moliver is Dean of the Leon Hess School of Business and Pozycki Professor of Real Estate at Monmouth University. He has been a member of the faculty for thirty-eight (38) years. Dr. Moliver earned a Master's Degree and a PhD. in Economics from Virginia Polytechnic Institute. He is a licensed real estate sales agent, a Certified Tax Assessor, and a Certified General Real Estate Appraiser. Dr. Moliver is a Member of the Appraisal Institute and holds an MAI designation. He is also the founder of the Kislak Real Estate Institute, New Jersey's sole provider of executive and academic credit-bearing real estate education. He has testified before numerous New Jersey County Tax Boards, Superior Court, and Tax Court and has been qualified as an expert in the area of economics and real property valuation. Additionally, Dr. Moliver has prepared numerous valuation reports as a private consultant. He has not previously prepared testimony for a proceeding before the BPU.

Dr. Moliver reviewed, to the extent available, the ten articles relied upon by McHale in preparation of his report. He noted, however, that four of the ten articles are not published and not available in the public domain. Dr. Moliver commented that it would have been difficult for them to have been reviewed by McHale. Dr. Moliver also commented on the one article that was part of the New Hampshire study, which McHale omitted. This article, authored by Francois Des Rosiers in 2002, concluded that transmission lines proximate to residential properties have resulted in a negative 9.6% decline in value in the studied area of those properties.

Dr. Moliver reviewed additional articles relating to property values and proximity to HVTL, landscaping, buffering, noise abatement, stigma, and view. A review of that literature on the impact of transmission lines to mostly residential properties generally found that the range of impact is between zero (0%) and negative ten (-10%) percent.[60] The range is attributable to differences in the size, design, and magnitude of the project, as well as voltage and current capacities. Some studies were conducted in rural areas, and lot sizes and depths also varied. The perceived quality of home and neighborhood were also factors. Generally, Dr. Moliver noted that the width of the studied ROWs was either not disclosed or were very wide, ranging up to 750' in width for multiple rights of way. Generally, the literature notes that factors including perceived health risks associated with electromagnetic fields and impaired views caused by power lines reduce the value of affected properties. Dr. Moliver stated that there does appear to be an adverse value impact of up to 10% associated with the impact of locating transmission lines adjacent to residential properties.

Dr. Moliver also described several factors that differentiate the Project from those studies he reviewed. He was not aware of any study of any kind that examined a situation in which all of the adverse factors were present, in addition to the combination of an HVTL and railway ROW. Dr. Moliver noted the following additional aggravating factors associated with the MCRP, which he suggests that the MCRP will have an even greater negative impact on valuations.

First, the size of the ROW is uncharacteristically narrow which places nearby properties very close to the transmission line itself. Extensive tree clearing and vegetation removal will be required by JCP&L for safety reasons. As a result, transmission lines and these very tall monopoles will be visible to many homeowners and other properties. The extent of the tree and vegetation removal from the private properties is unknown at this time but it seems clear that unwelcome noise associated with the train and transmission lines will increase and be largely unabated until vegetation levels return to current levels, if they can.

[60] Dr. Moliver cited to Bottenmiller et al., 2013; Cowger et al., 1996; Jackson, 2010; Seiler, 2014.

Second, because of narrowness of ROW, any EMFs would extend further into private and public properties adjacent to the HVTL. Relying on the information in the record on the distances of the MCRP in each segment from adjacent properties, it can be concluded that the magnetic field of 4 mG or higher will extend in many instances to over two hundred (200') feet onto private property engulfing homes, recreational fields, and centers of employment. Third, Dr. Moliver incorporates Dr. Carpenter's opinion that EMFs above 4 mG is a public health concern.

Fourth, Dr. Moliver explained that New Jersey is classified as a full-disclosure state. Accordingly, any detrimental conditions particular to a property must be fully disclosed by a real estate broker/sales person to a potential buyer. Under full disclosure, realtors are subject to treble damages plus legal fees if they do not disclose information about possible environmental conditions relating to the property in question.

Dr. Moliver also commented on the concern and market impact that potential buyers seeking FHA financing, a common means of securing a mortgage in order to purchase a home, may be disqualified by the MCRP. According to FHA regulations, the relevant portions of which are placed in the addenda of his report, "No dwelling or related property improvement may be located within the engineering (designed) fall distance of any pole, tower or support structure of a high-voltage transmission line, radio/TV transmission tower, microwave relay dish or tower or satellite dish (radio, TV cable, etc.)."[61]

In sum, Dr. Moliver argued that sheer logic should prevail as the Project will have much higher poles, imposing visual externalities, loss of vegetation (increasing visual impairment, increased noise pollution and loss of quiet enjoyment), extraordinarily narrow right of ways that abut private properties, and JCPL's own witness who calculated that the effects of EMFs will extend onto private properties. It was the professional opinion of Dr. Moliver that the proposed Project would introduce considerable visible changes to the properties along its 9.7 miles where substantial monopoles and transmission lines would be constructed. Additionally, he took into

[61] https://portal.hud.gov/hudportal/documents/huddoc?id=41502c2HSGH.pdf

consideration the opinion of Dr. Carpenter that significant level of EMF's could cause childhood cancer. Dr. Moliver concluded that the MCRP will adversely impact property values, especially single-family homes, that are adjacent to or proximate to the proposed monopoles and transmission lines.

Lastly, Dr. Moliver commented on McHale's opinion that the North Jersey Coast Line generated stigma has already impacted private properties and, by extension, the construction of the proposed MCRP would not impose any newly-caused adverse impact upon nearby property values. Dr. Moliver set forth that the rail line was constructed and operational before most of the properties were developed into residential homes. Purchasers, therefore, had full knowledge about the railroad and any visual impairment and noise issues relating to their property. The fact that these values may have a lower value than similar properties not abutting a rail line is simply because of the mix of incompatible uses. In the meantime, residents have used vegetation to provide a screen, much of which will have to be removed if the Project is built. Dr. Moliver asserted that the Project would generate a new round of external influences that will impact values.

On cross-examination, Dr. Moliver confirmed that he only visually observed three segments of the MCRP – segments 4, 11, and 13, which he said were randomly selected. [8T17:10-23.] An inquiry about the relative weight of the articles referenced by both McHale and Dr. Moliver was held. The 2015 article by Chalmers that reviewed HVTL's impact on real estate markets in New Hampshire and was cited by McHale (JC-11, Exh. JJM-2 at 14-15), concluded that studies have consistently been split with about half showing no impacts and half showing small impacts in the range of one to six (1%-6%) percent. [8T27:17-29:25.] Dr. Moliver qualified his disagreement with those conclusions stating that some of the studies have not taken into account the complex of factors that can have an impact on real estate values, specifically, width of the ROW, height of the towers, and voltage of the line. [8T30:24-31:23.] He stated that one must exercise extreme caution when making broad or generalized statements. On further examination, Dr. Moliver reiterated that one study by Francois Des Rosiers actually measured the adverse impacts to real estate due to the proximity and visual

encumbrances of a HVTL as ranging from negative five to negative twenty-three (-5% to -23%) percent depending on the area studied. [8T43:14-44:8.]

Lastly, by using the Company's maps, Dr. Moliver was able to discern whether schools, parks and other properties, in addition to personal residences, would be within or outside the measure of 4 mG EMFs from the MCRP. He was not injecting any opinion on the health or field dissipation of EMFs, but simply measuring the real property that appears to be encompassed by the distances examined by the WHO. [8T52:8-54:16.]

On rebuttal, McHale emphasized that NJT retains the right to clear vegetation along its ROW, of which the property owners should be imputed to have knowledge, and which makes any new impacts from the MCRP a redundancy with negligible impact on real estate values. McHale also disagreed that any mandatory or voluntary real estate disclosure of the MCRP would be necessary or would be impactful on prospective buyers given the vast number of such disclosures made.

Further, McHale took exception from Dr. Moliver's criticism of the breadth and strength of McHale's researched studies on the impact of HVTLs on real estate values. He maintained that his broader review of studies over the years would support his opinion that about half the studies found some minimal impact and the other half found no evidence of impact. With respect to Dr. Moliver's opinion that the narrowness of the NJT ROW compounds the real estate impacts, McHale stated, without more specifics, that he has observed some electrical ROWs in the range of 100' to 240', with "several" ROWs similar to the MCRP. As to Dr. Moliver's contention that this old NJ Transit ROW was uncharacteristically narrow, McHale refuted such contention by referring to a range of ROW widths for other transmission line projects in New Jersey. McHale set forth that any additional stigma from the MCRP would be temporary and fade with time.

In his rebuttal presentation, McHale also explained that his view that EMFs from the Project would not impact real estate values was an assumption that he had to factor into his analysis in order to complete it. He went on to say, however, that his assumption is borne out by the witnesses at the hearing who did have expertise in this

field. McHale criticized Dr. Moliver for going beyond a stated appraisal assumption on EMFs as presented by the intervenor's counter-witness to finding it himself to be clear and compelling. Similarly, McHale again questioned Dr. Moliver's reliance on real estate disclosures that are so numerous in any transaction as to be discounted of its singular weight. Lastly, McHale asserted as rebuttal against Dr. Moliver his perspective that there are far too many factors present during financial review of a home mortgage application and far too many sources of home mortgages for the MCRP monopole structures to be considered a significant negative one for one type of mortgages, specifically FHA.

Environmental Impacts

Kirsty Cronin presented testimony on behalf of the Company. She is a Principal Environmental Scientist in the Power and Energy Group of Berger. In her position with Berger, which she joined in 2001, Cronin's responsibilities have included identification and review of potential routes for electric transmission lines and parcels for substations, conducting and overseeing environmental studies (i.e., wetland delineations, threatened and endangered species habitat surveys) and obtaining federal, state and local environmental permits and approvals, as needed. For twelve years, Cronin has provided environmental studies and permitting support for large-scale linear projects including transportation and transmission projects. She has provided written pre-filed testimony on behalf of JCP&L previously in the Oceanview and Montville Whippany HVTL matters.

Cronin serves both as the Project Manager for Berger for the MCRP and as a member of the Routing Team. Her testimony was offered on the subjects of the environmental impacts and permitting process of the MCRP. Cronin summarized the permits required for the Project, in addition to the within BPU approval. The proposed timing and further details is contained in her pre-filed testimony. By way of overview --

1. U. S. Army Corps of Engineers federal permits pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, most notably for any potential impacts to the Navesink River.

2. NJDEP Division of Land Use Regulation (DLUR) Freshwater Wetlands and Flood Hazard Area Control Act Permits required for all activities located within regulated areas including freshwater wetlands and associated transition areas, streams, floodplains and riparian zones.

3. NJDEP DLUR Coastal Zone Management Rules Coastal Wetland Permit and Waterfront Development Permit for impacts to coastal resources associated with the construction of the transmission line.

4. NJDEP Division of Water Quality Stormwater Construction Permit Requests for Authorization for Construction Activities. This is required to receive authorization for point source discharges from construction activities that disturb one acre or more of land, or disturb less than one acre but are part of a larger development including clearing, grading, and excavation.

5. New Jersey Turnpike Authority License to Cross Permit required for the crossing of the GSP.

6. Monmouth County Soil Conservation District Certificate of Soil Erosion and Sediment Control certificate is required for all activities associated with soil disturbances greater than 5,000 square feet.

7. New Jersey State Historic Preservation Office Approval. Phase IA cultural resource investigations must be conducted and submitted because the MCRP will encompass known historic or archaeological resources and indicate the presence of buildings, structures, or ruins over fifty (50) years old.

In addition, Cronin stated that the Project will need to coordinate with the NJDEP Green Acres Program, U.S. Fish and Wildlife Service (USFWS), National Oceanic and

Atmospheric Administration's National Marine Fisheries Service (NOAA-NMFS), and the NJDEP Endangered and Non-Game Species Program for potential impacts to the subjects of their respective regulatory jurisdiction.[62]

Cronin also testified that there are both freshwater and tidal wetlands present within the area of the MCRP. Wetlands within the existing NJT ROW were delineated in the latter half of 2013 by Berger. The Project will also cross approximately thirteen (13) stream crossings but she noted that the NJT rail bed already crosses them. The placement of structures within the stream channel is not proposed. As part of the permitting process, JCP&L will apply for and obtain a NJDEP Flood Hazard Area Permit for potential impacts to floodplains and riparian areas. If required by the NJDEP, compensatory mitigation will be provided.

Through the use of the geographic information system (GIS) based NJDEP Landscape Project Mapping interactive web-based application, Berger and/or Cronin identified threatened or endangered species impacted by the MCRP to include black-crowned night heron (*Nycticorax nycticorax*), bald eagle (*Haliaeetus leucocephalus*), yellow-crowned heron (*Nyctanassa violacea*), and least tern (*Sternula antillarum*). According to the USFWS planning tools, the following federally-threatened species have been documented within the vicinity of the MCRP: northern long-eared bat (*Myotis septentrionalis*) and seabeach amaranth (*Amaranthus pumilus*). Cronin confirmed that coordination with the NJDEP Endangered and Non-Game Species Program, USFWS, and the NOAA-NMFS will be required as part of the permitting process.

Cronin also detailed other environmental impacts of the MCRP. She stated that the Project will result in both permanent and temporary impacts to freshwater wetlands, freshwater wetland transition areas, tidal wetlands, and riparian areas. Permanent impacts associated with the Project include the placement of structure foundations within regulated areas and tree clearing. Temporary impacts associated with the Project relate to the construction phase and its concomitant work pads, access roads,

[62] No mention was made by Cronin of any permits or permissions that would be required from the Earle Naval Weapons Station.

and pulling areas.[63] Project-related impacts to regulated areas will be avoided to the extent feasible and practicable. Where impacts cannot be avoided, measures will be implemented to limit impacts. As part of the permitting process, compensatory mitigation will be proposed for mitigating unavoidable Project-related impacts.

Cronin also testified, as did Sparhawk, about the relative environmental impacts of the two potential routes selected for more detailed study. For example, Route B would require approximately 10.5 acres of forest clearing while Route A would require 16.3 acres of forest clearing. For this analysis, Berger assumed that structures for Route A would be placed approximately five (5) feet outside of the highway ROW, notwithstanding that leave might be granted for the HVTL to be installed within that ROW. Thereafter, Cronin enumerated the steps that will be taken during construction to minimize and/or mitigate any environmental impacts.

With respect to the proposed improvements to the Taylor Lane Substation, Cronin noted that that aspect of the MCRP will result in impacts to NJDEP regulated areas including freshwater wetlands and riparian areas. Improvement to the substation will be included in the Soil Erosion and Sediment Control Plan submitted to the Monmouth Soil Conservation District for approval. Compliance with New Jersey Stormwater Management Rules will be required if the expansion of the substation will result in more than a quarter (0.25) acre of new impervious surface and/or one (1) acre of disturbance overall.

Lastly, Cronin presented testimony on the comparative environmental impacts to the publicly suggested alternative of constructing the 230 kV line underground. Impacts associated with undergrounding transmission lines through non-forested wetlands, transition areas, and riparian areas are actually greater than traditional overhead construction. Impacts associated with overhead transmission lines are limited to the footprint of the monopole foundations, while impacts associated with underground transmission lines would occur over the entire length of the Project during

[63] Pulling areas are temporary areas located along the transmission line necessary for the installation of the conductors. Conductor installation requires the placement of specialized equipment at each end of the sections being strung. The wire conductors are pulled between these areas.

construction/placement on the buried concrete duct banks. In addition to the duct banks, an underground HVTL project would also require placement of manholes approximately every 2,500 feet. Two manholes would be placed side by side; each manhole is approximately twenty-eight (28') feet long, eight (8') feet wide, and seven (7') feet tall, and weigh approximately forty (40) tons. The placement of manholes in regulated areas would be a permanent impact and require NJDEP permits.

On cross-examination, Cronin was asked several questions about the Route Selection Study, to which she contributed within her area of environmental impacts. She reiterated that corridors were reviewed first (A, B, C, etc.) and then, for those that were not eliminated, routes were reviewed. Even though Corridors E, F, H, I, J-2, K and O made the first cut within the corridor study, Cronin acknowledged that she had little input until the route selection process began as between Routes A and B, except for a very high level of environmental review. She could not articulate why those corridors were eliminated but believed it was not for environmental reasons. [5T15:7-19:3.]

From her prior experience, Cronin detailed two other JCP&L 230 kV transmission line projects: Larrabee-Ocean and Montville-Whippany with respect to ROW widths. Neither of those HVTLs are on a railway ROW. She recalled that the ROW in the Larrabee-Atlantic section is 200' wide and Atlantic-Oceanview is 100' wide. Montville-Whippany, which is not built yet, Cronin thought had 100' ROW. She was unaware for those projects whether the monopoles would be situated in the middle of the ROW or near the edges. [5T19:22-21:22.]

Cronin has seen the preliminary plan for construction access roads in Krauss' testimony but she has not done any environmental analysis of them at this point. She could not say, for example, if they would cross wetlands. The work pads, where equipment to build the Project will be temporarily placed during construction, have not been designed by the engineers so it is uncertain if they will be in or outside of the ROW. Similarly, Cronin could add no detail to where the pulling areas – spots for the spools of wiring and pulling/mounting equipment -- will be located and whether there are noise or land use impacts from those. [5T22:16-25:13.] All these activities will require DEP permitting but Cronin explained that only permanent impacts, i.e., those lasting

longer than six (6) months, would require mitigation in addition to environmental, soil erosion, and sediment control approvals. [5T28:15-30:15.] In her cross-exam testimony, Cronin provided some more details about what permits will be necessary for the MCRP to cross the Navesink River. That area will be under the jurisdiction of the Army Corps of Engineers and will require a Section 404 approval. At least on the Poricy Park side of these tidal waters, there are wetlands where the monopole structure must be installed.[64] Cronin was not sure if there are wetlands on the Red Bank side of the Navesink. [5T31:18-33:23.] She also clarified that the 10.5 acres of tree clearing that JCP&L had identified in its Petition and discovery answers was only for groups of trees within thirty (30) feet from the conductors.[65] The 10.5 acres did not include individual trees, other vegetation, or priority trees outside the ROW, which will require easements from landowners. [5T52:11-54:8.] Near the end of the cross-examination, Cronin noted that there has not yet been a habitat assessment to delineate whether and where the four threatened or endangered species might be impacted by the Project. [5T75:5-76:16.]

Vegetation Management and Aesthetic Impacts

Mark A. Korn was presented on behalf of JCP&L. He is employed by FirstEnergy Service Company as a Consultant. Korn is responsible for the initial vegetative clearing of new construction facilities, such as transmission lines and substations. He began his utility career as a ROW Technician with Allegheny Energy in 1980 in Pennsylvania. In 2012, after the FirstEnergy/Allegheny merger, Korn transferred to the Transmission Vegetation Management Department of FirstEnergy. His testimony centered on the initial clearing of the ROW and the ongoing vegetation maintenance related to the MCRP.

Korn articulated several steps to the vegetation management for the Project. With respect to the corridor, the area will be cleared to the specified width in accordance

[64] Cronin referred to a wetlands delineation that was undertaken by Berger in 2013 along the proposed MCRP route. [5T57:1-7.]

