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June 4, 2018

Melanie A. Bachman
Executive Director
State of Connecticut
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

Re: Underground Utility Design
345 KV Connection to United Illuminating Company Singer Substation
PSEG Power Connecticut LLC
Petition No. 1218 - Bridgeport Harbor Station Unit 5 Combined Cycle Project
1 Atlantic Street
City of Bridgeport, Fairfield County, Connecticut

Dear Ms. Bachman:

As part of its Development and Management Plan Update No. 2 dated April 12, 2018, PSEG Power Connecticut LLC (PSEG) filed final updated underground utility drawings with the Connecticut Siting Council (CSC) that showed the 345 Kilovolt (kV) generator connection from the Bridgeport Harbor Station Unit 5 (BHS 5). This Development and Management Plan Update No. 2 was approved by the CSC on April 16, 2018. Previously, based on the conceptual 345 KV design available at that time, PSEG had filed an analysis of electric and magnetic fields (EMF), dated May 4, 2016, with the CSC on May 5, 2016. As there were minor changes in the alignment and depth of the 345 KV ductbank, PSEG performed a re-analysis and update of the EMF calculations, which is attached. For your records and information, enclosed please find the updated electric and magnetic fields (EMF) analysis for the project.

The following attachments are enclosed:

1. EMF Evaluation for the 345kV Underground Duct Bank on Henry Street, dated June 4, 2018;
2. A revised Calculation of Electromagnetic Field (Revision C) prepared by LS Cable, dated April 23, 2018; and
3. A copy of the previously submitted Magnetic Field Calculation for Bridgeport Harbor Generator Lead, dated May 4, 2016 and prepared by Exponent.

The re-analysis calculated that the highest projected EMF field is 177.5 milliGauss (mG) directly above the underground circuit within the Henry Street roadway right-of-way (ROW) as compared to the prior value of 132 mG identified in Attachment 3. The appropriate EMF engineering controls have been incorporated, including distance and the use of an underground ductbank. In addition, the analysis is conservative in that the depth of cover is approximately 50% greater than used in the calculation for the entire off-site portion of the 345 KV circuit. In summary, the EMF fields remain low and consistent with the CSC EMF best management practices guidance dated February 20, 2014.

If you have any questions or require clarification, please contact me at 973-856-0066 or the Project Senior Technical Director / Regulatory Lead, Jeff Pantazes at 856-359-7645.

Very truly yours

David Hinchey
Manager – Environment Major Permits and Projects
PSEG Power LLC
Fossil Environment, Health, and Safety

Enclosures

Attachment 1 **EMF Evaluation for the 345kV Underground Duct Bank on Henry Street, dated June 4, 2018**

Attachment 2 **Calculation of Electromagnetic Field (Revision C) prepared by LS Cable, dated April 23, 2018**

Attachment 3 **Magnetic Field Calculation for Bridgeport Harbor Generator Lead prepared by Exponent, dated May 4, 2016**

C Michael Perrone
Harold Blinderman, Esq
Franca L. DeRosa, Esq.
Leilani M. Holgado, Esq.
Karl Wintermeyer
Scott Matheson
Jeffrey Pantazes
Leonard Rodriguez, Esq.

Attachment 1 **EMF Evaluation for the 345kV Underground Duct Bank on Henry Street, dated June 4, 2018**

Attachment 1

PSEG Bridgeport Harbor Station Combined Cycle Unit 5
EMF Evaluation for the 345kV Underground Duct Bank on Henry Street

Evaluation

PSEG Power Connecticut LLC (PSEG) is currently constructing a new Combined Cycle Plant at Bridgeport Harbor Station, designated as Unit 5 (BHS 5). The plant will provide power to the Independent System Operator – New England (ISO-NE) via an underground 345 kilovolt (kV) circuit, routed in a reinforced concrete duct bank under Henry Street, from the PSEG site to the United Illuminating Company (UI) Singer Substation. The project (Petition No. 1218) was approved by the Connecticut Siting Council (CSC) on July 21, 2016.

The 345 kV duct bank extends approximately 800 feet along Henry Street. The design shows the top of the duct bank at a minimum of 3.0 feet below ground surface (bgs) at the eastern end and exceeding 6 feet bgs at the deepest section. For clarity, depths bgs described in this analysis will be to the top of the duct bank. The drawings included in Development and Management Plan Update No. 2, show the duct bank plans, cross sections, and embedment depths.

The electric and magnetic field (EMF) levels were originally calculated in a Technical Memorandum dated May 4, 2016 prepared by Exponent (the "2016 Exponent Analysis"), and submitted to the CSC on May 5, 2016 in support of the original CSC review. Subsequent to the submittal of the memorandum and CSC approval of the project, modifications were made to the duct bank design to avoid interferences due to subsurface utilities and to better facilitate duct bank construction. Those modifications have been evaluated in the attached Calculation of Electromagnetic Field, dated April 23, 2018, prepared by LS Cable.

