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September 23, 2019

A-2019-3012304

VIA HAND DELIVERY

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, 2nd Floor North
P.O. Box 3265
Harrisburg, PA 17105-3265

**Re: Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, for Approval of the Glen Brook Substation 230 kV Connecting Lines Project in Salem Township, Luzerne County, PA
Docket No. P-2019-3012353**

Dear Secretary Chiavetta:

Enclosed for filing are the responses of PPL Electric Utilities Corporation to the Bureau of Technical Utility Services Data Requests Nos. A-1 through A-14, in the above-referenced proceeding.

The attached responses contain **HIGHLY CONFIDENTIAL** material, and are therefore being filed via hand delivery.

Respectfully submitted,

Jessica R. Rogers

JRR/jl
Enclosures

cc: Jordan Van Order (via E-mail)
Jeremy Haring (via E-mail)

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A-1 Reference the Letter of Notification, Paragraph 17. Please provide a detailed explanation of how PPL Electric determined the minimum acceptable voltage.

Answer PPL EU determined the minimum acceptable voltage by identifying the voltage criteria that is needed to maintain reliable operations, minimize voltage gradients throughout the PJM grid, maintain system stability margins during both steady-rate and transient operations and provide voltage to end use customers within acceptable voltage performance requirements of PA Code 57.14. System voltage beyond the acceptable limits may cause unacceptable consequences such as cascade tripping of transmission lines, generators, motors, and equipment damage, including customer equipment damage. In extreme cases, cascade tripping may result in local or large-scale blackouts.

A review of PJM Manual 3 Section 3.3.1 shows that PPL EU's voltage criteria aligns with other PJM TO Criteria. This alignment is done to minimize the voltage gradient across the PJM grid.

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A-2 Reference the Letter of Notification, Paragraph 18. Please explain whether the emergency ratings of the lines are based on PPL Electric's own criteria.

Answer PPL EU develops transmission system ratings in accordance with NERC FAC-008, which requires transmission owners to establish ratings by utilizing ratings provided by equipment manufacturers, developing ratings through an open process such as PJM, IEEE, or a past practice that has been verified by testing, performance history or engineering analysis.

PPL EU determines transmission line ratings by utilizing the methodology contained in the "PJM Transmission and Substation Design Subcommittee (TSDS) Rating Task Force, Bared OH Transmission Conductors Ratings, November 2000". This rating methodology uses several geographically appropriate inputs such as wind speed, ambient temperature, and ice loading to determine the applicable ratings for our service territory.

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A-3 Reference the Letter of Notification, Section 2. Please explain whether load growth in the area has led to any change in circumstances as it relates to the need for the proposed project. If so, quantify these load growth impacts.

Answer No, load growth is not a significant factor impacting any of the critical contingency scenarios noted in the Letter of Notification.

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A-4 Reference the Letter of Notification, Section 2. Please explain why violations of PPL Electric's FERC Form 715 criteria are now an issue.

Answer PPL EU identified thermal and voltage violations in the Berwick area during routine periodic modeling of its system coincident with 2016 RTEP analyses. The voltage violation was first discovered in the 2016 analyses but may have existed prior to this time. The thermal violation is primarily driven by a significant amount of new generation on the bulk transmission system. Approximately 4,600 MW of new generation has been added to the PPL EU bulk transmission system in the last five years.

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A-5 Reference the Letter of Notification, Section 2. Please explain whether there is any PJM, non-FERC Form 715, violations.

Answer PJM has not reported any PJM, non-FERC Form 715, violations in the Berwick area.

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A-6 Reference the Letter of Notification, Attachment 1, Section 3.3. Please explain whether a 69 kV bus section circuit breaker failure has occurred, in the previous 5 years, at the Columbia Substation. If so, for each event, please provide the date, duration of the event, and whether there was a summer emergency rating violation on the Hunlock-Berwick 69 kV line.

Answer There have been no 69 kV bus-tie circuit breaker failure events at the Columbia Substation in the previous 5 years. Consistent with the NERC TPL-001-4 standard, PPL EU Transmission Planning criteria requires it to perform forward looking analysis and plan the transmission system to withstand contingencies and meet customer needs with regard to capacity, voltage and reliability.

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A-7 Reference the Letter of Notification, Attachment 1, Section 3.3. Please provide a historical record, at least 5 years, of a tower contingency on the Susquehanna-Harwood 230 kV lines. If so, for each event, please provide the date, duration of the event, and whether there was an immediate voltage collapse in the area.

Answer There have been no tower contingencies on the Susquehanna-Harwood 230kV lines in the previous 5 years. Consistent with the NERC TPL-001-4 standard, PPL EU Transmission Planning criteria requires to perform forward looking analysis and plan the transmission system to withstand contingencies and meet customer needs with regard to capacity, voltage and reliability.

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A-8 Reference the Letter of Notification, Attachment 1, Section 3.3. Please provide the approximate number of hours per year that the violation occurs. Additionally, explain the nature, if any, of the seasonal or duration characteristics of these violations. Also, please provide the number of consecutive hours.

Answer Based on a review of historical load data this condition occurs during approximately 6,071 (~70%) hours per year. The largest consecutive number of hours throughout the year where this condition occurs is 741 hours. There is greater occurrence during the summer peak and winter peak times.