[65] Cronin stated that Route A used a fifty (50) foot width for tree clearing calculations because there were no preliminary plans for that route, its monopole placements, or centerline so the default was used. [5T51:11-52:10.] By definition, that formula would have over-counted Route A cleared acreage in comparison to Route B.

with the FirstEnergy Initial Clearing of Transmission Lines Specification and the FirstEnergy Detailed Property and Provision List. Next, any tree outside of the ROW with greater than twenty-five (25%) percent of its crown extending into the corridor shall be removed. Trees that are designated as Priority Trees will also be removed. Priority Trees are defined as trees located adjacent to transmission corridors that are dead, dying, diseased, structurally defective, leaning or significantly encroaching, where the transmission facilities are at risk of arcing or failing should the tree or portions of the tree (1) fall into or near the transmission facilities; or (2) grow into or towards the transmission facilities.

Korn also testified to the regular vegetation maintenance that would be in place after completion of the Project. Obviously, the goal of any such maintenance program is to ensure that vegetation does not encroach upon and/or become a hazard to the operation of the HVTL. The safe and efficient operation is supported through the removal and control of all incompatible vegetation that has the potential to interfere with the transmission system. These tasks may be accomplished through the use of herbicides, mechanical mowing, or hand cutting. Tree limbs that threaten to intrude into the ROW from trees growing outside the ROW will be removed, to eliminate the threat of damage to the line conductor or other facilities. Vegetation removal will be accomplished by a wide variety of mechanical trimmers, manual trimming, or an aerial saw, as conditions require. Entire trees, both within and outside of the ROW, will be removed should they exhibit weakness or structural damage and pose a high degree of risk or imminent threat to the transmission line's uninterrupted service. In order to remove trees and vegetation both on and off ROW, JCP&L will first obtain the necessary rights from the applicable property owners, an area of testimony outside the purview of Korn.

In his pre-filed rebuttal testimony, Korn reiterated that it is already known that there must be vegetation clearance throughout the sixty (60') foot wide corridor surrounding the monopoles. This will be forty-five (45') feet on the rail side, and fifteen (15') feet on the opposite side. He concurred with Dr. Moliver that the extent to which priority trees will need to be trimmed or removed is not yet known. Nevertheless, he seemed confident that the vegetative screening that presently exists on private

properties to buffer visual and auditory impacts of the NJT trains will not be entirely eliminated. It will differ, obviously, from parcel to parcel, and, again, is unknown at present. For the same reasons, Korn disagreed with the composite representations prepared by Michael Basch, at the direction of Stephen Lunanouva and Corcoran-Clark for RAGE, with respect to the extent of the vegetation proposed to be removed, as well as the visibility of the monopoles and transmission lines upon completion of the MCRP.

On cross-examination, Korn clarified that the Board, JCP&L, and NERC will have final say on the amount of vegetation that needs to be cleared. With respect to the ROW, the homeowner from whom the property will be acquired does not have a voice in vegetation management. [4T25:20-26:3.] With respect to property that is outside the ROW, JCP&L's professionals or contractors decide which trees are "priority trees" and must be removed to protect the HVTL. Korn stated that a priority right-of-way easement will be obtained from any impacted homeowners before JCP&L makes the determination as to which trees must be trimmed or removed. [4T27:22-28:10.] Various methods of trimming are used by JCP&L, including, but not limited to, aerial saws, but Korn represented that those are not used near residences. [4T31:22-33:17.] Korn further stated that both his division and that of real estate works in conjunction with the property owners to select new buffers, such as fencing or substitute vegetation. [4T43:6-22.]

Korn was also cross-examined on the degree of vegetation removal that will be required for the construction of the MCRP. Korn explained that a sixty (60) foot-wide corridor will be cleared within the NJT ROW on the side of the tracks on which the monopole will be installed for most of the segments. That constitutes the entire width between the tracks and private property along those segments. In segments 2, 6, 8, and 9A, those initial corridors will be one hundred (100) feet wide to the edge of the NJT ROW. [4T46:8-47:2.] Korn could not know how much vegetation will be removed at this preliminary time, but he admitted that all vegetation will be cleared to the outer edge of the ROW.

Michael Basch, proprietor of Virtual Access Tours, LLP (Virtual Access), Jackson, New Jersey, testified on behalf of RAGE on the issue of the aesthetics of the

proposed MCRP. Virtual Access generally provides photography services of all types to the real estate industry. One of its services is to create virtually-staged images, a depiction of a particular property in the light that best presents that property. In many cases, this will involve some "photoshopping" to depict things about a property based on what kinds of changes might be made. In all aspects, he strives to provide an accurate representation of the property.

Basch attempted to visually show the impacts of the tall monopoles and the JCP&L vegetation management protocols on the present environment through virtual artistic rendition of certain prospective locations along the 9.7 mile stretch of the MCRP utilizing computer-aided design (CAD) and rendering tools, including Photoshop™. Members of RAGE selected the locations for Basch's photographs. Information was provided on the anticipated height and dimensions of the utility monopoles that are to be installed by JCP&L if the Project is approved. Basch used existing structures in the photographs to determine the scale of the monopoles, both in height and width, and used a computer program to superimpose on the existing photographs a depiction of the monopoles. Basch testified that the resulting exhibit represents, to a reasonable degree of certainty, the accurate application of that information to the photograph taken.

Stephen Lunanuova, of Red Bank, New Jersey, also presented testimony on behalf of RAGE on this aspect. He is a volunteer officer of that citizen organization and worked with Basch to prepare the virtual depiction of the impact of the Project on the community. Lunanuova, along with others, selected the locations for Basch to photograph with the intent of providing a representative sample of locations (single family homes, schools, businesses, etc.) He also provided relevant information from the Krauss exhibits for the location and size of the proposed monopoles and directed in some instances that some or all nearby vegetation be removed in the depiction.

Lunanuova stated that JCP&L did not provide very detailed information about where the monopoles would be located, or their height. JCP&L also provided little useful information about what vegetation would be cleared except to describe in general terms that areas near the monopoles and wires would need to be permanently cleared, even to the extent of acquiring easements to make that possible. Lunanuova also set

forth that he had no interest in trying to exaggerate the impact of these monopole structures and wires because, in his lay estimation, no exaggeration was needed to appreciate the impact. While some judgement had to be exercised in selecting the information given to Basch, he emphasized that he did not set out to exaggerate the impact.

Presented as a panel together, Basch and Lunanuova were cross-examined in the same manner. Lunanuova was questioned on the directions given to Basch for the preparation of the exhibits they sponsored, which included reliance upon the testimony of Company witness Krauss. [8T169:23-170:12.] Lunanouva and several other volunteers from RAGE decided on the locations at which photographs would be taken. [8T170:17-171:21.] They also provided the rough details as available from the Petition with respect to approximate height, width and locations of the monopoles along the almost ten-mile route of the MCRP. [8T173:11-25.]

Lunanouva could not recall on what basis he or others instructed Basch as to the amount of vegetation to remove in the depicted images. Basch clarified, however, that he received graphics via email highlighted with a marker as to what part of the vegetation needed to be removed. [8T180:17-181:5.] Those emailed graphics and/or instructions were not preserved or presented in response to discovery.[66] Basch was also provided photos of existing monopoles and JCP&L information with specifications. Neither he nor the independent contractors he used to undertake the actual photographic and computer graphics went to existing monopoles for observational or other purposes. [8T183:25-185:23; 192:3-193:1.]

Acquisition Issues

Tracey J. Janis testified on behalf of the Company as the Manager of Right-of-Way Services for FirstEnergy. Her primary responsibility is to provide oversight to her group in the acquisition by fee title or easement of the land rights necessary for

[66] I instructed Basch and members of RAGE who interacted with him to review their records to see if any emails, photographs, images or instructions used during this photographic project could be recovered. [8T191:11-24.] None were produced.

transmission facilities. In her pre-filed direct testimony, Janis described that the MCRP will be constructed almost entirely within the boundary of the NJT's railroad property associated with its North Jersey Coast Line. With the exception of the Navesink River crossing, the remaining portions of the Project which are not constructed within the boundary of NJT railroad property will be constructed on existing JCP&L ROW. From the crossing at the Navesink River southeast to Chestnut Street, there may be a need for additional ROW across approximately fifteen (15) parcels due to the limited NJT railroad property in that segment(s).

Janis described that additional easement rights will be necessary for vegetation management and temporary right-of-entry agreements with private and/or public property owners for access points and possible construction laydown/storage yard areas. The majority of the rights needed, affecting approximately 350 parcels, are limited to vegetation management. Vegetation management predominantly impacts "Priority Trees," defined by JCP&L and discussed in more detail by Korn, as trees that that are dead, dying, diseased, structurally defective, leaning or significantly encroaching where the transmission facilities are at risk of arcing or failing should the tree or portions of the tree (i) fall near or into the transmission facilities or (ii) grow towards or into the transmission facilities.

With respect to the Company's negotiations with NJT to acquire the necessary ROW, Janis stated:

> JCP&L has been working with NJT for several years on this project, primarily through the engineering design phase with NJT Rail Operations. Additionally, in November 2015, JCP&L submitted project information to NJT Real Estate to commence their excessing review. According to NJT, the excessing review "entails review and analysis of relevant technical materials about the project by NJT's operating departments to determine whether the property may be used as requested, and if so, under what conditions." JCP&L received notification in May 2016 that the excessing review was complete and that the formal notice[67], including the conditions for use, is forthcoming. The Excessing Review

[67] There is no evidence in the record that this was ever issued by NJT.

> Process precedes consideration and discussion of the Railroad Property Construction and/or Occupancy Permit.

Janis also set forth that the Company will need to negotiate the private easement rights with the landowners described earlier by offering adequate compensation or compensatory landscaping considerations such as fencing or replacement vegetation. In the event that landowners do not agree to sell those easement rights, the Company will seek to exercise eminent domain rights pursuant to N.J.S.A. 48:3-17.6 and -17.7.

In her sponsored rebuttal testimony, Janis generally asserted that JCP&L should not have to wait for the NJT approvals before petitioning the Board for this waiver approval.[68] She states that obtaining a Railroad Property Permit is complex for this Project and that several departments, including, but not limited to, NJT Real Estate and NJT Rail Operations, must review JCP&L's plans and design for the engineering and construction of the Project. She also asserted that making concurrent applications for several approvals needed for a new project is standard in the industry. Janis claimed that the Board does not need the final cost of the NJT Permit in order to enter its determination, notwithstanding that a cost comparison to alternatives might be partially estimated.

On cross-examination, Janis established that she had only been asked to undertake a high-level analysis of ROW acquisition costs for Routes A and B. She was never requested to review those costs for any routes that were studied prior to the selection of Routes A and B as the Preferred Routes. [3T177:3-179:17.] Janis only became involved with the Project in 2014. She was not sure how long prior to that had JCP&L been in contact with NJT, although when probed, she acknowledged that this hearing and the OPRA discovery had made her aware that contact with NJT went back to at least 2012. [3T182:21-183:15.] Janis agreed that NJT has had the petitioner's engineering plans for several years and yet has not acted upon the request for ROW permits.

[68] Insofar as Janis is not an attorney, any opinion she asserted that the Company has met the legal standard of N.J.S.A. 40:55D-19 and that the NJT approvals are not necessary under that provision for the Board to render a determination are incompetent testimony and will be ignored. [3T163:19-176:7.]

Janis stated that the $450,000 projected cost represented an initial payment to NJT for the Construction and Occupancy permit. She provided no estimate of any future or continuing payments for the annual "rent" from NJT beyond that initial payment. The amount of those annual rents would be the subject of future negotiations. [3T192:2-193:17.] Janis was unaware of any comparable project – 230 kV HVTL with some considerable mileage within a railway ROW -- of JCP&L or FirstEnergy, or anywhere in the country.[69] [3T205:17-206:25.] With respect to the earlier filing for a project similar to the MCRP and along this same NJT ROW, Janis also had no recollection of the payment terms of any easement agreement. [3T198:1-12.]

On continued cross-examination, Janis reiterated her estimate that it would cost $26M to acquire the real estate for the ROW for alternative Route A. [3T209:15-21.] Janis admitted that in any situation in which the utility needs to acquire property from another owner, that owner "has pretty much more the advantage in negotiations." [3T215:4-11.] While JCP&L can overcome a landowner's advantage through the use or threat of eminent domain, she conceded that it does not have any legal right to acquire any property of NJT by eminent domain, which might put the Company in a poor bargaining position. [3T214:21-216:13.] In addition to the dollar amount of any such agreement, NJT and JCP&L will nevertheless be factoring in the value of road and monopole sharing, etc. [3T220:5-18.]

Miscellaneous Community Impacts and Public Opinion of MCRP

Will Irving is a Research Project Manager for Rutgers University in the Edward J. Bloustein School of Planning and Public Policy. He specializes in researching and preparing economic impact analyses and other reports for state agencies and private clients. Irving received a Bachelor's Degree from the University of California at Santa Cruz in 1993, and a Master's Degree in Public Policy from the Bloustein School in 2005. He has never testified before in any public utility matters. The purpose of his testimony on behalf of JCP&L was to sponsor and explain the report that he co-authored entitled

[69] Janis also acknowledged that the Company has not done any study or engaged any professional to estimate the cost of the annual easement fees to NJT for the MCRP. [3T218:24-219:16.]

"Economic Impact Analysis of Expenditures for Construction of JCP&L's Monmouth County Reliability Project."

Irving stated that capital expenditures on the Project can have significant one-time economic impacts for New Jersey. The total estimated expenditure for construction, $74.9 million, includes an estimated $4.7 million in contingencies on contracted labor costs. Of the estimated $74.9 million in total expenditures, some 81%, or $60.9 million, are expected to be made in-state. The in-state expenditures are expected to generate a total of 489 job-years in New Jersey, including indirect employment generated as a result of the initial expenditures. A job-year is equivalent to one job lasting one year. Irving explained that the labor effort required to complete the Project was spread roughly evenly over the term of the Project. For the MCRP, if the duration of the construction is three (3) years, the Project would support an average of 163 (489/3) jobs annually over that 3-year period. The 489 estimated job-years supported by the expenditures include 174 job-years directly associated with the project activity (construction labor and associated employment), and an additional 315 job-years in indirect employment throughout a broad range of sectors as the initial expenditures on labor, expenses, and material are re-spent throughout the State's economy.

At the hearing, Irving corrected his pre-filed direct testimony by stating that the Project has increased from $75 million to $111 million since he completed his report. [7T159:6-16.] On cross-examination, Irving stated that the original expenditure had been provided to him in early 2015, at which time he prepared his analysis. The testimony was prepared later. JCP&L did not provide the comparable breakdown of the $111 million estimate as it had for the original one. [7T161:12-164:3.] Accordingly, Irving did not calculate whether higher expenses would equate to more job-years. If the additional $36 million was intended to be spent on out-of-state materials, he acknowledged that it would have no impact in New Jersey. [7T181:2-182:5.]

On further cross-examination, Irving explained that he had undertaken no calculation of the number of permanent jobs that would be created by the Project once it was completed. His calculus only went to "one-time economic impacts" during

construction. [7T164:17-165:25.] Irving also admitted that there would be similar economic benefits from the construction of any transmission or non-transmission alternative to the MCRP of similar expenditure, dependent on the distribution of those expenditures between labor, materials and other categories. He also admitted that he had not been asked to calculate those impacts. [7T168:19-170:7.] Nor did Irving calculate whether there would be a negative impact if the Project resulted in lower local property values. [7T178:2-179:24.]

SUMMARY OF POST-HEARING POSITIONS

JCP&L

JCP&L argues that it has fully supported its case and satisfied the requirements for the Board to waive any municipal approvals that might otherwise be needed to construct the MCRP. Construction and energization of the Project will enhance the reliability and redundancy of JCP&L's transmission and distribution system in Monmouth County and, in particular, in a "load pocket" in the area from Red Bank to Aberdeen. JCP&L asserted that it has completed a comprehensive route selection process and chosen the route that will result in the less cumulative impacts compared to the available alternative routes. Moreover, the proposed route complies with the Board's regulation that prefers the use of existing ROW, including railroad ROW, for new electric transmission lines. The Company also argues that the post-MCRP calculated levels of EMFs will be below international health-based exposure limits, and that the weight of the scientific evidence from research studies does not support the conclusion that electric fields or magnetic fields are harmful at the levels to which people are exposed under transmission lines, in homes, or near machines and electrical appliances.

JCP&L cites to the New Jersey Supreme Court in Petition of Monmouth Consolidated Water Company, 47 N.J. 251, 258 (1966), for the principle that the Board's jurisdiction is appropriate and important because local zoning officials cannot be expected to balance local interests against the greater good of the consuming public. The Project is for an entire region and cannot be controlled by the parochial interests of those who happen to be geographically closest. While the statutory provision requires the Board to consider local interests, JCP&L states that it also requires the Board to give the utility the edge if all considerations – local and regional – are otherwise equal. N.J.S.A. 40:55D-19; In re Public Service Electric & Gas Co., 35 N.J. 368 (1961). JCP&L sets forth in its brief that it has clearly and unequivocally established that the Project is reasonably necessary for the service, convenience or welfare of the public based upon a sound review of the voluminous record.

JCP&L places heavy reliance upon the regulatory provision contained in N.J.A.C. 14:5-7.1(a) provides, in pertinent part, that –

> Whenever an EDC constructs an overhead transmission line, it shall: 1. Make use of available railroad or other rights-of-way whenever practicable, feasible and with safety, subject to agreement with the owners. . . .

The Company emphasized throughout the hearings and its post-hearing submission that the MCRP should be favored because it relies upon and makes use of the NJT ROW. It would have the undersigned find that the record in this case demonstrated and proved that the route ultimately selected for this Project is environmentally responsible and makes significant use of existing ROW, including railroad, i.e. NJT ROW.

JCP&L urges this forum to accept the testimony of Sims and others that PJM has validated the need for the Project to resolve the P7 violation in each year since it was approved. The Company contends that there is no rational basis to conclude that JCP&L's summer peak load will decrease to a level that obviates the need for the Project in the next five years. In fact, JCP&L states that at even lower peak load level of 5,862.9 MW, the P7 violation has been reconfirmed. The Company would also have me find that there is no credible basis to conclude that the summer peak in JCP&L's service territory will decline so precipitously below the lowest modeled level as to reduce the loss of load from 624 MW to below 300 MW, as required by NERC.

JCP&L also argues herein that it gave serious consideration to each transmission alternative but it was reasonable to reject them because they did not provide the same level of robustness as the MCRP. It claims that some of those alternatives might also negatively impact system reliability in some other way. For example, JCP&L contends that any alternative route that did not include an upgrade to the Taylor Lane Substation would result in part of the system remaining in a radial configuration, as opposed to the more reliable "networked" configuration that would result from the construction of the MCRP. With respect to the JMG suggestion that a new 230 kV source be established at the Eaton Crest Substation into the Red Bank area, JCP&L states that the record will demonstrate that such will not address the P7 violation because the Eaton Crest

Substation is configured to serve load only in its immediate vicinity, not miles away in the Red Bank area. Thus, significant upgrades to JCP&L's 34.5 kV network would have to be constructed, in addition to a new 230 kV transmission line. JCP&L would have this forum and the Board find that each alleged electrical alternative would either: (1) not remedy the NERC Category P7 violation; (2) cause other reliability issues to the JCP&L system; or (3) cost more and have more negative impacts on customers and the environment than the MCRP.