The calculation is based on a current flow of 1089 amps in the 4000kcmil conductors. This is based on the maximum output current of the generators with an extra 3% margin included. The original EMF calculation identifies the conductor size as 3000kcmil. The 2018 calculation reflects the updated ampacity requirement and conductor size.

Between the PSEG and UI property, the duct bank is in the Henry Street Right-of-Way (ROW). The duct bank elevation was changed near BHS 5 as it leaves the plant property and enters the Henry Street ROW. At the PSEG property line the duct bank is three feet below the surface of the street and the cables / conduits are in a horizontal configuration. As it proceeds to Singer substation, the duct bank drops in elevation to four feet below the street surface as it nears the Russell Street / Henry Street intersection. At Singer Substation, the duct bank is at an elevation of six feet ten inches below grade and has been transitioned to a vertical configuration. Of note, the 2018 calculation performed by LS Cable assumed a further reduction in minimum cover on the duct bank. To account for any minor field changes during construction necessary to avoid sub-surface interferences, a conservative depth of two feet of cover over the duct bank, versus the current design minimum of three feet, was used in the calculation. The resulting calculated magnetic field maximum is 177.47 milliGauss (mG).

Attachment 1

PSEG Bridgeport Harbor Station Combined Cycle Unit 5
EMF Evaluation for the 345kV Underground Duct Bank on Henry Street

This EMF value is within the acceptable exposure limits identified in the CSC February 21, 2014 Electric and Magnetic Fields Best Management Practices For the Construction of Electric Transmission Lines in Connecticut (CSC EMF BMP) Guidelines for the general public and within the typical edge of ROW values of 80 to 250 mG observed in other jurisdictions by the CSC. The original calculation showed a maximum magnetic field of 132 mG immediately above the cable, based on the original design depth of four feet four inches below the surface with a vertical cable configuration. While the magnetic field at the highest point in the routing (i.e. the least amount of depth bgs) has increased from the original design, the change in EMF levels are relatively minor, and continue to be well within acceptable exposure limits.

It should be noted that the acceptable limits identified in the CSC EMF BMP Guidelines were established by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and the International Committee on Electromagnetic Safety (ICES) which have evaluated the causal relationship between magnetic field and adverse health effects. There are no other applicable state or federal exposure standards for EMF (at 60 Hz) based on demonstrated health effects.

A summary of the original and subsequent calculation are as follows:

Calculation By:	**Duct Bank Configuration**	**Coverage (Top of Concrete to Grade)**	**Calculated EMF values based on Peak load**	**Exposure limit by ICNIRP***	**Exposure limit by ICES***
Exponent (Original 2016)	Vertical	4.33 feet	132 mG	2,000mG (General public area)	9,040mG (General public area)
LS Cable (Final 2018)	Horizontal at point of minimum cover	2 feet	177.5 mG	2,000mG (General public area)	9,040mG (General public area)

* As cited in CSC February 21, 2014 Electric and Magnetic Fields Best Management Practices For the Construction of Electric Transmission Lines in Connecticut.

Further, the area where the duct bank is shallower than the depth bgs used in the 2016 Exponent Analysis are on Henry Street, from the PSEG property line to approximately Russell Street. There are no residential properties on either side of the Henry Street ROW in this area. From Russell Street to the west towards the Singer Substation and the nearest residential properties, the duct bank is generally at or below the depth assumed in the 2016 Exponent Analysis. The duct bank is not located in the center of the Henry Street ROW, but is routed closer to the northern edge of the ROW, approximately 2 meters from the ROW boundary. The adjoining properties along the northern edge of Henry Street are owned by the City of Bridgeport (the Russell Street ROW), Emera Energy, and PSEG. The distance to the southern edge of the ROW is approximately 5 meters or greater.

PSEG Bridgeport Harbor Station Combined Cycle Unit 5
EMF Evaluation for the 345kV Underground Duct Bank on Henry Street

The EMF fields rapidly drop off with distance from the duct bank and also drop off as the duct bank depths increase. The revised calculation considered the "worst case" configurations and depths for the complete duct bank design and routing and are, thus, conservative. As noted, the current analysis used 2.0 feet of cover, while the design minimum is 3.0 feet. The data and calculations support the conclusion that while EMF fields have changed from the 2016 Exponent analysis, the fundamental conclusions of the analysis remain unchanged.

Conclusion

The EMF levels above the 345kV duct bank are within the range of acceptable exposure limits observed in the CSC EMF BMP Guidelines. PSEG has modified the underground utility design and has re-analyzed EMF fields. The changes are consistent with the CSC guidelines with a maximum field strength of 177.5 mG immediately above the duct bank.

