Northeast
Utilities System

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Northeast Utilities Service Company
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(860) 665-5000
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March 8, 2004

Ms. Pamela B. Katz
Chairman
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: Docket No. 272 - Middletown-Norwalk 345kV Transmission Line

Dear Ms. Katz:

This letter provides the response to requests for the information listed below.

While it is not possible to provide all the information requested at this time, the Company is attaching the information which has been completed.

Response to TOWNS-01 Interrogatories dated 01/28/2004
TOWNS - 021 , 027 , 028 , 030 , 031

Very truly yours,

Anne B. Bartosewicz
Project Director - Transmission Business

ABB/tms
cc: Service List

SERVICE LIST
Docket: 272

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Witness: Peter T. Brandien
Request from: Connecticut Siting Council

Question:
Regarding the GE report "Connecticut Cable Transient and Harmonic Study for Middletown to Norwalk Project, East Devon - Beseck 40 Mile Cable Option (MIN-P1), Final Report" dated November, 2003, on page E-2, this report states that "(t)ransient overvoltages would be limited sufficiently by surge arrestors to protect the insulation of utility equipment, but utility customer loads may not be protected by these arrestors."

a. Please provide any and all studies, reports, analyses or other information on which this statement is based.

b. Please confirm that substation transformers are among the pieces of utility equipment that surge arrestors could, and normally would, protect.

c. Please identify any and all substation transformers in southwestern Connecticut that cannot be protected by surge arrestors.

d. Please provide any and all studies, reports, analyses or other information on which the response to the above request segment (c) is based.

e. If all substation transformers are protected by surge arrestors from transient voltage surges originating from the bulk power transmission system, please explain how utility customer loads would be unprotected from these surges.

f. Please provide any and all studies, reports, analyses or other information on which the response to the above request segment (e) is based.

Response:
a) The study itself titled "Connecticut Cable Transient and Harmonic Study for Middletown to Norwalk Project, East Devon - Beseck 40 Mile Cable Option (MIN-P1), Final Report" dated November, 2003 provides the analyses by which GE makes this statement.

b) Yes, surge arrestors are used to protect transformers.

c) None, to our knowledge based on the results of the General Electric Transient and Harmonic Report (MIN-P1)

d) The Companies performed no additional analysis.

e) Surge arrestors are used to help ensure that substation equipment is protected based upon that equipment's insulation. However, industry accepted load vulnerability curves, such as the CBEMA curve, show that damage can occur before the point which a surge arrestor operates. Also, while the surge arrestors can protect substation equipment, overvoltages can be amplified by distribution cables and capacitors which could cause the customer to see higher voltages than at the substation.

f) No detailed studies or analyses were performed. Such studies require very extensive and detailed modeling of both the transmission and distribution systems. Until a decision is made by the Connecticut Siting Council on the route the 345-kV transmission lines are to take, whether the transmission line is be constructed above or under-ground, where the overhead and underground segments of the transmission line must be located and the type and number of underground cables to be installed, any study or analysis would be meaningless.

Witness: **Peter T. Brandien**
Request from: **Connecticut Siting Council**

Question:
Reference page 8 of the December 16, 2003 Supplemental Filing.

a. Provide copies of the analyses, studies, evaluations, reports, and workpapers, prepared by or for CL&P or UI, which form the basis for the following statements: Extrapolating from the results of the GE studies, the Companies have concluded that it may be technically possible to add in the range of 5 miles of underground cable construction to the Companies' proposed route, provided that the additional length is contiguous to or originating from a substation.

b. Provide on CD in machine readable format, the input data and results of any such analyses, studies or evaluations.

c. Provide copies of the analyses, studies, evaluations, reports, and workpapers, prepared by or for CL&P or UI, which examined the operational, power distortion and/or future expansion effects of adding this amount of additional underground cable construction to the Companies' proposed route.

d. Identify and discuss in detail the factors which form the basis for the conclusion that this additional 5 miles of underground cable construction would have to be contiguous to or originate from a substation.

e. Provide copies of the analyses, studies, evaluations, reports and workpapers which form the basis for the conclusion that this additional 5 miles of underground cable construction would have to be contiguous to or originate from a substation.

f. Provide copies of the analyses, studies, evaluations, reports and workpapers that form the basis for the conclusion that, at most, an additional 5 miles of underground cable construction could be added to the Companies' proposed route.

Response:

a) The conclusion that an underground cable in the range of 5 miles may be technically feasible was reached by extrapolation of the results of the analysis' performed by GE. As stated in the supplemental filing, this is an assessment of potential technical feasibility. Studies of transients, harmonics, stability and other technical elements of the ISO-required 18.4 application would need to be completed to determine whether the line would actually meet reliability standards.

b) See a above.

c) As stated in a above, the companies did not perform any specific studies to determine the possibility of adding up to 5 miles of additional cable construction to the Companies' proposed route. Please see the GE studies and the companies' supplemental filing.

d) The Companies believe that requiring any additional cable be continuous and originate at a substation would limit the amount of transition equipment between East Devon and Beseck. Each transition station between Beseck and East Devon places equipment in series with this line and in a position of high voltage stress. Without detailed studies, the Companies were not able to extrapolate that such transition stations would be acceptable.

e) See a and d above.

f) See a through d above.