In addition, JCP&L contends that any suggestion that the probability of the P7 violation occurring should be factored into the analysis of whether the Project is really needed is spurious. NERC and PJM mandate compliance with their reliability standards. Whether the P7 double failure contingency ever occurs, as well as fact that it has not yet occurred, has no relevance to a determination based upon the RTEP process that there is a reliability issue in the Red Bank area. Odds of the P7 voltage collapse do not play into this analysis.

Further, JCP&L points to evidence in the record that the MCRP might have prevented or mitigated some past outages. If the MCRP had been in-service when this event occurred, there may not have been a voltage collapse and/or the number of customers impacted would have been greatly reduced. According to the Company, while each of these three recent events had a different root cause and did not involve a NERC P7 contingency, each demonstrates the amount of load at risk in JCP&L's Monmouth County region from the loss of the existing 230 kV sources into the Red Bank Substation, and offers additional evidence of the reliability and redundancy benefits the MCRP will bring to JCP&L's system. JCP&L disagrees that any non-transmission alternative proposed by Rate Counsel or RAGE would solve the P7 violation or the reliability needs of the Red Bank area. In sum, JCP&L is of the opinion that it has demonstrated that: (1) the MCRP is needed; (2) the Company considered and appropriately did not pursue alternatives to the MCRP; and (3) no other party has identified any alternative that is a viable or reasonable alternative to the MCRP.

JCP&L also advocates that it had adequately considered all potential route corridors at a high level and several potential routes at a more detailed level, satisfying

its proof obligations under In re Public Service. It has demonstrated how and why it narrowed the search for a new 230 kV transmission line into Red Bank to two potential routes, and two potential loop options into Taylor Lane Substation.[70] The Company then compared the costs of those two competing routes, satisfying the requirement to undertake cost analysis of alternatives. It satisfied its obligation to listen to the people living in the vicinity of the proposed MCRP, and made an adjustment as a result of that exercise.

JCP&L conducted a comprehensive Routing Study to determine the best route for the Project. After extensive field work and analysis, and based on the seventeen (17) Potential Corridors originally identified, the Routing Study team selected four alternative corridors for additional study. Ultimately, the Routing Study team selected Route B as the Preferred Route for the Project. Route B was chosen because the cumulative social, environmental, and financial impacts associated with constructing it will be less than any other alternative route. JCP&L repeated in its post-hearing brief that the Preferred Route can be constructed largely within existing ROW, and thereby is in accord with the BPU's regulation governing construction of new electric transmission lines, N.J.A.C. 14:5-7.1(a)(1).

With respect to vegetation management and environmental or aesthetic concerns, the Company sets forth in its post-hearing brief that the vegetation clearance and maintenance for the construction and operation of the Project will be accomplished in accordance with applicable regulatory standards. It has to meet vegetation management requirements for the safe, adequate and proper construction and operation of the Project, but will do so with an appropriate sensitivity for property owner concerns regarding screening as practicable. Similarly, the Company asserts that it has adequately explained to and protected residents from any EMF impacts consistent with state and federal guidelines, relying upon testimony from Dr. Bailey and King that the Board has accepted in prior HVTL matters. Specifically, it points to the fact that there

[70] As part of the Project, JCP&L explained that the Taylor Lane Substation will be expanded and the new 230 kV transmission line construction will be looped into the Taylor Lane Substation. JCP&L will also add breakers within the existing fence line at JCP&L's Freneau and JCP&L's Red Bank Substations; however, that work does not require zoning or siting approval and is therefore not included within the scope of the Company's Petition to the BPU. [JC-3 at 5-6.]

are no federal or state limits on magnetic field from transmission lines. The WHO recommendation for power frequency magnetic fields states that the adoption of arbitrarily low exposure limits is not warranted. It argues that little weight should be given to Dr. Carpenter's expert opinion on EMFs as scientifically unsupported.

JCP&L reiterates its position, set forth in earlier motion practice, that it is under no obligation to complete negotiations with NJT for use of the ROW prior to the completion of this Board proceeding. It has not fully estimated the price of the yearly arrangement although JCP&L has been in contact with NJT for several years regarding many aspects of the Project. NJT has informed JCP&L that the NJT "excessing review," which precedes the actual negotiation of the terms and conditions of the Railroad Occupancy Permit, was completed in May 2016. The Company awaits NJT's issuance of a formal notice of completion of the excessing review. JCP&L is of the opinion that uncertainty should not create an obstacle to the Board's approval of the Project provided the Board is satisfied that the Company has a reasonable basis for estimating such costs.

JCP&L is confident that it adequately responded to and contradicted the local public concerns about the impact of the MCRP on their property values through the report of McHale. That report acknowledged the possibility that a temporary stigma associated with the Project could be caused or perpetuated by organized community criticism. However, this stigma and any adverse impact on property values would be negligible as compared to the stigma associated with the noise from and schedule frequency of the existing commuter railway. Further, this temporary stigma could be countered by the utility confronting erroneous factual claims and by the utility's promotion of Project benefits. Moreover, the Company claims that abutting and nearby property owners would, or should, have been aware of the Board preference for the co-use of railroad ROWs.[71]

[71] The Company stated in its post-hearing brief that the Board can order JCP&L to explore these real property issues as the Project moves forward and, if necessary, take appropriate action to address those valuation concerns in accordance with N.J.S.A. 48:3-17.7 and N.J.A.C. 14:1-5.8. Susquehanna-Roseland Order at 79 Ordering ¶13.

In its reply post-hearing submission, JCP&L contends that the positions of the respondents and intervenors must be rejected for several reasons. First, the need for the Project has been confirmed and reconfirmed annually during the RTEP process, and even at the lowest peak load levels discussed on the record. The Company also argues that Rate Counsel's argument that the NERC Category P7 criteria violation would not exist at peak loads of either 5,862.9 MW or 5,918 MW is contrary to the record evidence. Further, the company strenuously disagrees with the objectors that demand in Monmouth County is rapidly falling even though it did decline from 2011 through 2016.

Second, any alternatives were not realistic or fully-developed by the opposing parties. JCP&L does not believe it should have been required to set up strawmen just to knock them down. JCP&L also asserts that RAGE and JMG are merely relying upon the emotional defense of "NIMBY" or "not in my back yard" when they proffered alternatives to the MCRP. In addition, the Company disagrees with a comparison of routes eliminated during the high level Potential Corridor Study to Routes A and B, which were studied in much greater detail.

Without repeating here earlier arguments set forth above and more fully in its briefs, JCP&L also refutes that FERC Order 1000 is relevant; that FirstEnergy has ulterior motives for pursuing the MCRP; that health or real estate values will be impacted; or that the Project will be more expensive than other feasible alternatives.

Staff of the BPU

Staff has waived its right to file any post-hearing brief or to take any position in this matter.

Rate Counsel

Rate Counsel asserts that JCP&L has failed to carry its burden in this matter and that the Board must reject the MCRP for several reasons. First, it argues that the Company has failed to prove there is a genuine need for the Project. Peak

summer load in the shore region of JCP&L's noncontiguous territory has been decreasing since 2011. PJM and JCP&L used highly inflated and unsupported estimates of future peak usage to justify this Project. Rate Counsel is of the opinion that the complete factual record in this matter proves that the potential P7 violation will not occur during the relevant five (5) or even fifteen (15) year planning horizon of the RTEP process. It asserts that actual peak loads were not used by PJM or the Company to re-examine the need for the MCRP. In addition, prior planning criteria would support cancelling the Project. The assumptions underlying the P7 violation giving rise to the need for the MCRP in 2011 have not and now will not be met, according to PJM's own projections, until past 2031. Accordingly, Rate Counsel asserts that JCP&L has failed to demonstrate the need exists for the MCRP.

Second, Rate Counsel argues that no alternatives had been fully developed by the Company in terms of costs, impact, or effectiveness in addressing the identified potential NERC violation. Rate Counsel points out that the Company found shortcomings to each of the transmission alternatives because they did not provide for a second supply line to some substations that only have a single supply transmission line. However, the Company does not represent that a single supply transmission line, or "radial feed" reflects a NERC violation. Several types of non-transmission alternatives were not considered by the Company at all. Furthermore, the Company did not consider using distributed generation, smart inverters, or smart grid technologies to solve any NERC criteria violations.

Relying upon the New Jersey Supreme Court decision in In re Public Service Electric & Gas Co., 35 N.J. 358, 377 (1961), Rate Counsel states: "Alternative sites or methods and their comparative advantages and disadvantages to all interests involved, including cost, must be considered in determining such reasonable necessity." Cost comparison was made even more spurious by the fact that the Company has not provided an update of its 2016 estimate of these significantly increased costs, which was already more than five times the original cost estimate of $22 million. One of the largest expenses for the MCRP – NJT upfront and annual payments to lease the ROW – have not even been estimated. The Board must be able to make an "apples to apples" comparison or be sufficiently informed as to the

comparative advantages and disadvantages, including cost, to determine "reasonable necessity."

In its reply post-hearing submission, again, without repeating in full its briefed positions here, Rate Counsel contends that JCP&L has not sustained its burden of proof on this Petition.

RAGE

RAGE took up the predominant oar in mounting the opposition to the MCRP, understandably, in light of the fact that the Project is in the back yards of its members. RAGE presented its closing arguments that JCP&L has not proven the need for the Project, gave short shrift to any alternatives, purposely underestimated the costs of the MCRP, undervalued the financial and aesthetic impacts to the residences along its route, and underplayed the health and environmental concerns. As did Rate Counsel, RAGE highlights that the Company has not met its burden of proof under Public Service and N.J.S.A. 40:55D-19. RAGE would have this forum and the Board hold that there is no P7 violation, without which this Project cannot be prudently justified, and that even if there is a violation, the likelihood of that risk materializing should moderate the solution selected.

RAGE argues that the "route study" undertaken by JCP&L was a complete sham. It highlights that the "study" was commissioned nearly a year before any notification of any P7 issue, and was devoted almost entirely to developing a justification for the MCRP. During the time that the "study" was in progress, JCP&L was engaged in detailed engineering planning for the MCRP, providing thousands of pages of documents to NJT to try to obtain the railroad's permission to build the line on its ROW. Yet, NJT has still never voted on those approvals.

RAGE also notes that JCP&L itself does not seem very concerned about this potential voltage collapse by the fact that it currently has no plan in place to control one that might occur in the interim. It has done nothing to limit the harm that its customers would suffer in that unlikely event. By contrast, RAGE has proposed an SPS that would

control any possible voltage collapse. The SPS would also minimize the P7 contingency until its proposed alternative solution is implemented. RAGE argues that the Company's failure to date to install an SPS is irresponsible. The Company claims that the MCRP is "urgently" needed but the P7 contingency was brought to JCP&L's attention seven years ago. Yet, the Company still has no plan, such as an SPS, to address how it would mitigate the harm from the loss of the two 230 kV lines if they were to fail before the MCRP (or any better alternative) is built.

RAGE also emphasizes that this is the third time that JCP&L has issued claims of a dire need for this Project. In December 1988, JCP&L proposed to construct substantially the same line as the MCRP, but using slightly shorter monopoles. JCP&L claimed that it had to construct this line to meet its service obligations, although at that time the company said the deficiencies were in the Taylor Lane area. When settlement negotiations failed, JCP&L withdrew the application. In 2000, JCP&L proposed a slightly less ambitious version, 6.5 miles of 230 kV line to be erected from Matawan to Middletown. The Company asserted that demand in the area was so strong that it doubted whether it could meet summer peak demand the following summer without the project. RAGE noted that this claim must have had no merit, as JCP&L withdrew the petition only a few months later.

As did other parties, RAGE asserts that skewed priorities prevented JCP&L from undertaking a fair analysis of alternatives to the MCRP. Based on its expert's testimony, RAGE contends that SVCs and STATCOMs can provide fast-acting reactive power by regulating the voltage, power factor, and harmonics to quickly stabilize the system. These non-transmission alternatives would cause virtually none of the extensive disruption and permanent blight that the MCRP would create. RAGE would have this forum and the Board find that JCP&L's actions and inactions were unreasonable. A reasonable utility, concerned about the public it serves, would have conducted powerflow analyses to determine whether the P7 contingency could have been mitigated or even eliminated by RAGE's proposed alternative. It could have performed theoretical tests with one or more SVCs, one or more STATCOMs, of differing capacities, dimensions and locations. A reasonable utility would also have investigated the best price at which it could accomplish these projects. JCP&L made a

strategic decision to pursue the MCRP to the virtual exclusion of any alternative, and RAGE asserts that such a decision must have consequences.

Further, JCP&L justified its selection of the MCRP on how it would add "robustness" and additional reliability to its system. The Company claims that the MCRP would provide improvements to the Freneau Substation and the Taylor Lane area, but these improvements are not relevant to the P7 contingency. Their inclusion in the Project appears to be subsumed under the Company's definition of "robustness." During the hearing, JCP&L conceded that this case is solely about the P7 contingency, and that it would not be prudent to pursue the MCRP in the absence of that NERC violation.

RAGE, as did Rate Counsel, continued in its post-hearing submissions to argue that this forum and the Board should consider the ultimate motivations behind the Project. It asserts that the Company has a major incentive to inflate its transmission costs:

> New transmission rates will be in effect in June 2017 when JCP&L implements a formula transmission rate for Network Integrated Transmission Service (NITS). Upon implementtation, JCP&L expects improvements to net income and cash flows from the transmission segment, including planned investments to complete necessary Regional Transmission Expansion Projects (RTEP), as required by PJM.
>
> [Exh. RC-5 at 3.]

In its post-hearing submission, RAGE requests that this forum draw an adverse inference against JCP&L from its refusal to update discovery responses and the Project data. Such an inference would demand that the Project be deemed to be a lot more expensive than $111 million, and that the unexplored alternatives would be a lot less expensive. JCP&L's estimates for the cost of the MCRP have escalated precipitously. In obtaining PJM's concurrence for the MCRP, JCP&L first estimated its cost to be $22 million. In 2012, it updated that cost to $40 million. Then in 2015, the cost was estimated to be $75 million. As of June 2016, the estimated cost was $111 million, plus an additional $3.9 million in Taylor Lane costs. RAGE considers it foolish to accept

JCP&L's claim that this inflation stopped in mid-2016. Meanwhile, PJM's reaction to these escalated costs is cavalier, perhaps because they can be passed through to ratepayers.

RAGE also highlights in its brief that the 2016 $111 million estimate does not include the costs to use the NJT ROW, to cross the Earle Naval Weapons Station property, to acquire "priority tree rights," overheads at Taylor Lane, or to cover legal and other expenses of these proceedings. With respect to the NJT ROW costs, RAGE argues that there is no reason to believe that JCP&L would bargain hard with NJT, especially given the extensive engineering, legal, and other investments the Company has made in the MCRP thus far. Moreover, there is no real incentive for JCP&L to negotiate since it expects that all costs of the project would be included in the FERC rate of return. On the other side, NJT would have every reason to believe it is the one in the driver's seat.

In spite of the Company's reliance upon N.J.A.C. 14:5-7.1, RAGE argues that this particular railroad ROW is neither safe nor feasible, and as such, should enjoy no presumption in its favor. To the contrary, the NJT ROW is unusually narrow and, due to its historic roots and route, is in unusually close proximity to residences. If constructed, the MCRP would consist of 100+ transmission monopoles, ranging in height from 110 to 210 feet, with base diameters of up to ten (10) feet, along the edge of an extremely narrow active commuter rail line ROW, in a densely populated residential area. A project like the MCRP has never been constructed anywhere, and for good reason, according to RAGE. It would be unprecedentedly complicated and disruptive to build.

RAGE argues that the environmental, aesthetic, and health considerations also demand rejection of the Project by the Board. RAGE also argues that the MCRP would be a permanent blight on the landscape of five of New Jersey's most livable towns, resulting in serious adverse impacts on the property values of the homes near the line, a blight on a large historic district, and ruining the ambience of numerous parks, schools, and playgrounds. JCP&L proposes to permanently denude much of the rail line and its adjacent properties of the mature and dense vegetation that screens these properties from the NJT ROW. Environmental impacts of the MCRP are both

substantial and also unknown, according to RAGE, because JCP&L has chosen not to apply for permits in time for the Board to review those impacts. There can be no true comparison to alternatives to the MCRP because JCP&L only conducted "high level" analysis during its corridor and route studies. Further, RAGE asserts that the perception of harm from EMFs is strong even if not definitely proven to be harmful to human health. It argues that Dr. Bailey's rebuttal testimony is so strident and filled with invective that it plainly demonstrates that he is no impartial and objective expert, but someone whose testimony has for the first time been challenged in New Jersey by a credible public health official.

RAGE would have the Board direct JCP&L to return to PJM and engage in a meaningful analysis of all reasonable alternatives for resolving the P7 contingency, including non-transmission alternatives, and then open the solution(s) to the competitive process envisioned by FERC Order 1000. For RAGE, it is especially important that this process use the most accurate forecasting possible, since past forecasts have been significantly overstated and actual load growth has flattened.

In its reply post-hearing submission, RAGE contends that the Company has not satisfied its burden of proof; that it has purposely ignored finding the highest peak load level at which the P7 violation resolves; that this particular ROW usage is not safe, practicable or feasible; that for the MCRP, the impacts on the five communities are of paramount importance because the P7 violation only impacts service into Red Bank; and that any alternative construction would have comparable economic benefits which the Company chose not to calculate, just as it chose not to calculate in a timely manner the costs of any alternatives. It also argues that JCP&L's suggestion that homeowners or landowners can "just" file for "inverse condemnation" damages is specious and a fool's errand.

JMG

JMG asserts in its post-hearing submission that the MCRP is entirely unnecessary because of collapsing demand for power in the JCP&L service territory. If the PJM power demand studies had produced accurate forecasts or even remotely

close to actual peak load usage, JMG argues that this Project never would have been considered in the first instance. JMG believes the record proves that the reliability issue mitigates and theoretically solves when actual load usage falls to 5,862.9 MW – that is, the theoretical case "solves" and with a proper load-shedding strategy, no voltage collapse should occur. It also takes the position that the Project may be unnecessary in light of the fact that the claimed reliability issue involving the theoretical loss of two 230 kV lines on a common tower is a contingency that has not occurred in the forty-three (43) years since the second line was added to the common tower in 1974.