Reference Documents

1. Magnetic Field Calculations for Bridgeport Harbor Generator Lead, dated May 4, 2016 prepared by Exponent (included as Attachment 3).
2. Calculation of Electromagnetic Field, dated April 23, 2018 prepared by LS Cable (included as Attachment 2)
3. State of Connecticut, Connecticut Siting Council (CSC) Memo dated February 21, 2014 regarding Best Management Practices for Electric and Magnetic Fields

Attachment 2 Calculation of Electromagnetic Field (Revision C) prepared by LS Cable, dated April 23, 2018

20004748 QM08
20001785 QM08
20001785 UM
20001785 BSOH

ISO 9001
ISO 14001
OHSAS 18001

LS Cable & System

Contract No.	: MA00004757	Ref. No.	: 16463-EMF-01
Owner	: PSEG Power Connecticut LLC.	Page No.	: 1 of 2
Project Name	: Bridgeport Harbor 05 Combined Cycle Project		
Bidder	: LS Cable America, Inc.		

Document Title

Calculation of Electromagnetic Field

For

1 Circuit type

C	Apr. 23, 2018	Issued for Approval	H. S. Jeon	J. Y. Joo	B. S. Kim
B	May. 23, 2017	Issued for Approval	H. S. Jeon	J. Y. Joo	B. S. Kim
A	Apr. 20, 2017	Issued for Approval	H. S. Jeon	J. Y. Joo	B. S. Kim
Rev. No.	Date	Descriptions	Prepared By	Reviewed By	Approved By

LS Cable & System

Calculation of Magnetic Field

Flat Configuration (1 Circuit)

1. Condition of Calculation

Strength of Magnetic Field is calculated under conditions shown below.

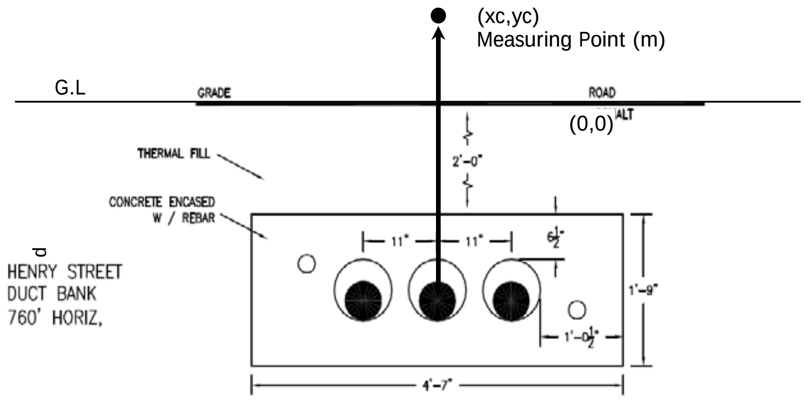


Fig. 2 Cross section drawing of W-BQ route cable

s

Where,

(xc,yc)	Coordinate of Measuring Point	(0,1.0668)	[m]
d	Depth of Cable Laying	1.067	[m]
c	Distance between Cable Laying centerr	0.000	[m]
s	Distance between 1st Cable Axis	0.279	[m]
s1	Distance between 2nd Cable Axis	0.000	[m]
r_c	Distance between each Cable and Measuring Point	Varies	

2. Formula

Calculation is made in accordance with Underground Transmission System Reference

2.1 Magnetic Field of X Direction

$$\hat{B}_X = -2\times10^{-3}\hat{I}\left[\frac{y_c+d}{r_c^2}\right]$$

Where,

I	Current Flowing in One Conductor
yc	Y Coordination of Measuring Point
d	Depth of Cable Laying
r_c	Distance between each Cable and Measuring Point

