September 14, 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.

This filing completes all the requested information for the CSC-04 set of interrogatories.

Response to CSC-04 Interrogatories dated 08/25/2004
CSC - 071 , 072 , 074 , 077 , 078 , 079 , 082 , 083 , 084 , 085 , 086 , 087 , 088 , 089 , 090

Very truly yours,

Anne B. Bartosewicz
Project Director - Transmission Business

ABB/tms
cc: Service List

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
Should the requirement for maintaining harmonic resonance above the 3rd harmonic be the only criteria for acceptable or unacceptable system performance in terms of harmonic amplification requirements?

a. If yes, please specify why this criterion alone is sufficient.

b. If not, please describe what other criteria should be used.

Response:
No. Frequency scans alone should not dictate acceptable system performance for new transmission lines. Frequency scans should be used as an indicator as to how well the system will respond to various switching and fault clearing events, and sources of harmonic current. Frequency scans with a point of first resonance at or below the third harmonic serve as an indicator of potential problems that must be further studied and evaluated through time domain switching analyses (Transient Network Analyses). Frequency scans can be used as an initial screening tool to test and determine whether proposed transmission plans have potentially damaging operating limitations. Careful review of the GE frequency scan reports shows that there is much more information that needs to be considered in addition to the single frequency scan value. Examination of the impedance graphs shows that each frequency trace has a significantly different amplitude, and that each "hump" in the graph may have a different width. All of these factors are important and it would be inappropriate to draw a conclusion solely from the frequency scan value.

Time domain switching analyses must be performed to fully analyze the system response to various operating conditions. Such analysis will provide insight into the fundamental and harmonic voltage conditions to which substation and customer electrical equipment will be subjected and must be capable of withstanding.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
Should the amounts of damping associated with the various resonance points be a factor in establishing acceptable performances? If not, please discuss why. If yes, please specify:

a. The minimum acceptable criteria in terms of resonance frequency number and damping. These criteria should be provided, per harmonic number, at the different driving points of the system.

b. The maximum permissible harmonic voltage magnification levels, per harmonic number, which you consider acceptable.

Response:
Damping is an important factor in determining whether system performance is acceptable. This is why the "frequency scans" only serve as a general indicator of system response to various switching and fault clearing events. Time domain switching analyses (Transient Network Analyses) must be performed to fully analyze the system response to various operating and maintenance conditions.

a and b) The Companies do not support the use of frequency scans as the only tool to be used to determine the acceptability of system performance. The Companies currently have no specific resonance criteria, but would be extremely concerned about frequency scans which showed high impedances near the second harmonic (120 Hz). The Companies have no specific criteria on damping or harmonic magnification levels. The Companies rely upon the results of detailed switching analyses to determine whether or not transient overvoltages are within the capability of transmission equipment.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
Are there any plans to change the existing Phase I design from less HPFF to more XLPE cable sections? If so, which cables would be replaced? If not, does the Applicant intend to study the effects of such a change on system performance and/or the need for STATCOM capacity in Study Case 7? If such studies are not planned, please explain why this alternative should not be investigated.

Response:

CL&P has no plans to change the existing Phase I design by installing XLPE cables in place of HPFF cables in the underground section of the transmission line between Archers Lane and Norwalk Junction transition stations. The Companies are evaluating reducing the Bethel to Norwalk line's contribution to the capacitive charging currents in SWCT by energizing only one of the two approved HPFF cables under most operating conditions. The needs of SWCT and the Norwalk-Stamford sub-area for additional transfer capability are immediate and the risk of customer outages increases with time. The Bethel to Norwalk transmission project as a stand alone project provides significant reliability benefits and should not be delayed.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
For the current and projected future power system in southwest Connecticut, what contributes to higher voltages under light load conditions? What steps are taken to mitigate high voltages during light load conditions?

Response:
Generally, a decrease in customer demand for electric energy reduces power flows on the transmission grid, which contribute to higher voltages. This is true for the current system and will remain true for the projected future power system in Connecticut.