JMG also argues that the Company has not met its burden of proving that the MCRP is a safe and reasonable response to the potential P7 violation. It asserts that JCP&L did not undertake a genuine analysis of alternative transmission routes and gave no consideration to non-transmission alternatives. JCP&L commissioned the "Potential Corridor Study" in early 2010, ten (10) months before PJM gave the Company its initial notice that there was any problem at all that needed to be addressed for Red Bank reliability. For JMG, this inconsistency highlights JCP&L's bald determination to force the MRCP through the regulatory process without proof of real need and without due consideration of reasonable alternative solutions (either non-transmission or transmission-based) to the identified "problem." According to JMG, a cursory analysis of the study demonstrates that JCP&L and the route selection team rejected entire identified corridors deemed fit to deliver a solution to the electrical issue, often for the flimsiest of reasons, and for contradictory pretexts as well.

JMG also urges a finding that the Company (or PJM) could and should have calculated the load usage level that theoretically would stabilize the system without producing any thermally overloaded circuits (circuits loaded in excess of their emergency ratings), and thereby eliminating any need for any further analysis. It chose not to do so. The Company's lack of curiosity on this point, though understandable in that it wants to build this Project irrespective of actual need, is inexcusable from a ratepayer and public policy perspective. JMG also notes that the Company's only counterpoint to the STATCOM or SVC non-transmission solutions is that they would be too expensive and time-consuming to implement. It claims that there is no competent record evidence to support either of these assertions.

In addition, JMG contends that the MCRP Route Selection Study Report turns out to have been a post-hoc rationalization for a decision JCP&L made well before the study was even commissioned in January of 2010: that preferred Corridor B would yield the selected Route B, with other corridors quickly eliminated for the flimsiest of excuses despite their comparative attractiveness to the chosen corridor on all key criteria. JMG argues that the "study" was not a genuine study at all, and therefore, is entitled to no credence or deference whatsoever. Irrespective of any electrical need, the Company has clearly failed properly to evaluate alternative corridors and routes, and totally failed to carry its burden of proving that the selected route is the most reasonable and practicable alternative. JMG would argue that there are clearly other reasonable, practicable alternatives that would have less impact on the environment and other key criteria but that the Company has chosen to study none of them in anything more than a cursory, conclusory manner.

JMG supports the non-transmission alternative proffered by other parties that utilize two STATCOMS and 34.5 kV network reconfigurations or upgrades to resolve the P7 violation. JMG asserted that the record proves that there are viable electrical non-transmission alternatives to the Project to address any reliability issues that may be present at the greatly-reduced actual and forecasted peak loads for well into the future. As for any transmission-based alternatives, JMG briefed that there are several routes that would or could involve a partial or full build of an additional 230 kV circuit into Red Bank along an appropriate corridor that would not inflict the damage that the MCRP levels on property values, aesthetics (including view sheds), environmentally sensitive areas, historical districts and properties, and on the health and well-being of the public living in the vicinity of the Project.

JMG would have the Board find that there will be a significant effect on property values in the area, especially those that would abut the ROW. The Project would pass many residential and commercial properties, including a school and a hospital, in addition to seventy-six (76) historic properties in Middletown's historic district. Credible evidence supports this conclusion of property value loss. JMG asserts that the Company's testimony that properties would retain their value irrespective of the

presence of giant monopoles with high tension wires near the back or front lawns of residences is unworthy of any credence and should be rejected out-of-hand. In addition, the concern over EMFs is also a factor that should be taken into consideration with respect to reviewing the approval sought by the Company. JMG maintains that there is no doubt that the MCRP will cause EMF/ELF exposure to those living adjacent to it, and that those fields could have deleterious effects on public health.

In its reply post-hearing submission, the JMG contends that the position of the Company is not supported by the preponderance of the credible evidence in this voluminous record.

Other Municipal Intervenors

No other municipal intervenor chose to submit post-hearing briefs.

FACTUAL DISCUSSION, CREDIBILITY AND FINDINGS OF FACT

Based upon a review of the entire record and giving due consideration for the testimony of the witnesses and the arguments of the parties, as discussed below, I **FIND** the following facts:

Need for the MCRP

The first and most important threshold question posed in the Company's Petition is whether there is a need for this transmission Project. As described by several witnesses, the need is driven solely by the P7 contingency event, which if left unaddressed, is a NERC criteria violation. It is also undisputed and I **FIND** that the P7 violation would occur if, but only if, the two 230 kV transmission lines on the common structure between the Atlantic Substation and the Red Bank Substation both failed during a period when the summer peak load was also occurring, resulting in a voltage collapse – "blackout" – in the Red Bank service area, with more than 300 MW of load being lost.

The key to figuring out if the loss of two HVTLs would result in that voltage collapse is a powerflow analysis, a hypothetical modeling study. A powerflow analysis is a complicated computer-generated theoretical run of a utility system's transmission, sub-transmission, and distribution elements with certain criteria inputted into the software to demonstrate the implications of each hypothetical contingency. There are several ways to run the powerflow analysis – steady state or dynamic, and with or without cascading, but in any format, it involves a thousand moving pieces. This Petition is premised upon PJM notifying JCP&L of an unresolved contingency during the 2011 RTEP process. JCP&L then confirmed the lack of a stable solution – a nonconverging case -- resulting in a modeled voltage collapse, for the P7 contingency.

In light of the expensive, proprietary license for a powerflow software application, the respondents and intervenors initially had no basis upon which to test the PJM/JCP&L assumptions and were only in possession of a "data dump." There was no timely motion to compel the information in a different format; however, as set forth earlier, some sur-rebuttal and rejoinder powerflow analyses were run before the record closed in order to assure as complete and fair a factual record as possible for the BPU's review. I will not repeat the evidence rulings also set forth above. Significantly, a key variant in any powerflow analysis is the peak load plugged into the model.

In early 2011, the PJM projected peak loads used in the later 2011 RTEP were:

2012	6,551 MW;
2013	6,720 MW;
2014	6,804 MW;
2015	6,885 MW;
2016	6,942 MW.

[2T58:18-61:25.]

PJM predicted that the P7 event would occur in 2016 at the summer peak load of 6,942 MW. It was not predicted to occur in the other years forecasted, and I so **FIND**. Nevertheless, during these hearings, and well after the Petition was being prepared,

PJM and JCP&L witnesses testified that the voltage collapse would occur at every peak load they modeled down to 5,955, the actual summer peak load for 2016, which number was known before the hearings commenced.

While the maximum peak load at which the P7 violation would disappear was never calculated by JCP&L – more on that below -- there was considerable evidence in the record as to the size of the discrepancy between PJM forecasts and actual summer peak loads for the relevant five (5) and fifteen (15) year horizons. For example, the 2009 peak load forecast predicted usage of 7,300 MW in JCP&L territory in 2016, but the actual usage was 5,955 MW. That constitutes a differential of over 1,300 MW, or somewhat more than the output of two medium-sized nuclear reactors.[72]

In fact, PJM projected the following summer peak loads for JCP&L in January 2017 and July 2017 (Update), respectively:

2017	5,846	5,790
2018	5,865	5,797
2019	5,862	5,791
2020	5,815	5,745

[JMG-12.]

Publicly available information for PJM's forecasts for 2018,[73] which have issued since the record herein closed, indicates summer peak loads for JCP&L have been lowered again from that for 2017 by 2.4%, with projections for the five- and ten-year horizons being reduced by 3.3% and 2.9%, respectively. PJM also reports that the 2017 actual summer peak load was 5,721 MW, another four (4%) percent reduction. PJM projects that JCP&L summer peak load will not crest past 5,943 MW over the next ten (10) years, for a growth rate of 0.0%. According to this January 2018 report, JCP&L is not expected to exceed 6,100 MW summer peak load until the year 2032.

[72] The actual summer peak load of 5,955 MW was 18.4% below the PJM forecasted load for 2016. When asked if this was a big miss, Sims responded "Define big." [2T71:15-72:14.] He finally agreed that actual usage "diverged greatly" from the forecasted load. [2T77:5-10.]

[73] http://www.pjm.com/-/media/committees-groups/committees/pc/20171214/20171214-item-08a-preliminary-2018-pjm-load-forecast-report.ashx

This indicates not only flat growth but downward adjustments as the forecast goes forward. I conclusively **FIND** that there is falling demand in the JCP&L service territory since the 2011 RTEP identified the P7 violation and it can be characterized as significant. The tougher question is whether such lowered electrical demands is likely to obviate the NERC violation in the near future, a result that then obviates any need for the MCRP.

Although JCP&L correctly points out that Palermo confirmed the P7 NERC violation, I note that that confirmation was specifically premised upon the assumptions used by JCP&L and PJM. That verification is not confirmation that the P7 violation would continue to exist under different assumptions. Taken together with the analysis of recent adjustments to the peak load projections and those reviewed by Lanzalotta,[74] it becomes clear that the need for the MCRP may only occur as far out as the year 2031 or later, or it may dissipate altogether.

PJM witness Sims nonetheless testified that his team had confirmed a continued reliability issue at 5,955 MW during the 2016 Retool Study, as the powerflow case did not resolve. In an email to Sims dated July 15, 2016, Hozempa stated that JCP&L had also proven that the NERC Category 7 criteria violation does exist at the Summer 2016 peak load forecast level studied. [JMG-17.] In that email message, Hozempa explained that the system stabilized at the studied peak load level only after more than 300 MW of load was lost, as shown in the referenced cascade analysis.[75]

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[74] I concur with the Company's explanation that the theoretical powerflow model case resolution point of 5,862.9 set forth by Lanzalotta was not a modeled convergence, but a load assumption. [See pg. 46, supra.]

[75] Yet, that email message actually differentiated two types of calculated load losses:

> The total load isolated due to tripped elements is over 290 MW (consequential load loss), however, throughout the simulation of the event a total of 423 MW of load experiences voltage less than 85%. FE assumes that amount of load, 423 MW, is load 'at risk' of being lost.
>
> [JMG-17.]

The load loss might be, therefore, below the 300 MW NERC threshold.

I **FIND** that a P7 violation has not been re-confirmed at the July 2017 or January 2018 projected summer peak loads. At the very end of these hearings, I inquired of Hozempa about the issue of how low can the peak go before the P7 violation disappears. He stated that growth rates are flat, and while not spiking as earlier predicted, the risk of load loss is not going to disappear at current levels. [10T242:8-23.] While it is true that growth rates have been flat (or slightly down), and are predicted to continue to be flat (or even slightly down, see note 73 supra.), I also **FIND** that the actual and projected summer peak loads are now in the very gray area of P7 event territory. I **FIND** it was "convenient" for JCP&L to not test that envelope.

Moreover, while I would agree that the odds of the P7 voltage collapse happening[76] do not play into the need analysis, the other parties argue that the rush to approve the MCRP without further updated study and the weight to be given to the alternative solutions should take into account those odds. Some might characterize the MCRP as the electrical equivalent of using an elephant gun to kill a gnat. I concur and **FIND**, consistent with Palermo's credible expert testimony, that the degree of risk should inform the extent, timing, and appropriateness of any proposed solution. [9T188:7-22.] The preponderance of the credible evidence supports the finding that the P7 event is a "really low probability event." [9T222:1-3.]

In sum, I **FIND** that the Company has proven a need for a solution to the P7 contingency event, under assumptions that predominantly pre-date the Petition and these hearings. Nevertheless, I **FIND** that if otherwise warranted for reasons set forth below, there is at the very least some considerable "breathing space" to do further review and consideration of the MCRP and/or certain alternatives because of the significantly reduced load projections, which remain untested.

Alternatives to the MCRP

The Company presented the evaluation and determination of the Potential Corridor Study and the Route Selection Study through Sparhawk in support of its

[76] It is undisputed that there has not been a common tower failure in the forty-four years since the subject second 230 kV line was installed in 1974.

burden of proof under N.J.S.A. 40:55D-19 that it had adequately reviewed and considered alternatives to the MCRP prior to filing the Petition. For the reasons set forth below, I **FIND** that the Potential Corridor Study and the Route Selection Study were an exercise directed at a forgone conclusion, as supported by the timing of the Berger invoices, the NJT presentations, the PJM considerations, and other evidence. There are both timing and selection concerns with JCP&L's approach to the consideration of alternatives other than the MCRP. Its approach to the cost estimation of the MCRP and potential alternatives was also flawed.

With respect to the timing issues, it is undisputed and I **FIND** that JCP&L hired Berger in January of 2010 to prepare a corridor selection study to address a "need" for a third 230 kV line into Red Bank that would rectify a "problem" that was not identified to exist until ten months later. The Berger-led corridor and route selection study teams then "considered" and eliminated all competing corridors except A, B (MCRP), E and O. They did so by May 29, 2010, with only an average expenditure of $1,500 per corridor. [RAGE-42.] In addition, the Berger invoices totaled $63,331.50 by October 2010, a month before PJM's "informal" notification of a P7 contingency problem. [RAGE-43.] I **FIND** that the preponderance of credible evidence proves that JCP&L commenced studies to justify the MCRP as its preferred route months before any "problem" was even identified as needing a solution.[77] JCP&L also eliminated transmission corridors very early and with only light consideration, as discussed in more detail below.

I also **FIND** it significant, that the P7 violation was not identified during the 2010 RTEP when the five-year planning horizon showed a peak summer load for 2015 of over 7,200 MW. Hozempa did elaborate in response to my questioning on this point that PJM notified FirstEnergy in November 2010 of the non-converged case but by then, the 2010 RTEP was completed and those entities were already preparing for the 2011 RTEP. It was at that point that the violation was confirmed and the need for the Project identified.

[77] It should not go without saying that the MCRP has been proposed twice previously by the Company, notwithstanding that it was not at those times necessitated by or being utilized to address any NERC violation.

Lastly with respect to timing concerns, I **FIND** that all but Corridors A and B were eliminated no later than the fall of 2011, and more likely in or even before the summer of 2011. [6T89:4-8.] This is confirmed by the presentation on September 8, 2011, by JCP&L to the TEAC (JC-8, Exh. LAH-2), which was made on the basis of the Company's original MCRP cost estimate of $22.1 million dated April 26, 2011. [RAGE-18.] In what cannot be characterized as ironic or coincidental, on April 27, 2011, a new Purchase Order #45368405 was initiated between the Company and Berger, signaling the start of the Route Selection Study, which continued until the filing of the Petition. [Id. at 33, 283.] The first invoice for the Route Selection Study covered the period from April 27 to May 29, 2011. It is the only invoice with a significant expenditure of time on "meetings." Accordingly, and based upon the dates set forth just above, I **FIND** that it is more likely than not that Corridors E and O were eliminated no later than May 29, 2011.

There was also considerable testimony presented and questioned with respect to the thoroughness or seriousness of JCP&L's endeavor to study all the possible ways of getting a new 230 kV transmission line into Red Bank Substation. It is obvious that a number of corridors were included in the analysis even though they were quickly discarded for reasons that were obvious from the beginning. [6T65:11-70:21.] Five corridors were eliminated because they would have created new NERC violations. [6T26:1-7.] Moreover, JCP&L instructed Berger to consider upgrades to Taylor Lane Substation in any analysis. [6T80:1-25.]

In looking at the initial seventeen (17) corridors studied, the undersigned noted that it was difficult to follow the route geography and requested sua sponte that the Company provide better detail of same in order to develop this record. [TR-5.] While there was no testimony on this supplemental evidence, any person reviewing these maps alongside Sparhawk's descriptions can see that JCP&L literally went out of its way to plot a 230 kV line parallel to the Parkway for several miles in circumstances that did not obviously require such. For example, Corridor N is described thusly:

> Corridor N follows a combination of existing overhead transmission and distribution circuits, and local roads, from a tap point off of the Raritan River- Atlantic 230 kV transmission corridor to the JCP&L Red Bank Substation for

> approximately 7.4 miles. It begins at the intersection of the Raritan River – Atlantic 230 kV transmission corridor and County Road 537 and travels east/northeast along the road for approximately 2.5 miles. It turns north/northeast on Normandy Road for approximately 2.8 miles and intersects Newman Road and turns east along the road for approximately 2.0 miles and then turns north on the Atlantic – Red Bank 230 kV transmission corridor for approximately 0.1 miles into the JCP&L Red Bank Substation. Corridor N would require the construction of a three-ring breaker switching station at the location of the Raritan River – Atlantic 230 kV transmission line tap.
>
> [Exh. JC-7, Route Selection Study Report at 25.]

When I questioned Sparhawk during the hearings concerning the ability of an HVTL to cross the GSP as opposed to paralleling it for over three (3) miles, the dialogue continued:

> JUDGE COOKSON: Yes. But when you look at the description, it's interesting that – like I just said—N seems to have no problem crossing the Garden State Parkway through, you know, perpendicular as opposed to parallel. And yet other things that could get to K the same way, go up parallel on the Garden State Parkway, and that becomes the reason they get eliminated.
>
> MR. SPARHAWK: So, there's a difference between crossing horizontally a limited access like the Garden State Parkway or the Jersey Turnpike or a major road like that, versus parallel in the road.
>
> JUDGE COOKSON: I know. I just said that. N gets across the Garden State Parkway.
>
> MR. SPARHAWK: Yes. It gets across. I don't think that was the problem with N.
>
> JUDGE COOKSON: Yes. But, here's what I'm saying. If N could do it, then O would have gotten across—you could do some combination. Because the problem, you know, is as you get close to the Garden State Parkway. In other words, clearly there's a route across the Garden State Parkway.
>
> MR. SPARHAWK: Across.

> JUDGE COOKSON: Across. Perpendicular and not parallel for three or four miles.
>
> MR. SPARHAWK: Correct.
>
> JUDGE COOKSON: So, it seems like you've created an issue on some of the routes that is solved on some of the other routes, but you didn't consider mixing and matching.
>
> MR. SPARHAWK: I'm not sure I follow. Because we did consider mixing and matching. You brought O. O shares K, and that's the way across, for example. That's the way across the Garden State Parkway with no paralleling—
>
> JUDGE COOKSON: Yes. But N shares K, too, or it certainly gets to Red Bank.
>
> MR. SPARHAWK: It all gets to Red Bank. All of these, obviously, is to get everything into Red Bank. The problem with the ones down by the – would conflict with the road coming in on the Naval Weapons Station, that was the primary problem with those. So, I see what you're saying. I think we considered the different legs.
>
> [6T18:20-20:16.]

I **FIND** that Corridor N was not considered on any serious or detailed level and yet it is approximately 2.5 miles shorter than the MCRP, impacts the second lowest wetlands acreage, and is on the low end of crossings of historic properties and parcels in general. In addition, Corridor N does not entail a river crossing. While it relies upon the ROW of Normandy Road in the Earle Naval Weapons Station, I **FIND** that no inquiry was ever initiated as to whether the federal government would consider the co-location.

With respect to the sufficiency of the study of alternative transmission solutions, I **FIND** that the other potential corridors were not analyzed at all in depth, and only a few were even reviewed at a "high level." The Potential Corridor Study Team rejected several corridors including Corridor N because potential routes would need to use or cross the Earle Naval Weapons Station access road. This was asserted as a reasonable basis for rejecting them even though the same current two-line 230 kV service for which PJM tested the P7 loss contingency is on a tower that extends for several miles through the Earle Station. In fact, the Atlantic Substation is wholly

situated on the government property. Moreover, the preferred MCRP route would itself extend across the Earle Station access road at its northerly campus.