2.2 Magnetic Field of Y Direction

$$\hat{B}_y = 2\times10^{-3}\hat{I}\left[\frac{x_c-h}{r_c^2}\right]$$

Where,

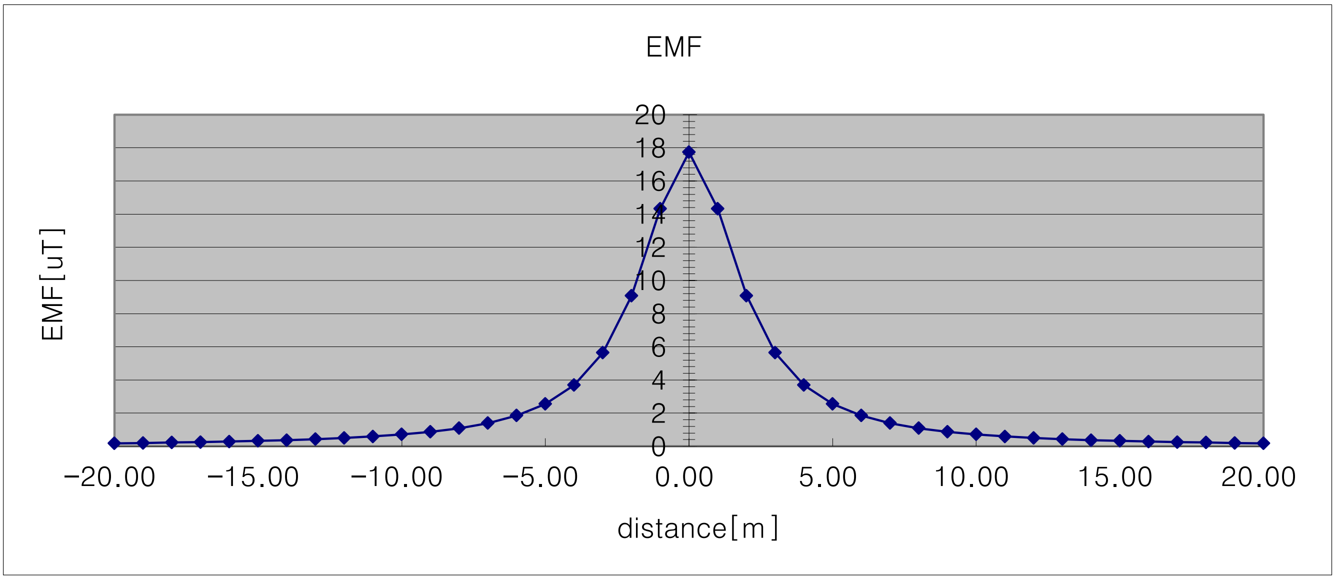
I	Current Flowing in One Conductor
xc	X Coordination of Measuring Point
h	Distance from X origin Axis to each Cable
r_c	Distance between each Cable and Measuring Point

2.3 Average Strength of Magnetic Field in Measuring Point

$$\hat{B} = \frac{\sum_{\theta=0}^{359} \sqrt{\hat{B}_X^{\,2} + \hat{B}_Y^{\,2}}}{360}$$

(Maximum value) 17.74692 [uT]
(177.47 [mG])

2.3.1 Graph of Ambient Magnetic Field



Note.1 In case of 1 circuits flat cable route, the result of Electro Magnetic Field at a height of 12-inch above ground level level shall be satisfied at 19m laterally with Tender specification 2.0 mG (Nominal value of 2 milligauss laterally)
Note.2 This calculation is based on 1089A in accordance with Ampacity requirement

Measure poin	EMF
[m]	[uT]
20.00	0.184387656
19.00	0.204078469
18.00	0.227085367
17.00	0.254192942
16.00	0.286430876
15.00	0.325171227
14.00	0.372273528
13.00	0.430306314
12.00	0.502894179
11.00	0.595277468
10.00	0.715244719
9.00	0.874743763
8.00	1.092781422
7.00	1.400883051
6.00	1.853876771
5.00	2.552189785
4.00	3.689136272
3.00	5.645036739
2.00	9.086126223
1.00	14.32925213
0.00	17.7469184
-1.00	14.32925213
-2.00	9.086126223
-3.00	5.645036739
-4.00	3.689136272
-5.00	2.552189785
-6.00	1.853876771
-7.00	1.400883051
-8.00	1.092781422
-9.00	0.874743763
-10.00	0.715244719
-11.00	0.595277468
-12.00	0.502894179
-13.00	0.430306314
-14.00	0.372273528
-15.00	0.325171227
-16.00	0.286430876
-17.00	0.254192942
-18.00	0.227085367
-19.00	0.204078469
-20.00	0.184387656
-21.00	0.167406827
-22.00	0.152661909
-23.00	0.13977788
-24.00	0.128454988
-25.00	0.118451368
-26.00	0.109570149
-27.00	0.101649793
-28.00	0.094556762
-29.00	0.088179899
-30.00	0.082426078

Attachment 3 Magnetic Field Calculation for Bridgeport Harbor Generator Lead prepared by Exponent, dated May 4, 2016

Exponent®

Technical Memorandum

TO:	Richard F. Timer, Jr., P.E. RCM Technologies
FROM:	Benjamin Cotts, Ph.D., P.E. Kevin Graf, Ph.D., P.E. William Bailey, Ph.D.
DATE:	May 4, 2016
PROJECT:	Bridgeport Harbor Generating Station Project No. 1603547.000
SUBJECT:	**Magnetic Field Calculations for Bridgeport Harbor Generator Lead**