Witness: **John J. Prete**
Request from: **Connecticut Siting Council**

Question:
Reference the Black & Veatch HVDC report provided in response to Data Request D-W-01, Question D-W-014. At page 1 the report notes that "This report examines the technical feasibility of a HVDC solution and neither recommends nor excludes an HVDC solution for the Middletown-Norwalk Project." Provide copies of any other analyses, studies, evaluations or reports, prepared by or for CL&P and/or UI, which examined the results of the Black & Veatch report and/or formed the basis for the specific conclusion that "a HVDC transmission line is not a technically and economically practical alternative."

Response:
Black & Veatch was tasked with "Examining the technical feasibility of a HVDC Solution" at a length similar to the distance between Beseck Substation and the proposed East Devon Substation. The analysis of the Black & Veatch HVDC report and its applicability to "meet the needs" of SWCT was performed in-house by a team of UI and NU engineers. This team determined that the application of HVDC technology was inappropriate because it did not adequately address the reliability, environmental, and cost issues associated with the M/N Project.

Please refer to sections 2.2.3 page 6 (HVDC Transmission Applications), 2.2.4 page 7 (Characteristics of HVDC Transmission Systems), 2.3 page 10 (Pros and Cons of AC and DC Transmission Systems), 4.12 page 25 (Estimated Construction Schedule), 5.0 pages 26-27 (Environmental Issues) and 7.0 pages 29-32 (Budgetary Cost Estimate) of Black & Veatch HVDC report for the details which led to the determination by the Team that the construction of an HVDC Transmission Line did not fulfill the companies' obligation to provide the Connecticut Siting Council with an environmentally compatible and cost effective solution which would meet the applicable reliability standard.

Witness: Peter T. Brandien
Request from: Connecticut Siting Council

Question:
Regarding the GE report "Connecticut Cable Transient and Harmonic Design Study for Phase 1, Final Report" dated June, 2003, on page 3-1, reference is made to cable data which includes technical data on both 345 kV XLPE cable and 345 kV HPFF cable. Recognizing that there are sizable differences between the R0, X0, B0, and B1 characteristics of these two cables, how would the use of XLPE with appropriate compensation in all locations where 345 kV cable is used, in preference to the use of HPFF, affect the study results of the following studies:

a. The GE report "Connecticut Cable Transient and Harmonic Design Study for Phase 1, Final Report" dated June, 2003,

b. The GE report "Connecticut Cable Transient and Harmonic Study for Middletown to Norwalk Project, East Devon - Beseck 40 Mile Cable Option (MIN-P1), Final Report" dated November, 2003,

c. The GE report "Connecticut Cable Transient and Harmonic Study for Middletown to Norwalk Project, East Devon - Beseck 20 Mile Cable Option (MIN-P2), Final Report" dated December, 2003,

d. The GE report "Connecticut Cable Transient and Harmonic Feasibility Study, Final Report" dated March, 2003.

Response:
a through d) The change in cable technology from HPFF to XLPE would change the results. The exact results cannot be stated with certainty. The Companies expect that this would shift the driving point impedance to a point where the resonances would occur at a higher frequency. This could shift resonances from slightly below the 3rd harmonic to the 3rd harmonic, potentially making harmonic concerns significantly worse. A detailed and costly study would be required to determine the impact of this change.

The Companies do not believe that other cable technologies such as XLPE are mature enough to be installed at this length.

Witness: **Peter T. Brandien**
Request from: **Connecticut Siting Council**

Question:
Regarding the GE report "Connecticut Cable Transient and Harmonic Design Study for Phase 1, Final Report" dated June, 2003, on page 3-1, reference is made to cable data which includes technical data on both 345 kV XLPE cable and 345 kV HPFF cable. Recognizing that there are sizable differences between the R0, X0, B0, and B1 characteristics of these two cables, how would the use of XLPE with appropriate compensation in all locations where 345 kV cable is presumed to be used, in preference to the use of HPFF, affect the conclusions stated in the Company's Supplemental Filing, page 8, i.e., that "...it may be technically possible to add in the range of 5 miles of underground cable construction to the Companies' proposed route..."?

Response:
Because of XLPE cables' limited and uncertain operational history at 345-kV and above, the Companies feel strongly that HPFF cable systems would be more appropriate for underground segments of a hybrid transmission line, except perhaps for a short section of about five miles. Worldwide there are only a few 345-kV and above XLPE cable installations in duct banks. The technology is immature and is not recommended for such a critical transmission interconnection. We know that the capacitive charging current (B1 and B0) of a 345-kV HPFF cable is approximately twice as great as that for the identical length XLPE cable; therefore, we know that the study results would change if XLPE cables were to replace the HPFF cables. Additional costly and resource constrained studies utilizing XLPE cables were not conducted because of the length of the circuits and the unproven reliability of such 345-kV installations.