The study team also rejected routes that ran along the GSP, as discussed above, without ever contacting the NJ DOT or Turnpike Authority to determine whether a certain longitudinal route would be permitted. Meanwhile, the team knew or should have known that Atlantic City Electric obtained permission and built longitudinally monopoles for at least two miles along the GSP south of Toms River in the Pinelands area.[78]

Specifically, Corridors C, D, K and L were eliminated because the tower line would run longitudinally with the GSP for about 3 miles. However, Corridors C and D compared quite favorably with Preferred Route B on all other indicia, including many fewer parcels and wetlands crossed, as well as historic sites impacted. They required little acreage acquisition as well. Corridors K and L impacted slightly more wetlands, but otherwise also compared quite favorably to Corridor B. As with other eliminated corridors, the study team did not calculate how much acreage would need to be acquired for Corridors C, D, K or L, or the associated costs. Sparhawk testified that NJ Turnpike Authority regulations as written were the sole reason to eliminate these corridors, but again, nobody on the study team contacted NJ DOT or the Turnpike Authority to discuss any exceptions or to seek permission.[79]

Corridors F, I, J-1 and J-2 were all eliminated for the reason that the study team believed that these corridors would require extensive collocation of new facilities within the existing rights-of-way used by the common tower (for 230 kV lines T-2020 and S-1033), and therefore would violate NERC reliability criteria.[80] Furthermore, each of these eliminated corridors compared quite favorably against Corridor B with respect to parcels and wetlands crossed; historic properties impacted; and approximate ROW acquisition. In fact, to the extent any new land would need to be acquired along the

[78] I/M/O the Amended Petition of Atlantic City Electric Company for a Determination Pursuant to the Provisions of N.J.S.A. 40:55D-19, BPU Docket No. EE02080521, Orders dated April 20, 2004, and June 15, 2004.
[79] 5T135:15-137:12.
[80] Route Selection and Study Report at 28. [JC-7, PWS-2]

existing tower corridor, it would be heavily wooded land in the Earle Naval Station directly adjacent to the railway tracks currently used for the twin 230 kV lines in question. This route would not have the social, environmental, view shed, historic site, property value or any other major impacts that the MCRP would have. I **FIND** that these were at least promising corridors and ought to have been given some additional consideration, not summary dismissal, but see just below.

While some intervenors spent considerable time on exploring the use of Eaton Crest to supplement power into Red Bank, Eaton Crest receives power through a tap of the Atlantic-Red Bank 230 kV line for service to just the pocket of load right around Eaton Crest. There is no 230 kV transmission line that runs from Eaton Crest into Red Bank, which the Company established by the preponderance of the credible evidence only serves the Eaton Crest load pocket. I **FIND** that Eaton Crest was not a credible alternative, although I also **FIND** that the Route Selection Study team had to have known that Corridors F, I, J-1 and J-2 from Atlantic to Red Bank and any taps off of them were going to be eliminated as soon as they went down on paper. To the extent they did deserve on merit to be eliminated quickly, that fact demonstrates their insincere inclusion in the first place.

As set forth above, Corridors M and N were eliminated for the sole reason that they would require use of ROW at the Earle Naval Weapons Station.[81] Yet, the Table 3 Corridor Comparison shows that Corridors M and N crossed far fewer parcels and impacted far fewer historic properties than preferred Corridor B. Additionally, Corridor N crossed far fewer wetlands, while Corridor M crossed slightly more wetlands than Corridor B. Corridors M and N were shorter routes (just over seven (7) miles) compared to Corridor B's original 10.1 miles.

Corridor H was eliminated for the apparent reason that the study team did not believe it could be built within a certain time period, but the study does not state a specific NERC violation, and Sparhawk could not cite to any. His only explanation for

[81] Route Selection and Study Report at 27 [JC-7, PWS-2.]

why Corridor H was eliminated was for a timing issue.[82] Corridor H, however, also compared quite favorably with Corridor B in that Corridor H crossed fewer parcels, impacted fewer historic properties, crossed fewer wetlands, and had similar acreage requirements to other corridors.[83] In fact, the Corridor H solution -- bringing additional 230 kV support to the Oceanview Substation that could feed the 34.5 kV system from Oceanview into Red Bank -- was noted in the study also to have the beneficial effects of alleviating possible NERC violations between the Larrabee, Atlantic and Oceanview Substations (none of which are related to the current MCRP).[84] The elimination of Corridor H for "timing" reasons seems ill-advised since additional 230 kV support at Oceanview would remedy the current claimed NERC violation as well as other potential reliability violations apparently in existence at Oceanview. [JC-7, Exh. PWS-2 at 29 n.3.] Sparhawk's cross-examination "seems to be saying that Route H could actually end up serving a second reliability project, even if in the future. Which seemed to sound like a positive, not a negative. If you took the timing out of it, it sounded it was a double solution." [6T24:2-9.] I think it is fair to assume, and I **FIND** that Route H might have been capable of "kill[ing] two birds with one stone" was eliminated after a less-than-robust review.

Corridors E and O were the last ones eliminated by the team after being carried over from the Potential Corridor Study to the Route Selection Study but, as stated, both were eliminated by May 29, 2011. The ostensible reasons for their discard was that they (i) required 86 and 68 acres of new rights-of-way acquisition; (ii) would require construction of a three-ring breaker switching station; and (iii) would not address the need to upgrade the Taylor Lane Substation. The study team did not identify how much acreage would need to be acquired or at what price. The team also did not identify either the size, possible location, or costs associated with constructing a three-ring switching station.[85] More tellingly, the Taylor Lane Substation upgrade should not have been a reason for eliminating these corridors, as Taylor Lane runs only along the Preferred Routes A and B, was considered important in order to segment Routes A or B

[82] 6T23:10-24:11.
[83] Exh. JC-7, PWS-2, Table 3 at 27.
[84] Exh. JC-7, PWS-2, at 29, fn. 3.
[85] 5T127:9-129:10.

if there was a blackout, and has nothing to do with either Corridors E or O. This "reason" for eliminating Corridors E and O actually exposes the perfunctory (and pre-determined) nature of the "study:" it demonstrates that the team thought it prudent to eliminate promising corridors because these corridors did not serve the interests of JCP&L's preferred corridor.

Additionally, Corridors E and O when compared with preferred Corridor B crossed fewer parcels, impacted fewer historic properties, and crossed fewer wetlands.[86] Corridor O had the lowest acreage of wetlands crossed and was the shortest of any of the initial seventeen (17) potential corridors; had the smallest amount of ROW acquisition acreage compared to Corridors A and E (again, Route B had "0" listed in that study for new ROW which also provided no NJT ROW lease costs); crossed the GSP without traversing it longitudinally; and, did not interfere with federal government defense access roads. The only apparent negatives were that Corridor O needs a three-ring switching station, the cost of which is not in the record.[87] Thus, it should have appeared and I **FIND** that Corridors E and O were very promising on paper. JCP&L never presented evidence on the price of a three-ring breaker switching station in order to use a tap into an existing 230 kV line.[88] Nor was there any discussion as to why these shorter routes could cost more or impose greater burdens on the local population or environment.

I am not determining that Corridors H, N or O should have been selected instead of the MCRP, but I do **FIND** that many of the alternative corridors were strawmen set up to fail. I **FIND** that these corridors had more potential than JCP&L was willing to give them. While it is true that the corridors that utilized tap points on the Raritan-Atlantic transmission line would require a three-ring breaker switching station and that most corridors would require ROW acquisition, the Company never saw fit to even price those pieces of the puzzle, thus handicapping the study. I **FIND** the Company should

[86] JC-7, PWS-2 at Table 3, at 27.
[87] There was also no price or other comparison to the two-circuit ring bus work required for the MCRP at Freneau Substation. [See page 31 infra.]
[88] There is no evidence in the record on the cost of a three-ring breaker. I cite this published report as just an example, without any evidential weight. Southwest Power Pool Interconnection Facilities Request at 9. https://sppoasis.spp.org/documents/swpp/transmission/studies/files/2013_Generation_Studies/GEN-2013-027-IFS-2014-002-02_FacilityStudy-R1_final_Redacted.pdf

also have included an estimate for the annual cost of the NJT ROW lease, so that this corridor and others could be fairly evaluated.

For the reasons articulated above, the Company's Corridor and Route selection seemed partially driven by its non-essential goal of upgrading the Taylor Lane Substation, notwithstanding that such was not necessitated by the criteria violation. Its definition of "robustness" during testimony and discussion of the strong weight to be given to its choice of the MCRP over alternatives was focused upon using the Project as an opportunity to change some radial 34.5 kV configurations to networked configurations through improvements to the Freneau Substation and the Taylor Lane area.[89] While these improvements are not relevant to the P7 contingency, their inclusion in the Project played an overly prominent role in the selection of the MCRP to solve the P7 violation. During the hearing, JCP&L conceded that this case is solely about the P7 contingency, and that it would not be prudent to pursue the MCRP in the absence of the NERC violation.

Moreover, the team did not study potential acquisition of ROW acreage adjacent to the MCRP route, or how close any new adjacent ROW could be located to it in order to satisfy NERC reliability criteria. Table 3 lists "0" as the acreage for the new rights-of-way necessary to implement Corridor B. As Sparhawk testified, the actual acreage that needed to be acquired from NJT was more than "0," and there was obviously additional acreage that would need to be acquired directly adjacent to the NJT railway line that had not been accounted for in the calculation. This is another example of "loading the dice" or making a fair comparison of corridors impossible, and I so **FIND**. The team also did not consider whether there were exceptions to the NERC corridor requirements, even though Sparhawk was familiar with other transmission builds that used shared corridors, especially in higher-density population areas.[90]

[89] As set forth above at 31, the Taylor Lane Substation upgrades appear to have been related to segmenting the proposed MCRP HVTL. If there was a different corridor or route selected, query whether Taylor Lane would have been relevant nevertheless.

[90] Sparhawk testified that having certain transmission facilities sharing common rights-of-way was not unusual, and actually was a "good" or "favorable" thing in congested areas. [5T125:9-18; 6T32:12-33:13.]

The Company faults the respondents and intervenors who objected to the comparison of routes eliminated during the high level Potential Corridor Study to Routes A and B, which were studied in much greater detail. It also criticized the objectors for relying on a rough estimate of $1,500 per corridor. Yet, the Company is itself to blame for the inability to compare apples to apples here or to know the costs of the study of each potential transmission route. If we all had had better detail on parcels, wetlands, historical properties, etc., as between more of the potential routes, the record discussion would have been better informed.[91] The Company also compared private properties adjacent to the Project as compared to private properties "crossed" by it, in another attempt to minimize numbers of impacted businesses, residents and residences.

Finally, in what I **FIND** to be a less than an objective manner, the Route Selection Study tipped the balance of aesthetic and visual impacts as between Alternate Routes A and B. The team's perspective that monopoles along State Highway Route 35 would be more visually intrusive for drivers and the twenty-two (22) nearby residences than for the 607 residences, not to mention parks and schools, along the NJT ROW was not a fair presentation. Similarly, the Company emphasized throughout its case the existing impacts of the NJT commuter rail line in an outsized manner with virtually no discussion during the Route Selection Study of the existing impacts of living near a four-lane divided state highway with its traffic running 24/7.

With respect to the issue of costs of the alternatives, I **FIND** that it was disingenuous for the Company to freeze its cost analysis of the MCRP at its $111 million mark and then also deliberately fail to put a dollar figure on one of the most essential elements of the Project, namely, the cost to lease and maintain the ROW from NJT.[92] It is clear from the preponderance of the credible evidence that JCP&L made no effort to study or engaged any professional to estimate the cost of the annual easement fees to NJT for the MCRP. [3T218:24-219:16.] The Company's current $450K estimate

[91] In its Reply Post-Hearing Brief, JCP&L stated: "Thus, it is clear that the JMG's attempts to compare the high-level data in the Corridor Screening Study with the more granular and specific data in the Route Selection Study regarding the impact of Routes A and B are misleading and unreliable."

[92] The Company might have had little incentive to attempt to keep the costs reasonable. Because the Project was awarded before the FERC Order 1000 reforms went into place, there is no cost cap on this Project, and the Company can seek to pass along all increases in costs to its base of ratepayers.

reflects only the payment that NJT would require for a Railroad Property Permit allowing initial construction and occupancy within the NJT ROW; JCP&L has not included any estimate for the subsequent annual rental fees that JCP&L will pay to NJT, as those fees will be subject to negotiation and cannot yet be determined.[93] NJT is in position to demand (and exact) an exorbitant fee for such use of its property, and the Company is in no position to drive any type of a reasonable bargain.[94] In sum, I **FIND** that the Company did everything it could to make it difficult for anyone to obtain a fair and accurate comparison to the Preferred Route B.[95]

Non-transmission solutions were ignored altogether. Palermo presented a cogent proposal, later fleshed out with details, of utilizing STATCOMS and reconductoring some thermally overloaded circuits to prevent the P7 event from causing a voltage collapse. I **FIND** that Palermo was a very credible expert witness, with an extensive background. His approach was thorough and balanced, and well-researched. Palermo was knowledgeable about PJM Operating Manuals and planning criteria to a degree that no other witness was, with the possible exception of Sims. [See, e.g., 9T217:8-219:2.] I was not convinced during the course of listening to all the testimony that Hozempa was an unbiased witness and I **FIND** that his critique of Palermo's alternative was more about shooting it down than genuinely understanding it.

While JCP&L found fault with each aspect of his proposal, it actually failed to test for the totality of the alternative to see if there would be no cascading or load loss over 300 MW. As set forth earlier, the primary area of continued disagreement was the means and the cost of reconstructing, reinforcing or reconductoring the three highest of the thermally-overloaded circuits. The Company presented piecemeal criticisms but failed to acknowledge that the reconductoring or reconstruction of those eleven circuits

[93] Janis stated that the Company did not "even try to determine" the costs because "New Jersey Transit actually reserves the right to negotiate those fees." Janis had no experience and no precedence for a project with the scope of the MCRP. [3T193:4-194:25; 3T208:7-209:8.] I do not know if JCP&L estimated the NJT ROW in its earlier petitions.

[94] In fact, the Company gave an estimate of approximately $26 million to obtain the rights-of-way for potential Route A (Route 35) of similar distance to the MCRP. [3T176:10-177:21.]

[95] Similarly, the Company attempted to inject into the case a cost of $8 million for acquisition of two small parcels near the Red Bank Substation that might be required for the STATCOM solution proposed by Palermo. This estimate, inter alia, was stricken from the Hozempa rejoinder testimony, but I cite it here only for the "state of mind" of JCP&L in attempting to continually tilt the playing field.

would be done before the P7 event and should have been factored in as existing changes when the powerflow analysis was undertaken. In other words, the powerflow should have been programmed to assume the STATCOMS and the more modern and several larger conductors as already in service. As I understand it, the result would have been a convergence on a solution and a stable system, and thus, no voltage collapse or further cascading analysis. [10T92:9-96:19.] Instead, the Company kept returning to the "shed load or overloaded circuits" excuse to find that it could not work.

I also **FIND** that the Company did not contradict such:

> Q. [Mr. Mosca] So, if those three 34.5 kV lines that are loaded beyond 125 percent of their emergency rating are properly reconductored or reconstructed, then there is no need to do any further cascading analysis. Is that correct?
>
> A. (Hozempa) If there was reinforcements built into the system that brought the line loading down below 125 percent on those facilities, then we would not be required to do cascading analysis.
>
> Q. And you modelled that very thing that would have brought all of those circuits under their 125 percent limit. Correct?
>
> A. (Hozempa) That is set out in the rejoinder report, the necessary reinforcements to put the system within compliance.
>
> Q. So, in fact, if you were to adopt Mr. Palermo's analysis and recommendations for line construction here, and system reinforcement with the STATCOMs, then you have completely rectified the NERC P7 violation and complied with all PJM and JCP&L criteria. Correct?
>
> A. (Hozempa) If we would do the reinforcements that are outlined in the rejoinder report?
>
> Q. Yes.
>
> A. (Hozempa) That is correct.
>
> [10T98:2-99:2.]

In sum, I **FIND** that the Company failed to undertake any meaningful inquiry into a solution to the P7 violation except the MCRP and failed entirely to consider any non-transmission solutions prior to the filing of the Petition. The fact that it tried to evaluate the costs of Palermo's proposal only in its "last word" rejoinder report in unavailing to it now.[96] I **FIND** that Palermo's comprehensive proposal, while not thoroughly evaluated by any party at the level that it would need to be for presentation to PJM, had genuine potential.

Various parties also raised the issue of the impact of FERC Order 1000 on the P7 solution selection process, or the ability and responsibility of PJM to cancel the Project if the need for it substantially changed.[97] It has been stated that FERC Order 1000 had the salutary twin effects of opening the market to competitive bidding for efficient network solutions to identified reliability issues, and also establishing a method for the successful bidder to cap the total price of the project, thus helping to ensure that the rate-paying public would not be overcharged for the proper solution. PJM awarded the MCRP to JCP&L under the pre-FERC Order 1000 rules such that JCP&L had the right of first refusal and no cap on the Project's cost. FERC Order 1000's timeline fits with the timeline in this matter and might explain the how and why of the Project's instant posture. FERC first issued a Notice of Proposed Rulemaking for what became FERC Order 1000 on June 17, 2010.[98] This rule proposal followed other FERC Orders that had introduced reforms into the electrical grid planning and building industry.[99] The

[96] As earlier testified to by Krauss, the MCRP itself includes reconstructing some 34.5 kV lines, at a cost not clearly differentiated in the Petition. From page 31 above: The Company will be rebuilding 34.5 kV circuit structures within Segment Nos. 5, 6, 7, 8 and 14. The portions of the 34.5 kV sub-transmission circuits that are proposed to be rebuilt are located in the narrower areas of the NJT ROW such that it is not wide enough for separate 34.5 kV and 230 kV pole lines. Accordingly, in those segments, JCP&L plans to place the 34.5 kV circuits on the same poles as the new 230 kV circuit in an underbuild configuration. It also appears to have been an unfair comparison to state that the MCRP would take only twelve to eighteen (12-18) months to begin and complete but that Palermo's alternative would take multiple years. As Hozempa could not support the latter estimates, they are not considered to be competent evidence herein.

[97] Potomac-Appalachian Transmission Highline (PATH) and Mid-Atlantic Power Pathway (MAPP) were both cancelled by the PJM Board on August 24, 2012. http://www.pjm.com/~/media/committees-groups/committees/teac/20120913/20120913-srh-letter-to-teac-re-mapp-and-path.ashx (transmission projects cancelled by PJM because "reliability drivers no longer exist for the project throughout the 15-year planning cycle.")

[98] Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, Notice of Proposed Rulemaking, FERC Stats. & Regs. ¶ 32,660 (2010).