Background

PSEG Power Connecticut LLC proposes to construct a 485-megawatt, dual fuel combined-cycle electric generating facility at the existing Bridgeport Harbor Station located at 1 Atlantic Street, Bridgeport, Connecticut (see Connecticut Siting Council petition No. 1218). The proposed project includes the construction of a short, ~800 foot, 345-kV underground generator lead interconnection from the Bridgeport Harbor Station to the Singer Substation operated by The United Illuminating Company. The proposed 345-kVgenerator lead will consist of three phase-conductors in a duct bank in vertical configuration at 4.33 feet burial depth as shown in Figure 1. The conductors will be single core with cross-linked polyethylene insulation, and each conductor shall be 3000 kcmil of segmented copper wires, with limited amounts of 3500 kcmil in areas where 3000 kcmil cannot meet ampacity requirements. The outer diameter of each cable will be 4.82 inches, and each will be installed in an 8-inch PVC pipe. The maximum generator rating of 651 MVA at 345-kV (including a 6% margin) was used to calculate a peak loading of 1089 Amperes. Although expected to operate at peak loading for much of the time, a representative loading of 83% of peak loading is also presented as an example ‘average’ load. [1]

Objective

The objective of the assessment described in this memorandum is to present calculations of the magnetic field from the proposed generator lead, to demonstrate compliance with the requirements re EMF in the Connecticut Siting Council’s Application Guide for an Electric Generating Facility, February 2016[2], and relevant portions of the Councils EMF Best Management Practices, dated February, 2014.[3]

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1 Yearly operating hours are projected to be 7600 with a capacity factor of 83%.

2 http://www.ct.gov/csc/lib/csc/guides/2016guides/elec_gen_application_guide_0216.pdf#55847