A review of PJM Manual 3 Section 3.3.1 shows that PPL EU's voltage criteria aligns with other PJM TO Criteria. This alignment is done to minimize the voltage gradient across the PJM grid.

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A-9 Reference the Letter of Notification, Attachment 1, Section 3.3. Please explain how much load would need to be reduced to eliminate these voltage and thermal violations, respectively. Provide a schedule, by year, of necessary reductions.

Answer To address the voltage violations caused by the Columbia circuit breaker contingencies, load levels must be reduced below the expected Berwick area peak load by 43% for a contingency on the 69 kV circuit breaker and 60% for a 230 kV circuit breaker contingency.

The thermal violation associated with the Susquehanna – Harwood 230 kV double circuit tower line outage is dependent on regional transfer power conditions and local area generation dispatch. Higher west-east power flows across the regional system result in higher flows from Susquehanna to Lackawanna. As per PJM's RTEP planning process contained in Section 2 of Manual 14B¹, generation re-dispatch and system adjustment is acceptable to address violations caused by an N-1-1 contingency. However, system generation redispatch and system adjustment are not acceptable solutions to address violations due to N-1 contingencies, which is the case here.

¹ <https://www.pjm.com/-/media/documents/manuals/m14b.ashx>

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A-10 Reference the Letter of Notification, Attachment 1, Section 3.3. Please explain whether a 69 kV bus-tie circuit breaker failure has occurred, in the previous 5 years, at the Columbia Substation. If so, for each event, please provide the date, duration of the event, and whether any voltage drops exceeded 8%.

Answer No 69 kV bus-tie circuit breaker failure event has occurred at Columbia Substation in the previous 5 years. PPL EU Transmission Planning criteria requires PPLE EU to perform forward looking analysis and plan the transmission system to withstand contingencies and meet customer needs with regard to capacity, voltage and reliability.

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A-11 Reference the Letter of Notification, Attachment 1, Section 3.3. Please provide a schematic for the Columbia Substation depicting the 230 kV bus and 69 kV bus.

Answer See attached **HIGHLY CONFIDENTIAL** diagram.

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A-12 Reference the Letter of Notification, Attachment 1, Section 3.3. Please explain whether the events are assumed to occur simultaneously (e.g. N-1-1) or whether each event individually causes the violations.

Answer Each event individually causes a violation.

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A-13 Reference the Letter of Notification, Attachment 1, Section 4. Please explain whether PPL Electric examined any non-wire alternatives. For example, could strategically-placed DER facilities be used to avoid or postpone the need for this project? Explain whether existing BTM DER facilities could be turned on in advance of certain peak usage periods, to avoid potential voltage or thermal violations in the event of the loss of the facilities. Explain what new DER facilities would resolve the potential violations.

Answer During preliminary assessment, PPL EU considered installing a large battery instead of building a new substation. However, this option was quickly ruled out due to its very high cost (approximately three times the substation cost). Additionally, installing a large battery does not provide a long-term solution to address the thermal violation due to power transfer on the 69 kV system from the bulk transmission system. In fact, as explained in the Letter of Notification, other, more expensive wires alternatives similarly fail to provide a long-term solution. The Glen Brook substation provides a new 230-69 kV source in the Berwick area and segments approximately 49 miles of networked 69 kV lines into radial sections by installing normally open switches as shown in figure 1-3 of Attachment 1 of the Letter of Notification. Building a new regional substation in the Berwick area is the only solution that addresses the thermal reliability concern on the 69 kV caused by high transfer conditions on the bulk transmission system.

Large amounts of DER (more than 150 MW) could alleviate the voltage concerns. However, similar to the battery alternative, DER or BTM DER will not resolve the thermal overloading problem caused by the Susquehanna – Harwood 230 kV DCT line outage event as that thermal reliability concern is driven, in part, by power transfer conditions from bulk transmission to non-bulk system. Additionally, as indicated in the response to question A-8, thermal overloading occurs during 70% of the potential hours of the year including overnight hours. Some BTM DER, such as solar panels, have limited availability during cloudy weather or nighttime. It should also be noted that PPL EU does not own or control any DER or BTM DER and cannot speculate on the future use of DER to resolve voltage and thermal violations.

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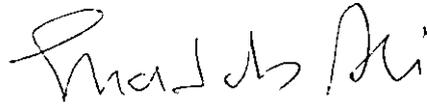
A-14 Reference the Letter of Notification, Attachment 1, Figure 1-1. Please explain whether closing the normally open switches during or in advance of potential violation periods would help resolve the violations, and if so, to what degree.

Answer Closing the normally open switches in Figure 1-1 would not resolve the violations. In fact, closing those switches will exacerbate the problem, as it would increase load connected to the Columbia substation.

VERIFICATION

I, SHADAB ALI, being the Manager – Transmission Planning at PPL Electric Utilities Corporation, hereby state that the facts above set forth are true and correct to the best of my knowledge, information and belief and that I expect PPL Electric Utilities Corporation to be able to prove the same at a hearing held in this matter. I understand that the statements herein are made subject to the penalties of 18 Pa.C.S. § 4904 relating to unsworn falsification to authorities.

Date: 09/19/2019



Shadab Ali