[99] FERC Order 1000, at ¶ 1.

industry knew that FERC was considering these reforms,[100] which might help to explain why JCP&L started this process in January of 2010, to get a head start on a transmission project it had tried (and failed) to build on two prior occasions.[101]

FERC adopted Order 1000 formally with a Final Order dated July 21, 2011. The Order would not become effective in the various RTO territories until each RTO had formally filed a compliance tariff. On September 8, 2011, JCP&L presented to TEAC the MCRP proposal to remediate the potential NERC violation that PJM formally identified as part of the 2011 RTEP process at a vague cost of $22 million. On April 30, 2012, PJM designated JCP&L to construct the MCRP (under the right of first refusal; no cap on costs).[102] On October 25, 2012, PJM formally filed its compliance tariff implementing FERC Order 1000.[103] Had PJM waited until that date to consider the P7 contingency solution, the alleged violation that drove the MCRP would have been subject to FERC Order 1000 review and bidding, and a very different project, at a much lower and capped cost, might have emerged.[104] I cannot make any finding with respect to the potential motivations and timing of the Company in its proposal of the MCRP to

[100] Order 1000, at ¶ 2 ("The Commission appreciates the diversity of opinions expressed by commenters in response to the Notice of Proposed Rulemaking as to whether, in light of the progress being made in many regions, further reforms to transmission planning processes and cost allocation mechanisms are necessary at this time.").

[101] FirstEnergy Services Company explicitly provided initial comments used in the Final Rule, as set forth in the Order, and listed its representation as including Jersey Central Power & Light. Order 1000, Appendix B, at page 588.

[102] Sims explained that even under FERC Order 1000, JCP&L would not have had to solicit proposals or stakeholder input because it was an "immediate need project." [2T230:9-231:2.]

[103] Compliance Filing of PJM Interconnection, L.L.C., Docket No. RM10-23-000, filed October 25, 2012, available online at: https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13096032.

[104] The opponents of the Project argued that transmission projects are financially desirable to the shareholders of FE. In its 2016 Annual Report to Shareholders, FE sets forth in its Executive Summary that its competitive operations have been performing so poorly from a financial perspective that it may be necessary for subsidiary FirstEnergy Solutions Corp. to declare bankruptcy. To offset losses in that part of the business, FE's management is forced to rely on the "solid results" and "stable, predictable earnings and cash flows" of the Regulated Transmission and Distribution businesses "to support FE's dividend." "[T]he transmission system is the centerpiece of [FE's] regulated investment strategy. Rate base is expected to grow 9% over the next five years as the company plans to invest $4.2 to $5.8 billion in capital from 2017 to 2021 as part of [FE's] Energizing the Future transmission plan. JCP&L has already filed an Application with FERC seeking a base return on equity of 10.5% (plus an additional 0.50 percent bonus) to cover investments that would include the MCRP. Rate Counsel and other Intervenors have termed the Company's request as "substantially excessive." See Intervenors' Protest of JCP&L Application for a Formula Transmission Rate, Jersey Central Power & Light Company, PJM Interconnection, L.L.C., Docket No. ER17-217-000 (FERC). Their argument asserts that the greater the costs of transmission projects, the greater JCP&L's cost recovery allowance will be, which in turn increases the profitability of the project. I make no findings on this argument as the BPU is in a better position to judge its strengths or weaknesses.

PJM in relationship to the timing of FERC Order 1000; however, I do **FIND** that the above recitations are accurate representations of the relevant timelines.

Electromagnetic Fields (EMFs)

As can be discerned from the testimony of both Drs. Carpenter and Bailey, the science of the health impacts from exposure to EMFs is unsettled. I **FIND** that both Dr. Bailey and Dr. Carpenter were articulate in their reasoning for or against different studies and their results. There are cogent reasons why different weight might be assigned to animal studies as compared to epidemiological ones, and vice versa. I certainly did not find Dr. Carpenter to be eccentric but rather an individual who has dedicated his professional life to public health and has been involved with a well-respected group of physicians, public health professionals and others on the issue of EMFs. His opinion that studies that are in whole or part funded by the regulated utility community could be biased is certainly not novel to this or any field. He also adequately explained why animal studies do not apply to childhood leukemia. Nevertheless, I **FIND** that the scientific testimony in this case is in equipoise and that neither side has been persuasive based upon the preponderance of the evidence standard.

Further, King's estimates of the impacts of EMFs fading with distance were not disputed. Dr. Bailey concurred with King that the electric fields are low at the edge of the ROW and will be even lower once one gets past the buffer of shrubbery, trees, fences, buildings, etc. Existing lines and especially the NJT track circuits are the major sources of magnetic fields both before and after the project. The MCRP's increase in the magnetic field at the edges of the ROW above the magnetic field from the existing lines will be present but small—less than 10 mG, and I so **FIND**. Nevertheless, I acknowledge Dr. Carpenter's opinion as a public health expert that a 10 mG increase at the edge of the ROW is not "small." The 2007 WHO report, while questioning the experimental evidence of mechanism or causation, stated that the epidemiological data "show an association between ELF magnetic field exposure and an increased risk of childhood leukemia."

It appears to be consensus in the scientific and medical community that there is a statistically significant association between EMFs and childhood leukemia and adult Alzheimer's disease but the causation or mechanism is not known or understood. I understood Dr. Carpenter's argument that causation should not stand in the way of imposing public health standards to safeguard against known associations between EMFs and childhood leukemia. However, even he cited to the fact that the number of cases of childhood leukemia worldwide that might be attributable to EMF exposure can be estimated to be less than five (5%) percent and maybe as low as two-tenths (0.2%) percent of the total annual incidence of leukemia cases. It was noted by all witnesses on this subject that exposure to other household sources of magnetic fields also elevate the risk of childhood leukemia. Children will be exposed to magnetic fields from household wiring, proximity to electric appliances, and exposures at school and play sites. The association between exposure to magnetic fields and adult cancer is even weaker.

Yet, as discussed throughout these proceedings and this decision, the distance from this proposed HVTL is much closer than recommended by even the Company. A typical transmission line consists of a wide ROW with the utility structures located in the middle of that ROW. In those circumstances, the HVTLs are normally located about as far from the edge of the ROW as can be practicably accomplished, which in turn minimizes the risk of exposure to unreasonably high levels of magnetic field emissions. The MCRP is not such a project. It will consist of monopoles erected approximately fifteen (15') feet to the outer edge of the ROW to an existing commuter rail line, the NJT North Jersey Coast Line. Moreover, that small portion of the ROW before private property contains the monopole structure without any allowance for its base width.

In a recent BPU case, JCP&L petitioned for the construction of a new sixteen-mile 230 kV transmission line that would be constructed in part with new monopoles and in part by replacing existing structures with monopoles, all within JCP&L's existing transmission right-of-way. In The Matter Of The Petition Of Jersey Central Power & Light Company Pursuant To N.J.S.A. 40:55D-19 For A Determination That The Oceanview 230 kV Transmission Project Is Reasonably Necessary For The Service, Convenience Or Welfare Of the Public, BPU Docket No. EO14030281 (January 1,

2015) (Oceanview). Dr. Bailey and King also presented testimony in that proceeding that appears to be much the same as they presented here, but which was unopposed. Despite the fact that in Oceanview there was no significant opposition to the project and no rebuttal testimony, the BPU expressed concern about the EMF health risk. It mandated that JCP&L conduct additional field readings of the EMF exposures post-construction in order to assure that its estimated exposures were consistent with actual readings. Id. at 13. Oceanview demonstrates that HVTLs may present a public health risk and are a concern to the BPU.

Nevertheless, I do not **FIND** that the medical evidence on potential health risks and increased cases of cancer is definitive and can be relied upon as settled science for purposes of the MCRP's impact to health to the residences and schools/parks that lie in its shadow. I also **FIND** that despite some strong epidemiological evidence, state, national and international public health standards for exposures to EMFs have not adopted Dr. Carpenter's recommendations. Accordingly, I **FIND** that the public health risks of EMFs will not inform my decision on the approval sought herein, but I would recommend that the BPU require post-construction measurements and mitigation if the MCRP is approved.

As stated below in the next sub-section, however, the science of EMFs is unable take into account human psychology and perception on such a volatile topic as increased risks of childhood cancer and senior dementia.

Real Estate Impacts

Any market-driven value is by definition driven in part by the emotions of human beings, albeit rational or not, who are buying and selling in the relevant market. If people generally believe that a house is haunted by ghosts, and that belief becomes widely held, then the price of that house will be impacted by the subjective fears of potential purchasers, notwithstanding several experts testifying that ghosts are not real phenomena. This perception of EMF health risks is very real to the public, and as admitted by the Company's witness, it exists irrespective of whether the science actually supports the perception.

The testimonies of McHale for JCP&L and Dr. Moliver for RAGE were at odds with each other, notwithstanding that they relied upon some of the same studies. It should be noted that neither was able to locate a study on the real estate market impacts of a ROW shared by both a commuter railway and a 230 kV transmission line. Apparently, there are no such studies because there is no evidence in the record that any such co-locations exist in this country. McHale reviewed some study abstracts on residential real estate market adjustments for an HVTL and opined that half the studies show no negative effect and half show very little. Dr. Moliver found that some of those studies were from small samples, or with greater ROW widths than the MCRP or unknown widths. He also cited a study omitted by McHale that demonstrated up to a negative ten (10%) percent market devaluation in the presence of an HVTL. In contrast, McHale opined without any factual underpinnings that the monopoles will add no new impact and even if some, would be slight and fade quickly.

An expert must be able to identify the factual basis for his conclusion, explain his methodology, and demonstrate that both the factual basis and underlying methodology are scientifically reliable. The New Jersey Supreme Court has stated:

> [L]itigation involving multiple causations or long-term exposure to toxic substances, it may not be possible scientifically for an injured person to prove decisively the medical cause of the injury. Faced with the need to accommodate the goals of our tort system when the scientific community was in disagreement, this Court adopted a less restrictive standard in Rubanick v. Witco Chemical Corp., 125 N.J. 421 (1991), for the admissibility of scientific evidence. That same standard is to be used in weighing the credibility of opinion evidence presented by experts. Given that the only significant distinctions between Rubanick and the present case are the forum and the quantum of damages recoverable, the Rubanick standard governing the admissibility and reliability of medical causation evidence should be applied in workers' compensation cases as well. See, e.g., Kemp ex rel. Wright v. State, 174 N.J. 412, 809 A.2d 77 (2002) (applying Rubanick in non-toxic tort case).
>
> [Lindquist v. City of Jersey City Fire Dept., 175 N.J. 244, 261 (2003)]

Further, N.J.R.E. 702 instructs that "[i]f scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify thereto in the form of an opinion or otherwise." See also N.J.A.C. 1:1-15.9(b).

> Thus, an expert "must possess a demonstrated professional capability to assess the scientific significance of the underlying data and information, to apply the scientific methodology, and to explain the bases for the opinion reached." Anderson v. A.J. Friedman Supply Co., 416 N.J. Super. 46, 72 (App. Div. 2010) (quoting Rubanick v. Witco Chem. Corp., 125 N.J. 421, 449 (1991)).
>
> Admissibility turns on three basic requirements:
>
> (1) the intended testimony must concern a subject matter that is beyond the ken of the average juror; (2) the field testified to must be at a state of the art such that an expert's testimony could be sufficiently reliable; and (3) the witness must have sufficient expertise to offer the intended testimony.
>
> [Hisenaj v. Kuehner, 194 N.J. 6, 15, 17 (2008).]
>
> [In re R.J., 2011 N.J. Super. Unpub. LEXIS 900, *14 (April 13, 2011) (standard applied to administrative law case)]

Support for an expert's methodology may be found in professional journals, texts, conferences, symposia, or judicial opinions accepting the methodology. In re Accutane Litig., 451 N.J. Super. 153, 199 (App. Div. 2017).

Applying these standards, I **FIND** that Dr. Moliver's expert opinion is entitled to greater weight than that of McHale. I **FIND** that McHale's credibility was undermined by his careless quotation of synopses of studies he never read. He utilized a general search engine that returned results for terms "effect of HVTL at 15 ft" and followed a link to a New Hampshire Siting Commission webpage, copied the summaries, and deleted the attribution footer from his reprint. [4T150:2-153:12; Exh. RAGE-34.] As reluctant as I am to express this, in my opinion, such "scholarship" by a student would produce an

"F" and subject one to claims of plagiarism. It is certainly not the work product of a professional entitled to much weight to count the number of supportive studies versus the number of unsupportive studies without regard for the study criteria and quality. The merits, depths, sampling size, and commonality must be taken into account before a study can be cited as persuasive to a novel setting. I also **FIND** that his opinion as an expert witness was blended with several lay perceptions that fell outside the scope of his presentation for the Company and were unverified. [See, e.g., 4T72:25-73:2.]

This commuter train was established in the 1880s on a non-modern ROW. It has both positive attributes to the community, e.g., charm, convenience, as well as negative attributes, e.g., noise, unaesthetic elements. The train also only runs between 5/6 a.m. and 11/12 p.m., with a once-hourly schedule during the non-rush-hour parts of the day. While there are a number of residences close to it that will also be close to the MCRP, trees and vegetation have grown over the decades to buffer the sight and sound of the trains. The Company and several of its witnesses, especially McHale, noted that NJT has the right to clear its ROW of trees or vegetation that interfere with the operation of the trains; yet, the fact that it has not weighs against utilization of that hypothetical as an argument for why the MCRP will add zero new impact to the real estate values of those properties. It is not hypothetical that JCP&L will undertake substantial vegetation management, extend the ROW for priority tree-trimming, and take other measures that will impact the real estate values of these properties; not to mention the towering shadow of 135' steel monopoles. MCRP will affect property values along the route, and will affect these values negatively and substantially. The tall poles and wires are an eyesore, pure and simple. The company cannot hide them with trees – they are just too tall and too obtrusive.

As stated earlier, there may be a good reason why there are no studies on the dual impact of a commuter rail line and 230 kV transmission lines on monopoles considerably taller than the more traditional eighty (80') foot ones. While JCP&L relies for many of its factual points and arguments on the Board's encouragement of co-existing use of a ROW by railroads and HVTLs, it defies logic to bootstrap that regulatory subsection to explain the lack of studies or other HVTL projects which demonstrate the compatibility of that co-existence. In sum, I **FIND** that the

preponderance of the credible evidence supports a negative ten (-10%) real estate impact on the residential market because of both the height of the proposed monopoles and the narrowness of the ROW, which will not be offset by the North Jersey Coast Line tracks currently buffered and running only on a commuter schedule.

Environmental Impacts

There was no testimony offered in direct contradiction to Cronin for JCP&L on the environmental permits that will be required or the environmental impacts of the MCRP. Nevertheless, it was clear from her statements that she was never brought into the Potential Corridor Study before it concluded so we have no competent comparative information of the amount and degree of environmentally significant areas for other potential 230 kV lines into the Red Bank Substation. At least for the MCRP route, the impacts are exacerbated by the height of these monopoles, required because of the shared NJT ROW, and at the wetlands near the Navesink River where the poles will be 210' and the foundations correspondingly larger, and I so **FIND**. Nevertheless, for reasons articulated by Cronin and others, I **FIND** that the preponderance of the credible evidence demonstrates that the MCRP should not be built underground. It is clear that environmental impacts associated with overhead transmission lines are limited to the footprint of the monopole foundations, while impacts associated with underground transmission lines would occur over the entire length of the Project.

Vegetation Management and Aesthetic Impacts

As stated above, the fact that NJT could but never has removed vast swatches of vegetation and trees from its ROW is not an argument that I would consider in favor of the Company's position here. Korn stated that it is already known that there must be vegetation clearance throughout the sixty (60') foot wide corridor of the monopoles. This will be forty-five (45') feet on the rail side, and fifteen (15') feet on the opposite side. With respect to property that is outside the ROW, JCP&L's professionals or contractors decide which trees are "priority trees" and must be removed to protect the HVTL. Korn stated that a priority right-of-way easement will be obtained from any impacted homeowners before JCP&L makes the determination as to which trees must be trimmed or removed, but the homeowners cannot voice much, if any, objection or

opinion in that process. Various methods of trimming are used by JCP&L, including, but not limited to, aerial saws, but Korn represented that those are not used near residences.[105] Mitigation in the form of new fencing and some forms of plantings will be offered by the Company.

FirstEnergy's policy, as set forth on their public website, states:

> Changes to grade elevations within the FirstEnergy transmission right-of-way are NOT permitted. Ground disturbance or excavations are NOT permitted within 50 feet of any FirstEnergy structure (poles, towers, guys, etc). In the event that the easement width from the structure foundation is less than 50', the distance from the structure to the edge of the easement will be the distance used.
>
> ***
>
> All vegetation on or adjacent to the right-of-way shall be low growing. Vegetation that promotes a low-growing plant community of grasses, herbs and shrubs that are 3-5 foot maximum mature height, (3-foot in N.J.) are permitted on FirstEnergy transmission rights of way, however it is preferred that the planting of any woody vegetation be done outside the wire zone of transmission facilities. (The wire zone is the area directly under the conductors and extending to about 15' on each side.) All approved shrubbery planted near FirstEnergy structures (poles, towers, guys, etc.) shall allow for working area and accessibility at ground level. (No closer than 10-feet from the structure, in any direction).
>
> [https://www.firstenergycorp.com/content/customer/help/safety/real-estate-power-lines/transmission-right-of-way.html (emphasis in original)]

I **FIND** that the vegetation removal could be extreme in this matter and undermine the buffering qualities of what has grown between and since the installation of the North Jersey Coast Line in the 1880s and today's residential structures. Because little information is available on alternative transmission routes, the relative amounts of vegetation removal cannot be known. I did not find either set of visual representations

[105] I **FIND** that the potential use of an aerial saw, a concern raised by RAGE, is a non-issue. The Board and the utility companies have professionals who oversee, monitor, and exercise the latter's tree management responsibilities. There is no reason to doubt that the right tool will be used for the job.

of the post-construction scenes to have been accurate or particularly helpful. Yet, I do **FIND** that common sense dictates that monopoles of 135' height fifteen (15') feet from the edge of the ROW will have disproportionately greater aesthetic impacts on the local communities than more traditional 80' monopoles in the middle of a hundred or more (100'+) foot ROW.

Acquisition Issues

Either JCP&L or NJT, or both, have studiously avoided completing negotiations for the Railroad Occupancy Permit and its corresponding costs. Notwithstanding that a Railroad Occupancy Permit from NJ Transit will provide the Company with the majority of its land use needs, I **FIND** that it is a significant gap in the presentation of this Petition that it failed to even place a price range on the record for that use. I have no doubt that any other permitting requirements for the MCRP or any other alternative will be pursued in a timely and thorough manner.

Miscellaneous Community Impacts and Public Opinion of MCRP

As Irving, a Rutgers economist, testified, his scope of assignment was to produce a calculation of the economic benefits of the MCRP being constructed. He was never instructed or given the required information to evaluate any of the other corridors. In fact, Irving's report was prepared on the basis of cost estimates that pre-dated the $111 million estimate for the Project. He admitted that if an alternative to the MCRP were to be approved and built, then it, too, would generate economic benefits for New Jersey.