3 http://www.ct.gov/csc/lib/csc/emf_bmp/revisions_updates/754bmpfinal.pdf

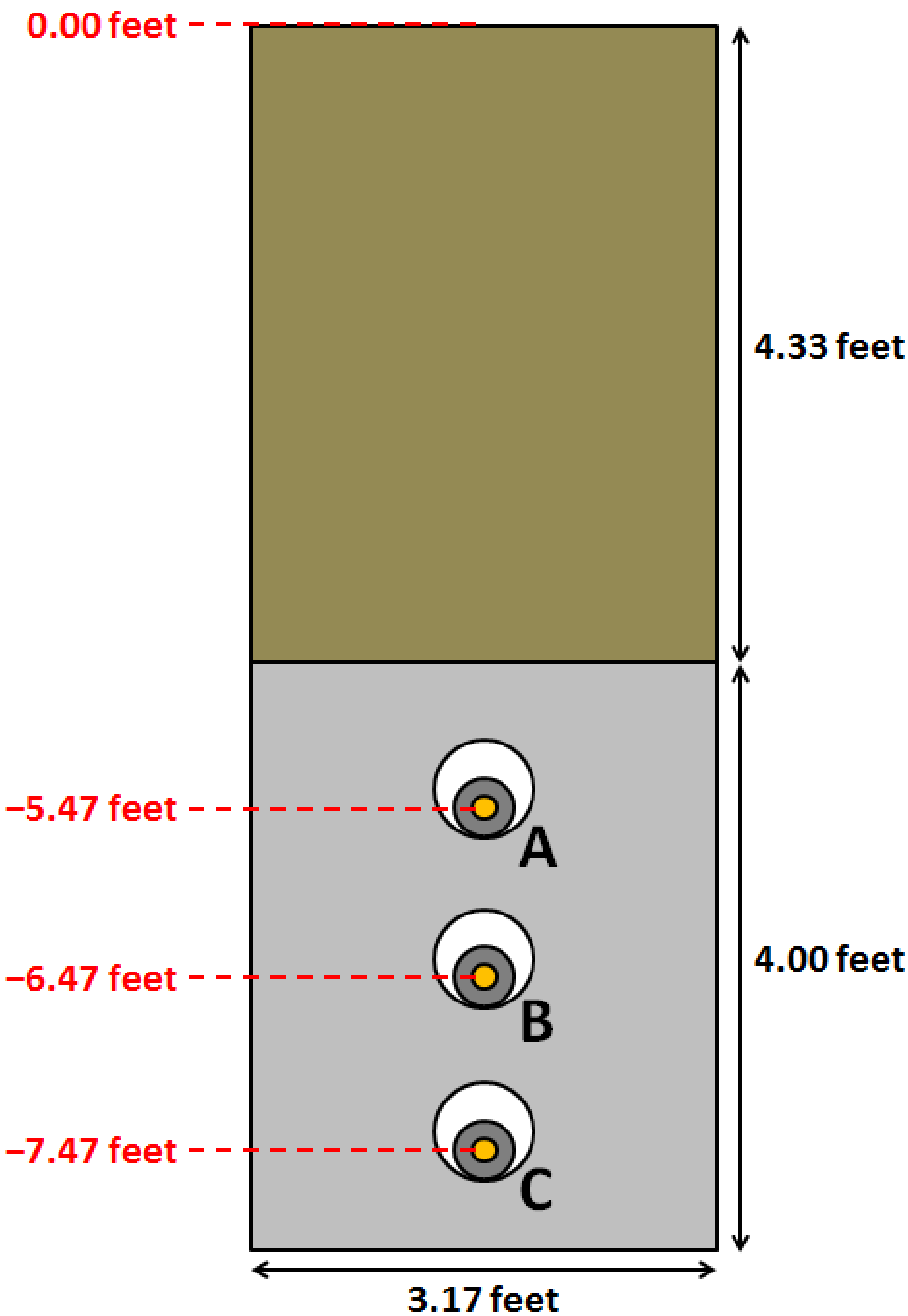

Figure 1. Proposed configuration of the 345-kV underground generator lead and depth of burial of phase conductors below ground.

Methods

Exponent calculated magnetic-field levels along a transect perpendicular to the centerline of the transmission line for both peak and average loading. Field levels were calculated as the resultant root-mean-square value of the field ellipse at a height of 1 meter (3.28 feet) above ground, in accordance with IEEE Std. C95.3.1-2010 and IEEE Std. 0644-1994.[4] Calculations employed computer algorithms developed by Bonneville Power Administration, an agency of the U.S. Department of Energy.[5] These algorithms have been shown to accurately predict magnetic-field levels measured new transmission lines.[6]

Inputs to the computer algorithms included conductor positions and line loadings, each detailed in the previous section of this report. Since the conductors are underground, the ground itself will block electric fields. Thus, the proposed line will not produce electric fields above ground and no electric field calculations were performed for this report.

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4 Institute of Electrical and Electronics Engineers (IEEE). Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines (ANSI/IEEE Std. 644-1994). New York: IEEE, 1994; Institute of Electrical and Electronics Engineers (IEEE). IEEE Recommended Practice for Measurements and Computations of Electric, Magnetic, and Electromagnetic fields with respect to Human Exposure to Such Fields, 0 Hz to 100 kHz. New York: IEEE. IEEE Std. C95.3.1-2010.

5 Bonneville Power Administration (BPA). Corona and Field Effects Computer Program. Portland, OR: Bonneville Power Administration, 1991.

6 Chartier VL and Dickson LD. Results of Magnetic Field Measurements Conducted on Ross-Lexington 230-kV Line. Report No. ELE-90-98. Bonneville Power Administration, 1990.

Results and Discussion

The calculated magnetic-field levels are summarized in Table 1, and profiles plotted transverse to the route of the transmission line as shown in Figure 2. The maximum calculated magnetic-field level is 132 mG at peak loading, and 109 mG for an example 'average' loading, both maxima occur directly above the proposed transmission line.[7] Field levels decrease symmetrically with distance from the transmission line centerline, falling to 17 mG or less beyond ±25 ft, and falling to less than 5 mG beyond ±50 ft. These calculated field levels are compared to magnetic-field exposure guidelines and to background levels measured at the perimeter of the Singer Substation submitted in Docket 272.

Table 1. Calculated magnetic-field levels (mG) for Peak and Average loading

Loading	−50 ft	−25 ft	Max	+25 ft	+50 ft
Peak	4.8	17	132	17	4.8
Average	4.0	14	109	14	4.0

[7] Due to the design of the transmission line magnetic field levels at any other loading level (e.g., 50%) can be calculated from the peak values listed in Table 1. For example a 25% or 50% loading level would result in a maximum magnetic field level of 33 mG or 66 mG, respectively (132 x 0.25 = 33; 132 x 0.5 = 66).