LEGAL DISCUSSION

Legal Standard/Burden of Proof

In this administrative proceeding, the Company has applied for a waiver from local municipal approvals that might otherwise be required for it to construct the MCRP, pursuant to N.J.S.A. 40:55D-19. That provisions sets forth:

> In such case appeal to the Board of Public Utilities may be taken within 35 days after action by the governing body. A hearing on the appeal of a public utility to the Board of Public Utilities shall be had on notice to the agency from which the appeal is taken and to all parties primarily concerned, all of whom shall be afforded an opportunity to be heard. If, after such hearing, the Board of Public Utilities shall find that the present or proposed use by the public utility or electric power generator of the land described in the petition is necessary for the service, convenience or welfare of the public, including, but not limited to, in the case of an electric power generator, a finding by the board 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 utility or electric power generator may proceed in accordance with such decision of the Board of Public Utilities, any ordinance or regulation made under the authority of this act notwithstanding.
>
> This act or any ordinance or regulation made under authority thereof, shall not apply to a development proposed by a public utility for installation in more than one municipality for the furnishing of service, if upon a petition of the public utility, the Board of Public Utilities shall after hearing, of which any municipalities affected shall have notice, decide the proposed installation of the development in question is reasonably necessary for the service, convenience or welfare of the public.

The purpose of the statute is to authorize the Board to exempt a public utility from local ordinance control when the interests protected by the local zoning regulations need to be subordinated to the "broader public interest" served by the public utility, N.Y. Central R.R. v. Borough of Ridgefield, 84 N.J. Super. 85, 94 (App. Div. 1964), and when the Company has made the necessary presentation.

It is well-established that this provision means that JCP&L has the burden of proof on the need for the MCRP, the feasibility of the company's method, plans and actions, and the consideration given to alternatives, as well as the suitability of the site chosen for the proposed structure(s).

> "The hearing before the board on the utility's petition to establish a discordant use in a prohibited zone was not intended by the Legislature to be simply a pro forma approval of management's decision. In re Application of Hackensack Water Co., [ ] 41 N.J. Super., at [408], 419 [App. Div. 1956]. Otherwise the requirement in the statute for notice to the affected municipality (which was given in this case) would have no particular point. Further consideration of the matter should not be limited to the ordinary factors which govern a decision as to whether the public convenience and necessity will be served by a course of operation or conduct proposed by a utility. The issue is broader: (a) Is the projected deviation from the zoning ordinance sufficiently necessary for the convenience and welfare of the public in connection with the service provided by the utility to warrant its authorization; and (b): If so, can the impact of the discordancy on the locality be lessened by imposition of reasonable conditions designed to preserve aesthetic and other relevant zoning considerations?" In re Monmouth Consolidated Water Co., 47 N.J. 251, 259 (1966).
>
> [In re Petitions of Public Service Electric & Gas Co., 100 N.J. Super. 1, 12-13 (App. Div. 1968)]

It has also been held that the Board may condition any approval under N.J.S.A. 40:55D-19 on reasonable modifications that more appropriately balance the local public interest with the broader utility franchise area's interest.

> Suffice it now in recapitulation merely to say that the Board's obligation is not a perfunctory one; it is called upon to inquire diligently and act positively and affirmatively to properly discharge the duty, implicit in the statute, of accommodating local interests of consequence in the light of the broader public welfare which has to be served and is entitled to primary consideration. This can frequently be done by the Board's imposition, fully within its powers, of reasonable conditions designed to preserve relevant zoning considerations or to apply some, but not all, of local zoning ordinance provisions. While the choice as to location and method of additional facilities rests in the first instance with utility management, we are clear that the Board does have the authority to require modifications, including changes in route, where important local considerations can be given recognition without sacrificing the wider public interest.
>
> [State v. Jersey Central Power & Light Co., 55 N.J. 363, 370-71 (1970)]

The New Jersey Supreme Court has also stated that the "[a]lternative 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., 35 N.J. 358, 377 (1961). Still further, considerations when judging the sufficiency of this Petition must go beyond engineering and economic factors:

> We do not read this language of the court [in In re Public Service Electric & Gas Co., 35 N.J. 358, 381 (1961)] as an expression that the Legislature has imposed upon the Board an affirmative role of planner on a regional basis, in the same way that the Legislature has conferred planning functions upon county and municipal planning agencies, on a more limited geographical basis. Rather, we interpret the quoted statement as expressing the view that the Board, in exercising its powers in situations such as this, must take into consideration not merely the engineering and economic aspects of the project, but also planning considerations, including those of an aesthetic character, in the balancing of interests.
>
> [In re Petitions of Public Service Electric & Gas Co., 100 N.J. Super. at 14-15]

More recently, the legal standards implicated in the statute have been expressed thusly:

> N.J.S.A. 40:55D-19 [ ] requires the Board to find that "the present or proposed use by the public utility . . . is necessary for the service, convenience or welfare of the public . . . and that no alternative site or sites are reasonably available to achieve an equivalent public benefit, the public utility . . . may proceed in accordance with such decision of the [Board], any ordinance or regulation made under the authority of this act notwithstanding." In making its determination, the Board must consider the site, the community zoning plan and zoning ordinances, the physical characteristics of the plot, and the surrounding neighborhood. In re Pub. Serv. Elec. & Gas Co., 35 N.J. 358, 377 (1961). When determining reasonable necessity, the Board must consider alternative sites and their advantages and disadvantages, including their costs. Ibid. The Board also must weigh all of the parties' interests, and where those interests are equally balanced, it must give the utility

> preference in light of the Legislature's clear intent that the broad public interest to be served is greater than local considerations. In re Monmouth Consol. Water Co., 47 N.J. 251, 258 (1966); Pub. Serv., supra, 35 N.J. at 377.
>
> [In the Matter of the Petition of South Jersey Gas Company for a Determination Pursuant to the Provisions of N.J.S.A. 40:55D-19, 447 N.J. Super. 459, 480-81 (App. Div. 2016)]

Further, in In re Monmouth Consolidated Water Co., 47 N.J. 251 (1966), the Court said that in applying N.J.S.A. 40:55D-19, the Board must consider --

> the suitability of the locus chosen for the utility structure, the physical character of the uses in the neighborhood, the proximity of the site to residential development, the effect on abutting owners, its relative advantages and disadvantages from the standpoint of the public convenience and welfare, whether other and equally serviceable sites are reasonably available for purchase or condemnation which would have less impact on the zoning scheme, and last but by no means least, whether any resulting injury to abutting or neighboring landowners can be minimized ... . The board should weigh all of these factors and while no controlling weight should be given to purely local considerations, they should not be ignored.
>
> [Id. at 259-60.]

Out of the above-referenced law, JCP&L refers to the earliest Appellate Division case with respect to a utility's burden of evaluating alternatives to a chosen project:

> No hard and fast rule may be laid down on this score. We do not think it obligatory on the utility to set up a lot of straw men and then knock them down. As part of its case in establishing basic necessity for the improvement itself apart from the location it should, however, show that the means or method proposed to meet the public need is reasonable and desirable, perhaps in relation to customary practices and methods in the industry and the company's existing methods, as well as any other pertinent factors, including any substantially greater expense of an alternative method which might be reflected in higher charges to its customers. Beyond this, the burden of demonstrating a feasible alternative method ought to devolve on the objectors, as should a showing of alternative sites beyond those brought forward by the applicant.

> [I/M/O Application of Hackensack Water Co., 41 N.J. Super. 408, 426-27 (App. Div. 1956) (emphasis added by Petitioner)].

I **CONCLUDE** that the burden of proof remains on JCP&L to show that the deviation from the local municipal zoning regulations is sufficiently necessary for the convenience and welfare of the public in connection with the service to be provided by the utility through this particular facility to warrant its authorization. The Board, and therefore this forum as well, is required to balance the engineering method, economic aspects, planning considerations, aesthetic character, local concerns, and broader general public interests in order to determine if the Company's proposal meets the statutory requirements.

Precedent For or Against Approval

Unlike the 1968 determination in favor of Public Service Electric & Gas, the evidence here has not "overwhelmingly demonstrated the need" for the MCRP. Nor has the record "pointed inexorably to the tremendously increased demand for electric power in the near future." To the contrary, the great weight of the factual evidence shows that demand is decreasing in the Company's service territory due most likely to end user efficiency, conservation, and flat growth. Cf. In re Petitions of Public Service Electric & Gas Co., 100 N.J. Super. 1, 7 (App. Div. 1968) (Most feasible route for the Holland-Branchburg leg, considering cost and minimum damage to private property, would be a two hundred (200') foot right-of-way immediately adjacent to and abutting New Jersey Power and Light Company's right-of-way.).

JCP&L has emphasized over and over again that the MCRP should be approved because it is the one route alternative that relies upon a shared ROW with NJT. N.J.A.C. 14:5-7.1(a)(1). It is one of its primary arguments. The regulation sets forth:

> (a) Whenever an EDC constructs an overhead transmission line, it shall:
>
> 1. Make use of available railroad or other rights-of-way whenever practicable, feasible and with safety, subject to agreement with the owners;
>
> 2. Locate towers whenever practicable and feasible in accordance with the topography so as to minimize their appearance; and
>
> 3. Establish a program of painting towers initially and periodically in order to camouflage their appearance as much as possible and to the extent consistent with the need for protection.
>
> (b) An entity that conducts vegetation management under an overhead transmission line shall comply with the standards for vegetation management set forth in N.J.A.C. 14:5-9.
>
> [N.J.A.C. 14:5-7.1]

This regulation is cited approximately twenty (20) times in the Company's post-hearing submissions.

JCP&L argues that the Board's long-established support and encouragement for the use of railroad and other rights-of-way for transmission line projects is similar to the approach of utility commissions in other states, citing Petition of Vermont Transco, LLC, 2008 Vt. PUC LEXIS 83 at *41-42 (Vermont Public Service Board, Mar. 27, 2008). Vermont Transco was a proceeding seeking authority to condemn property needed for easement rights to allow construction of transmission lines, and out of which JCP&L highlights, among other things, that:

> ... co-location along an existing railroad corridor should minimize the impacts of the Project across the Property. VELCO's proposal to follow the existing railroad corridor avoids a much more significant view by the public if the 115kV line were to follow the Bachand Reroute. Furthermore, since the existing railroad corridor is well-established, the land use associated with the existing right-of-way has had ample time to adapt to the presence of the existing corridor.

Yet, the Company fails to note significant distinctions between this Vermont approval and the present Petition. There, the Public Service Board was considering (1) the condemnation of one piece of private property 4,100 feet long; (2) for a one hundred (100') ROW; (3) adjacent – not within – a railway ROW; (4) of average pole height of 65.5 feet; (5) for HVTL of only 115 kV; and (6) on property that has "some aesthetically pleasing qualities, as it is open fields and hedgerows with some local views, but it is not an area with outstanding scenic or visual resources." [Id. *38] In addition, I note that no "other states" were cited (or found).

Our Supreme Court has noted: "[t]he aesthetic impact of a 90-foot monopole in an industrial zone, however, will be minimal. In another case, a comparable structure in a residential area could impose a more substantial impact." New Brunswick Cellular Tele. Co. v. Borough of S. Plainfield Bd. of Adjustment, 160 N.J. 1, 17-18 (emphasis added). Accord, Cell South of N.J. v. Zoning Bd. of Adjustment, 172 N.J. 75, 91 (2002) ("the increasing size of wireless facilities continues to give us pause"); Smart SMR v. Fair Lawn Bd. Of Adjustment, 152 N.J. 309, 331 (1998) ("[i]n sum, whether or not a

radio transmission tower or monopole will substantially impair the character of a neighborhood will depend on the circumstances of the case.") Thus, our Supreme Court has repeatedly acknowledged that tall monopoles present an inevitable question of adverse impact on aesthetics and property values.

Most of JCP&L's current HVTLs have monopole heights of just over eighty (80') feet. In this Petition, the extra-tall monopoles necessary to support 230 kV lines and clear the NJT catenary lines also require large bases of up to ten (10') feet in diameter, with engineered foundations dug into the railway ROW, which in some instances must be placed directly adjacent to the tracks.[106] The Company has failed to determine what effect the active use of this railway would have upon the stability of the poles and lines. I also repeat that this historic North Jersey Coast Line is itself on a very narrow ROW of one hundred (100') feet; even less in some segments. While the Company cites the ROW as "approximately 100 feet," the evidence establishes that such is clearly not the case for several of the monopole structures near Red Bank, and likely for numerous of the other monopoles where preliminary engineering freely utilized "+/-" to estimate the widths. [See Note 8, supra.] Berger was told by JCP&L that the ROW should be one hundred and twenty (120') feet[107] and PJM's own technical requirements indicate that 230 kV HVTLs should be constructed on a ROW of 150'.[108]

Moreover, there is more than just a little aesthetic or local impact from the MCRP. The MCRP would visually impact seventy-three (73) historic properties, including many located in the heart of the historic district in Middletown.[109] This makes the route of the Project by far the most intensive intrusion of historic properties of any of the potential corridors. As also found above, the health risks of EMFs as scientifically

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[106] See JC-2 at Exh. SMH-1 Rebuttal, page 6, where Humphrys explains that "the transmission line is now approximately 10 miles in length and routed along the NJ Transit railway. Based on this routing, 108 structures were assumed due to the curvature of the railway corridor. Helical or micropile foundations are now required due to the proximity of the railway tracks. More extensive access roads are needed along the railway corridor. Some of the project management and construction management costs were increased based on recent NJ transmission projects."

[107] Sparhawk testified that the desired width for a 230 kV transmission line provided to Berger by JCP&L was one hundred and twenty (120') feet. [JC-7, Exh. PWS-2 at 4.]

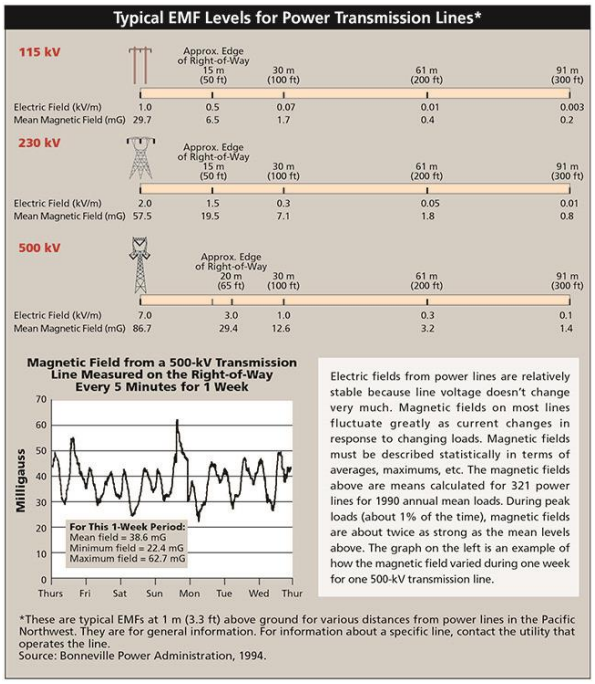
[108] See Table 1, http://www.pjm.com/-/media/planning/design-engineering/maac-standards/20020520-va-general-criteria.ashx?la=en

[109] Id. at Table 9. Table 9 identifies seventy-three (73) Historic Properties and seven (7) "previously identified archaeological sites" within one-half of a mile of Route B.

measured and/or subjectively perceived is a factor peculiarly borne by the five municipalities the MCRP will run through. The NIEHS website has maintained:

> *What if I live near a power line?*
>
> It is important to remember that the strength of a magnetic field decreases dramatically with increasing distance from the source. This means that the strength of the field reaching a house or structure will be significantly weaker than it was at its point of origin, as you can see below. For more information, see the NIEHS educational booklet, "EMF: Electric and Magnetic Fields Associated with the Use of Electric Power." This booklet, prepared in 2002, contains the most recent NIEHS research on health and powerline electric and magnetic fields. The World Health Organization website has information prepared in 2010. For example, a magnetic field measuring 57.5 milligauss immediately beside a 230 kilovolt transmission line measures just 7.1 milligauss at a distance of 100 feet, and 1.8 milligauss at a distance of 200 feet.[110]
>
> [https://www.niehs.nih.gov/health/topics/agents/emf/index.cfm (June 15, 2017)]

[110] The website also contains this chart:



If this were a typical ROW for a HVTL, I do not believe we would be having a serious debate about EMFs. Yet, we are because this is a very narrow ROW where a mere "15' feet" gains relevance for the citizens and businesses located along the Project. The scientific and health risks of EMFs is a debate I could not adequately determine but I did not need to reach it for all the other reasons already set forth. Nevertheless, it is an element that the Board should take into consideration.

In sum, I **CONCLUDE** that there is no in-state or national precedent for the co-location of a 230 kV transmission line within a narrow railway in close proximity to hundreds of residential properties, as proposed by JCP&L.

CONCLUSIONS OF LAW

I **CONCLUDE** that JCP&L has not met its burden of proof under N.J.S.A. 40:55D-19 and that N.J.A.C. 14:5-7.1 cannot save its application.[111] In this instance, the use of this particular NJT ROW for 230 kV monopoles of an average height of 135' and maximum height of 210' is untried, untested, and likely infeasible due to its narrow width, age, and proximity to residential communities. Furthermore, the aesthetic, real estate, and environmental impacts on the five communities is overwhelming and is not offset by the interests of all JCP&L ratepayers, that is, the general public, because this particular project is geared to a resolution of a highly improbable P7 violation that could cause a blackout in the Red Bank area and only that area. As articulated by Hozempa upon my questioning:

> MR. HOZEMPA: Well, because that particular contingency did not solve in the powerflow model, which indicated there was something going on.
>
> JUDGE COOKSON: Something going on – how did you know where it was?
>
> MR. HOZEMPA: Because we took the two lines out between Atlantic and Red Bank. And when you take those two lines

[111] During the hearings, PJM concurred that JCP&L will not suffer any financial penalties if the Board rejects the MCRP. Both PJM and JCP&L agree that if the MCRP is not approved, they will return to the planning stage and find another way to solve the P7 contingency. [2T175:11-178:10; 180:8-181:25.]

> out, the powerflow doesn't find a solution. So, that indicates for that particular contingency there's a problem.
>
> Now, we know that those lines serve from Atlantic to Red Bank, or actually, the lines feed from Atlantic into the Red Bank load pocket. That's where the power start [sic] and into the Red Bank substation, that indicates that's the area that's going to have the issues when those two lines have a contingency on them.
>
> [10T22:2-22.]

I further **CONCLUDE** that the Company set up "straw men" alternatives offensively and not in the unnecessary manner referred to in Hackensack Water. JCP&L failed to give much more than short shrift to alternative corridors and ignored non-transmission solutions entirely. An examination of the details, inclusive of the costs, of the alternative routes was never undertaken, In re Public Service (1961), and certain indispensable line items for the MCRP were deliberately left blank. A somewhat more detailed review of Route B does not satisfy JCP&L's responsibilities here.

The evaluation directed by JCP&L was both pre-emptive in the timeline of the "need" for the Project and created an unlevel playing field tipped in its obvious favor. This is not a close case of general public interest versus parochial interest, with a tie going to the public utility company. I **CONCLUDE** that JCP&L's application for municipal waivers pursuant to N.J.S.A. 40:55D-19 must be denied because the Company has not supported its application by the preponderance of the relevant and admissible evidence. The MCRP is not a safe or reasonable response to the potential P7 violation.