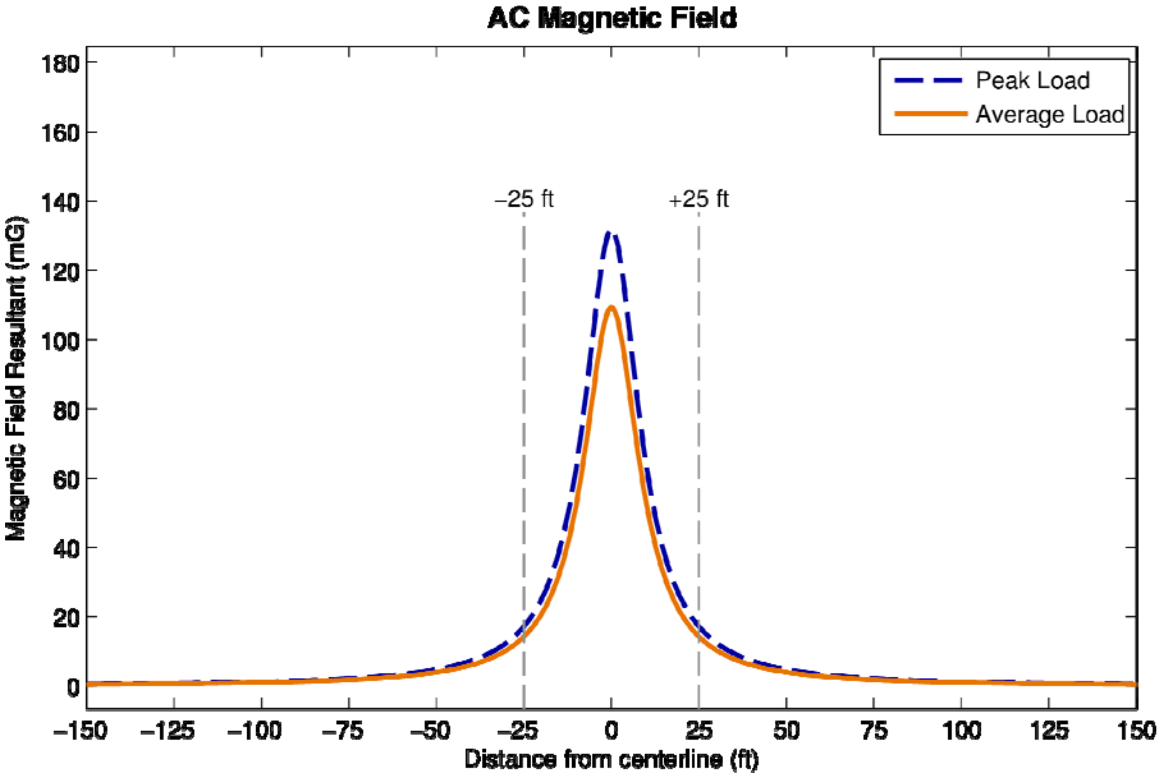

Figure 2. Magnetic field profile across transmission line cross-section for peak and average loading

Field levels out to a distance of ±300 feet to either side of the transmission line are included in Table A-1 of Appendix A.

International scientific organizations, the International Committee on Electromagnetic Safety (ICES) and International Commission on Non-Ionizing Radiation Protection (ICNIRP) each developed magnetic-field exposure guidelines to protect health and safety.[8,9] These guidelines were based upon extensive review and evaluation of the relevant health research, and the World Health Organization (WHO) has recommended that policy makers adopt international exposure limit guidelines like those from ICNIRP and ICES.[10] The ICNIRP and ICES guidelines for magnetic-field exposure are summarized in

[8] International Committee on Electromagnetic Safety (ICES). IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields 0 to 3 kHz C95. 6-2002. Piscataway, NJ: IEEE, 2002.

[9] International Commission on Non-Ionizing Radiation Protection (ICNIRP). Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz – 100 kHz). Health Physics 99:818-826, 2010.

[10] World Health Organization (WHO). Fact sheet No. 322: Electromagnetic Fields and Public Health – Exposure to Extremely Low Frequency Fields. World Health Organization, June 2007.

Table 2 alongside the maximum calculated magnetic-field levels associated with the proposed 345-kV line. The maximum calculated magnetic-field levels are less than 7% of the ICNIRP general public guideline, and less than 2% of the ICES general public guideline. At distances beyond ±25 ft from the transmission line, calculated magnetic-field levels are less than 1% of either the ICNIRP or the ICES guidelines for general public exposure.

Table 2. ICNIRP and ICES guidelines for magnetic-field exposure, compared to maximum calculated magnetic-field levels for the proposed 345-kV line

	Magnetic-Field Exposure (60 Hz)
ICNIRP	
Occupational	10 G (10,000 mG)
General Public	2 G (2,000 mG)
ICES	
Occupational	27.1 G (27,100 mG)
General Public	9.040 G (9,040 mG)
Maximum Calculated	
Peak Loading	132 mG
Example : 'Average' Loading	109 mG

Background measurements of the electric and magnetic fields around the Singer Substation to which the generator leads will connect were reported in the Post-Construction EMF Monitoring Report 12/18/09 for the Singer Substation in Docket 271.[11] Spot measurements on two occasions of the electric field levels were measured as 0.0 kV/m and the magnetic fields around the substation were reported as varying between about 0 mG and about 110 mG. The maximum magnetic field from the proposed generator lead is calculated to be slightly higher than the upper end of the reported spot measurements around the substation; however the magnitude of the latter measurements is subject to the load demand on the station at the time measurements were taken. On other days, the magnetic field measured might be higher or lower.