It is recommended that JCP&L be required to undertake the following:

1. Establish an STS as a contingent and temporary measure to prevent peak load blackout of greater than 700 MW loss, to be armed for only the minimally necessary peak load hours of the summer while further considerations are undertaken.

2. Replace or upgrade the three to eleven (3-11) 34.5 kV older and potentially overloaded conductors within the next two years.

3. Hire a neutral engineering firm, from a list created with input from all active parties hereto and selected from that list by the Board, to undertake a new Study of Routes and Alternatives, inclusive of both HVTL and non-transmission (e.g., STATCOMS), as solutions to the P7 violation, without regard to any upgrade to Taylor Lane or Freneau Substations.

ORDER

For the reasons set forth at length above, it is herein **ORDERED** that the petition of Jersey Central Power & Light for a determination pursuant to N.J.S.A. 40:55D-19 that the Monmouth County Reliability Project is reasonably necessary for the service, convenience or welfare of the public is and the same is hereby **DENIED**.

I hereby **FILE** my initial decision with the **BOARD OF PUBLIC UTILITIES** for consideration.

This recommended decision may be adopted, modified or rejected by the **BOARD OF PUBLIC UTILITIES,** which by law is authorized to make a final decision in this matter. If the Board of Public Utilities does not adopt, modify or reject this decision within forty-five (45) days and unless such time limit is otherwise extended, this recommended decision shall become a final decision in accordance with N.J.S.A. 52:14B-10.

Within thirteen days from the date on which this recommended decision was mailed to the parties, any party may file written exceptions with the **SECRETARY OF THE BOARD OF PUBLIC UTILITIES, 44 South Clinton Avenue, P.O. Box 350, Trenton, NJ 08625-0350,** marked "Attention: Exceptions." A copy of any exceptions must be sent to the judge and to the other parties.

March 8, 2018
DATE

GAIL M. COOKSON, ALJ

Date Received at Agency: 3/8/18

Date Mailed to Parties: 3/8/18
id

APPENDIX

LIST OF WITNESSES

For Petitioner JCP&L:

Scott M. Humphrys

Theodore R. Krauss

Kyle Whisner

Lawrence A. Hozempa

Mark L. Sims

Kyle G. King

William H. Bailey, Ph.D.

Mark G. Korn

Tracey J. Janis

Jerome J. McHale

Kirsty Cronin

Peter W. Sparhawk

Will Irving

For Respondent Rate Counsel:

Peter J. Lanzalotta

For Respondent BPU Staff:

None.

For Intervenor Joint Municipal Group:

None.

For Intervenor RAGE:

Donald M. Moliver, Ph.D

P. Jeffrey Palermo

Michael Basch

Stephen Lunanuova

David O. Carpenter, M.D.

For Intervenor Boards of Education:

None.

LIST OF EXHIBITS IN EVIDENCE

For Petitioner JCP&L:

JC-1	Affidavit of Publication/Proof of Service
JC-1a	Affidavit of Publication/Proof of Service
JC-2	Direct Testimony of Scott M. Humphrys
JC-2R	Rebuttal Testimony of Scott M. Humphrys
JC-3	Direct Testimony of Theodore R. Krauss[112]
JC-3R	Rebuttal Testimony of Theodore R. Krauss
JC-4	Direct Testimony of Kyle Whisner
JC-4R	Rebuttal Testimony of Kyle Whisner
JC-5	Direct Testimony of Mark A. Korn
JC-5R	Rebuttal Testimony of Mark A. Korn
JC-6	Direct Testimony of Kirsty M. Cronin
JC-7	Direct Testimony of Peter W. Sparhawk
JC-7R	Rebuttal Testimony of Peter W. Sparhawk
JC-8	Direct Testimony of Lawrence A. Hozempa
JC-8R	Rebuttal Testimony of Lawrence A. Hozempa
JC-9	Direct Testimony of Mark L. Sims
JC-9R	Rebuttal Testimony of Mark K. Sims
JC-10	Direct Testimony of Tracey J. Janis
JC-10R	Rebuttal Testimony of Tracey J. Janis
JC-11	Direct Testimony of Jerome J. McHale
JC-11R	Rebuttal Testimony of Jerome J. McHale
JC-12	Direct Testimony of Kyle G. King
JC-12R	Rebuttal Testimony of Kyle G. King
JC-13	Direct Testimony of William H. Bailey, Ph.D.
JC-13R	Rebuttal Testimony of William H. Bailey, Ph.D.

[112] A correction to one of the exhibits to Exhibit JC-3 (TRK-Segment 13 Revised) was submitted as part of JC-3 at the time of hearing on April 4, 2017.

JC-14 Direct Testimony of Will Irving

JC-15 Rate Counsel's responses to JCP&L discovery requests JC-RC-2, -3, -4, -5, -7, -8, -9 and -12

JC-16 Response to discovery request JMG-JCPL-41

JC-17 Response to discovery request JC-RAGE-55

JC-18 Response to discovery request JC-RAGE-54

JC-19 Response to discovery request JC-RAGE-51

JC-20 Response to discovery request JC-RAGE-52

JC-21 ALJ's Recommended Decision in Application of PPL Electric Utilities Corporation before the PaPUC in Dkt. No. A-2009-2082652 et al. dated Nov. 12, 2009 (excerpts)

JC-22 PaPUC's Order dated Jan. 14, 2010 (entered Feb. 12, 2010) in Application of PPL Electric Utilities Corporation in Dkt. No. A-200902082652 et al. (excerpts)

JC-23 Decision of Supreme Court of Washington in Lakey et al. v. Puget Sound Energy, Inc. dated March 7, 2013 (excerpts)

JC-24 Response to discovery request JC-RAGE-59

JC-25 "High-Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects," James A. Chalmers, PhD, and Frank A. Voorvart, PhD, The Appraisal Journal, Summer 2009 pp 227-245

JC-26 Excerpt from Exhibit JJM-2 (pp 14-15) to J. McHale Rebuttal Testimony (Exhibit JC-11R)

JC-27 "Transmission Line Impacts on Residential Property Values: A Study of Three Pacific Northwest Metropolitan Areas," J.R. Cowger, Steven C. Bottenmiller, MAI, and James Cahill, Right of Way, September/October 1996 (pp13-17)

JC-28 N.J.A.C.14:5-7.1

JC-29 Response to discovery request JC-RAGE-23

JC-30 Response to discovery request JC-RAGE-24

JC-31 Response to discovery request JC-RAGE-25

JC-32 Response to discovery request JC-RAGE-1

JC-33 Response to discovery request JC-RAGE-2

JC-34 Response to discovery request JC-RAGE-3

JC-35 Response to discovery request JC-RAGE-4
JC-36 Response to discovery request JC-RAGE-5
JC-37 Response to discovery request JC-RAGE-8
JC-38 Response to discovery request JC-RAGE-13
JC-39 Response to discovery request JC-RAGE-14
JC-40 Response to discovery request JC-RAGE-18
JC-41 Response to discovery request JC-RAGE-20
JC-42 Response to discovery request JC-RAGE-50
JC-43 Response to discovery request JC-RAGE-84
JC-44 Response to discovery request JC-RAGE-86
JC-45 Response to discovery request JC-RAGE-89
JC-46 Response to discovery request JC-RAGE-85
JC-47 Response to discovery request JC-RAGE-98
JC-48 Response to discovery request JC-RAGE-90
JC-49 Response to discovery request JC-RAGE-91
JC-50 Response to discovery request JC-RAGE-92
JC-51 Response to discovery request JC-RAGE-93
JC-52 Response to discovery request JC-RAGE-99
JC-53 Rejoinder Report of Lawrence A. Hozempa (redacted)(only certain portions)
JC-54 Rejoinder Report of Lawrence A. Hozempa (confidential) (only certain portions)
JC-55 L. Hozempa chart correcting the calculations in RAGE Exhibit RAGE-57

For Respondent Rate Counsel:

RC-1 Discovery Request RCR-ENG-6
RC-2 Peter Lanzalotta Direct Testimony (redacted and confidential versions)
RC-3 Rate Counsel Discovery Requests RCR-ENG-1 through 16
RC-4 Lanzalotta peak load conclusion from PJM 2016 retool program (confidential)
RC-5 JCPL Credit Metrics report to Board of Public Utilities (judicial notice)
RC-5A JCPL Formula Rate Filing, dated October 28, 2016 (judicial notice)
RC-6 Rate Counsel Discovery Requests RCR-ENG-17 through 23

For Respondent BPU Staff:

S-1	Response to discovery request S-MCRP-1
S-2	Response to discovery request S-MCRP-2
S-3	Response to discovery request S-MCRP-3
S-4	Response to discovery request S-MCRP-4
S-5	Response to discovery request S-MCRP-5
S-6	Response to discovery request S-MCRP-6
S-7	Response to discovery request S-MCRP-7
S-8	Response to discovery request S-MCRP-8
S-9	Response to discovery request S-MCRP-9
S-10	Response to discovery request S-MCRP-10
S-11	Response to discovery request S-MCRP-11
S-12	Response to discovery request S-MCRP-12
S-13	Response to discovery request S-MCRP-13
S-14	Response to discovery request S-MCRP-14
S-15	Response to discovery request S-MCRP-15
S-16	Response to discovery request S-MCRP-16
S-17	Response to discovery request S-MCRP-17
S-18	Response to discovery request S-MCRP-18
S-19	Response to discovery request S-MCRP-19
S-20	Response to discovery request S-MCRP-20
S-21	Response to discovery request S-MCRP-21
S-22	Response to discovery request S-MCRP-22
S-23	Response to discovery request S-MCRP-23
S-24	Response to discovery request S-MCRP-24
S-25	Response to discovery request S-MCRP-25
S-26	Response to discovery request S-MCRP-26
S-27	Response to discovery request S-MCRP-27
S-28	Response to discovery request S-MCRP-28
S-29	Response to discovery request S-MCRP-29
S-30	Response to discovery request S-MCRP-30
S-31	Response to discovery request S-MCRP-31

S-32	Response to discovery request S-MCRP-32
S-33	Response to discovery request S-MCRP-33
S-34	Response to discovery request S-MCRP-34
S-35	Response to discovery request S-MCRP-35
S-36	Response to discovery request S-MCRP-36
S-37	Response to discovery request S-MCRP-37
S-38	Response to discovery request S-MCRP-38
S-39	Response to discovery request S-MCRP-39
S-40	Response to discovery request S-MCRP-40
S-41	Response to discovery request S-MCRP-41
S-42	Response to discovery request S-MCRP-42
S-43	Response to discovery request S-MCRP-43
S-44	Response to discovery request S-MCRP-44
S-45	Response to discovery request S-MCRP-45
S-46	Response to discovery request S-MCRP-46
S-47	Response to discovery request S-MCRP-47
S-48	Response to discovery request S-MCRP-48
S-49	Response to discovery request S-MCRP-49

For Intervenor Joint Municipal Group:

JMG-1	Graph of Data Points of PJM Load Forecast Reports from 2012, 2016 and 2017
JMG-2	2014 .kmz file JCP&L sent to New Jersey Transit May 23, 2014
JMG-3	Updated .kmz file that JCP&L sent to NJT in 2016 (confidential)
JMG-4	Updated .kmz file that JCP&L sent to NJT February 14, 2017
JMG-5	[not in evidence]
JMG-6	Google Earth™ map representation of JCP&L transmission lines and substations in the area of proposed MCRP route
JMG-7	PJM Load Forecast Reports 2006-2017 (Table B-1 only)
JMG-8	Responses to discovery requests JMG-31 through JMG-33
JMG-9	Realtor's "Disclosure of Proposed JCP&L Transmission Line"

JMG-10 Google Earth™ and Google Maps™ images illustrating JCP&L Atlantic substation to Red Bank substation transmission lines
JMG-11 Photo of Exhibit JMG-1 as modified during hearings
JMG-12 PJM Summer Coincident Peak Load forecast update for July 2017
JMG-13 Photos of Statcoms, excerpt from "Design and Implementation of a 154-kV +/- 50-Mvar Transmission STATCOM Based on 21-Lever Cascaded Multilever Converter."
JMG-14 Google Earth™ satellite image of Red Bank substation
JMG-15 Google Earth™ satellite image of Eaton Crest substation
JMG-16 FirstEnergy Planning Criteria, dated December 18, 2014
JMG-17 Email from Hozempa to Sims regarding MCRP Dynamic Cascade Analysis, dated July 15, 2016
JMG-18 Response to discovery request JMG-JCPL-65
JMG-19 Response to discovery request RAGE-JCP&L-256

For Intervenor RAGE:

RAGE-1 Direct Testimony of P. Jeffrey Palermo
RAGE-2 Reply Testimony of David O. Carpenter
RAGE-3 Reply Testimony of Donald Moliver
RAGE-3A HUD & Disclosure Document Package
RAGE-4 [not in evidence]
RAGE-5 Reply Testimony of Stephen Lunanuova
RAGE-6 Reply Testimony of Michael Basch
RAGE-7 [not in evidence]
RAGE-8 2014 Google Earth .kmz File, OPRA Request of RAGE to New Jersey Transit [duplicate of JMG-2]
RAGE-9 NJT schedules
RAGE-10 [not in evidence]
RAGE-11 [not in evidence]
RAGE-12 [not in evidence]
RAGE-13 [not in evidence]
RAGE-14 [not in evidence]
RAGE-15 2014 Google Earth File JCPL response to RAGE discovery request 165

RAGE-16 [not in evidence]
RAGE-17 Response to discovery request JMG-JCPL-6
RAGE-18 Response to discovery request RAGE-JCPL-5
RAGE-19 1990 BPU order from Agenda Meeting January 2, 1990
RAGE-20 Response to discovery request RAGE-JCP&L-144
RAGE-21 BPU final order in ACE transmission case
RAGE-22 Response to discovery request RAGE-JCP&L-176
RAGE-23 [not in evidence]
RAGE-24 [not in evidence]
RAGE-25 [not in evidence]
RAGE-26 [not in evidence]
RAGE-27 [not in evidence]
RAGE-28 [not in evidence]
RAGE-29 [not in evidence]
RAGE-30 [not in evidence]
RAGE-31 [not in evidence]
RAGE-32 [not in evidence]
RAGE-33 [not in evidence]
RAGE-34 Appendix A – Dr. Moliver Direct Testimony Addendum
RAGE-35 [not in evidence]
RAGE-36 [not in evidence]
RAGE-37 Des Rosiers, “Power Lines, Visual Encumbrances & House Values”
RAGE-38 2017 Google Earth KMZ file 2017
RAGE-39 FirstEnergy website pages "Current transmission easement language.”
RAGE-40 Response to discovery request RAGE-JCP&L-131
RAGE-41 Response to discovery request RAGE-JCP&L 165 Attachments 27b & 28b
RAGE-42 Berger Invoices, pp. 1-183 & 281-284
RAGE-43 Berger Invoice summary: “Louis Berger Invoice Route Study - Tabulation”
RAGE-44 OPRA request to NJT responses, engineering maps
RAGE-45 Carpenter Chart “Funding Sources and Findings Regarding Exposure to 50/60 Hz EMFs and Childhood Leukemia and Other Diseases Since Three Meta-Analyses” (1998-2000)

RAGE-46 Palermo Basecase_Voltage_report_97pu: “Powerflow Output Report.” [CEII Confidential]

RAGE-47 Palermo: “Base Case Report” [CEII Confidential]

RAGE-49 Palermo Basecase_Voltage_report_97pu: “Loadings Report” [CEII Confidential]

RAGE-50 Palermo Basecase_Voltage_report_97pu: “Worksheet” [CEII Confidential]

RAGE-51 Palermo Map provided in response to JMG-JCPL-05

RAGE-53 Palermo “Voltage Report” [CEII Confidential]

RAGE-56 Sur-Rebuttal Report of P. Jeffrey Palermo [CEII Confidential]

RAGE-57 Palermo Chart Re: No Overloads > 125% [CEII Confidential]

RAGE-58 Responses to discovery requests RAGE-JCP&L-215-222, 233-235

RAGE-59 Response to discovery request JMG-JCP&L-76 with Attachment 1

RAGE-60 Response to discovery requests RAGE-JCP&L-198-202

For Intervenor Boards of Education:

None.

ALJ On Notice:

ALJ-1 Response to Discovery Request RAGE-JCP&L-15

ALJ-2 Summary of Written Public Comments

Transcript Requests

TR-1 1T202:3 – Date of Letter from NJT re Underground Construction

TR-2 1T216:21 -- MCRP Costs Related to Marketing

TR-3 2T234:10 -- MCRP Cost Estimates Provided to PJM

TR-4 6T62:14-17 – Eaton Crest Highest Voltage

TR-5 6T33:7-12 (ALJ Request) – More Detailed Versions of Figure 2 to JC-7

TR-6 4T20:2-21:14 -- Powerflow, Dynamic Case Summaries

TR-7 5T120:14-121:14 – New ROW Acreage for Segment 13

TR-8 10T56:9-25 – JC-54, Table 4.7.1 Revised [stricken]

TABLE OF ACRONYMS

ALJ	Administrative Law Judge
BES	Bulk Electric System
BPU	New Jersey Board of Public Utilities
CAD	Computer Aided Design
CEII	Critical Energy Infrastructure Information
DLUR	Division of Land Use Regulation
DOT	New Jersey Department of Transportation
EMF	Electro-Magnetic Fields
EPRI	Electric Power Research Institute
FERC	Federal Energy Regulatory Commission
FHA	Federal Housing Authority
GSP	Garden State Parkway
GIS	Global Imaging Satellite
GIS	Geographic Information System (NJDEP)
HVTL	High Voltage Transmission Line
IARC	International Agency for Research on Cancer
ICNIRP	International Committee on Non-Ionizing Radiation Protection
IEEE	Institute of Electrical and Electronics Engineers
JCP&L	Jersey Central Power & Light Company
JMG	Joint Municipal Group
kV	Kilovolt
KMZ	Keyhole Markup Zipped File Format for Google Earth™
MAPP	Mid-Atlantic Power Pathway
MCRP	Monmouth County Reliability Project
mG	Milligauss
MW	Megawatt
MVAR	Mega Volt Ampere Reactive
NDA	Non-Disclosure Agreement
NERC	North American Reliability Corporation
NESC	National Electrical Safety Code
NIEHS	National Institute of Environmental Health Sciences

NIH	National Institutes of Health
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJSA	New Jersey Statutes Annotated
NJT	New Jersey Transit
NJTA	New Jersey Turnpike Authority
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OAL	Office of Administrative Law
OPRA	Open Public Records Act
PATH	Potomac-Appalachian Transmission Highline
PJM	PJM Interconnection, LLC
PLS	Power Line System
RAGE	Residents Against Giant Electric, Inc.
ROW	Right of Way
RTEP	Regional Transmission Expansion Plan
RTO	Regional Transmission Organization
SPS	Special Protection System
STATCOM	Static Synchronous Compensator
TEAC	Transmission Expansion Advisory Committee
TOA	Transmission Owners Agreement
USFWS	U.S. Fish and Wildlife Service
WHO	World Health Organization