In the U.S., there are no state or federal exposure standards for 60-Hz magnetic fields based on demonstrated health effects, and the Connecticut Siting Council (CSC) recognizes that "a causal link between power-line [magnetic field] exposure and demonstrated health effects has not been established, even after much scientific investigation in the U.S. and abroad." The CSC continues "its cautious approach to transmission line siting that has guided its Best Management

[11] http://www.ct.gov/csc/cwp/view.asp?a=3&q=453782 Appendix E, p. 4.

Practices since 1993," advocating "the use of effective no-cost and low-cost technologies and management techniques on a project-specific basis to reduce [magnetic field] exposure to the public while allowing for the development of efficient and cost-effective electrical transmission projects."[12] Specifically, the CSC expects an examination of the following engineering controls to limit magnetic-field levels in public places: distance, height, conductor separation, conductor configuration, optimum phasing, increased voltage, and underground installation. Each of these potential low- or no-cost measures has been addressed as detailed below.

- Distance – Placing the transmission line underground allows for a relatively small (approximately 1 foot) conductor separation which enhances magnetic-field cancellation and results in magnetic field levels decreasing very rapidly with distance so that at distances beyond ±25 feet from the duct bank field levels will fall to 17 mG or less. No residential structures or statutory facilities are abutters to this project. See also Conductor Separation and Conductor Configuration below.

- Height of Support Structures – The proposed 345-kV line will reside in an underground duct bank, and thus structure height is not applicable.

- Conductor Separation – The proposed 345-kV line will be buried in an underground duct bank, allowing for relatively small (approximately 1 foot) conductor separation. This conductor separation, which is small relative to that of typical overhead lines, provides additional magnetic-field cancellation and results in magnetic field levels decreasing very rapidly with distance.

- Conductor Configuration – Constructing the duct bank in a vertical configuration effectively moves two of the phase conductors further below ground, and hence reduces

[12] Connecticut Siting Council. "Electric and Magnetic Fields Best Management Practices for the Construction of Electric Transmission Lines in Connecticut." Revised on February 20, 2014.

maximum magnetic field levels relative to a horizontal configuration where all conductors are at the same burial depth

- Optimum Phasing – Since the 345-kV line will be the only line present in the proposed duct bank, its phasing will not affect the calculated magnetic-field levels, and thus is not a candidate for phase optimization.

- Increased Voltage – By operating the proposed transmission line at 345-kV, the Applicant has already increased the voltage relative to other lower-voltage (e.g., 115 kV or 230 kV) interconnection options.

- Underground Installation – The proposed 345-kV line will be buried in an underground duct bank, allowing for relatively small (approximately 1 foot) conductor separation. This conductor separation, which is small relative to that of typical overhead lines, provides additional magnetic-field cancellation and results in magnetic field levels decreasing very rapidly with distance. Underground installation also effectively blocks the electric field from the phase conductors.

While no pre-construction measurements of EMF around the proposed generating site are available at this time, it is well known that because of their design that the dominant sources of EMF at the boundaries of facilities like substations and generating plants are the transmission lines that connect these facilities to the electrical grid.[13] At maximum load, the proposed generating lead from the Bridgeport Harbor Station will produce a magnetic field above the cables marginally higher than measured magnetic fields at its termination at the Singer Substation. This will be achieved by design considerations that will minimize the magnetic

[13] IEEE Standard 1127 states that "[i]n a substation, the strongest fields near the perimeter fence come from the transmission and distribution lines entering and leaving the substation. The strength of fields from equipment inside the fence decreases rapidly with distance, reaching very low levels at relatively short distances beyond substation fences." IEEE Guide for the Design, Construction, and Operation of Electric Power Substations for Community Acceptance and Environmental Compatibility. New York: IEEE. IEEE Std 1127-2013, p. 26.

field as called for by the Connecticut Siting Councils guides for substations and transmission lines and the absence of statutory abutting land uses defined in Section 16-50p(i) of the Connecticut General Statutes.

Appendix A

Calculated Magnetic-Field Levels at 25 ft Increments

Table A-1. Calculated magnetic-field levels (mG) for Peak and Average loading at 25 ft increments from −300 ft to +300 ft from the transmission line centerline

	Magnetic Field (mG)	
Distance from Centerline (ft)	**Peak Loading**	**Average Loading**
−300	0.1	0.1
−275	0.2	0.1
−250	0.2	0.2
−225	0.2	0.2
−200	0.3	0.3
−175	0.4	0.3
−150	0.5	0.5
−125	0.8	0.7
−100	1.2	1.0
−75	2.2	1.8
−50	4.8	4.0
−25	17	14
0	132	109
25	17	14
50	4.8	4.0
75	2.2	1.8
100	1.2	1.0
125	0.8	0.7
150	0.5	0.5
175	0.4	0.3
200	0.3	0.3
225	0.2	0.2
250	0.2	0.2
275	0.2	0.1
300	0.1	0.1