When energized, an overhead or underground transmission line acts as a capacitor and attempts to increase the voltage, with an underground transmission line acting as a significantly larger capacitor than that of an overhead line. This electrical characteristic remains constant, irrespective of the power flow. Offsetting the voltage rise due to capacitance of the transmission line is the voltage drop associated with the flow of current on that line. The voltage drop is directly proportional to the magnitude of the current flow. During heavy customer demand periods, the voltage drop due to high current flows on the transmission lines exceeds by appreciable amounts the voltage rise associated with capacitance of overhead or underground transmission line. During such periods, substation capacitor banks are switched into service to offset the voltage drops. However, during the periods when current flows are minimal, the voltage drops associated with the current flows are less than the voltage rise associated with the capacitance to the transmission line. In these periods, the voltage on the transmission grid rises.

To maintain acceptable voltage levels during light customer demand periods, capacitors on the transmission and distribution systems are removed from service, transformer taps adjusted and the Glenbrook STATCOM would automatically adjust to the need for absorbing vars. If these actions are not sufficient to reduce system voltages to acceptable levels, generation could be operated to absorb reactive power.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
Are the shunt capacitor banks in southwest Connecticut used to help control system voltage under various loading scenarios? If so, please describe in detail how this is accomplished.

Response:
Yes. The shunt capacitor banks in SWCT help the Companies control system voltages within a certain voltage range and under various conditions. The capacitors are controlled and placed into service by system dispatchers who monitor load, system voltages, generation dispatch, and power transfers. If system voltages are declining, a capacitor bank is placed into service to increase the voltage. Voltages tend to rise when load and transfers decrease. Under these conditions, capacitors are removed from the system.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
Are all the shunt capacitor banks listed in Table 1 of GE's report, entitled "Connecticut Cable Resonance Study for XLPE Alternative in Middletown to Norwalk Project," under the direct control of either the Applicant or ISO-NE?

Response:
No. With the exception of the Cross Sound Cable filters, all capacitors in the referenced list are under the control of CONVEX (The Connecticut Valley Electric Exchange), which operates the power system in Connecticut under the direction of ISO-NE. The Cross Sound Cable filters are in service when the Cross Sound Cable is in service.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
With reference to GE's August 2004 Report on Study Cases 5, 6, and 7, please explain the significance of the 6th column of Table 1 (p.2), entitled "Light Load." Does this indicate that under light load conditions only the shunt capacitors associated with the Cross Sound Filters would be expected to be in service?

a. If not, what is the significance of this column in Table 1?

b. What party provided the information in Table 1?

c. What regional load levels are associated with each loading condition?

d. Based on Table 1 alone, is it more likely that all capacitor banks would be in service for peak load conditions or for light load conditions?

e. Based on Table 1 alone, is it more likely that all banks of capacitors (except the cross sound filter capacitors) would be out of service for peak load conditions or light load conditions?

f. On page 2, paragraph 3, GE states, "An additional generator…is given for 'Light Post Project,' which depicts a more realistic scenario with more local generation off." Please explain in detail why this is more realistic. What scenario is it more realistic than and why? For what year(s) is this scenario considered realistic?

g. What is GE's understanding of the circumstances that constitute:

i. Peak load conditions?

ii. Light load conditions?

Response:
The 6th column of Table 1 (p.2), entitled "Light Load," indicates that under the modeled conditions only the shunt capacitors associated with the Cross Sound Cable were modeled as in service. This condition is also referred to as "All Out of Service" in other locations in the report.

a. See response above.

b. The Companies provided the data in Table 1.

c. As indicated in the response to CSC-04; Q-CSC-073, the switching studies and frequency scans performed by GE are not loadflow based. There is no load level associated with each condition. These studies attempted to bound possible conditions that could occur on the transmission system.

d. It is reasonable to expect more capacitor banks to be placed in service as the demand in SWCT increases. "Light load" in the GE studies bounds system conditions. It does not necessarily correspond to a low demand level in SWCT.

e. It is reasonable to expect more capacitor banks out of service at lighter demand levels. Please refer to the response to CSC-04; Q-CSC-073.

f. As indicated in the response to CSC-04; Q-CSC-075, completion of the Project will increase transfers into SWCT. Therefore, the more expensive generation located in SWCT may be operated less, since cheaper power can be imported from outside the area. This can occur when the Bethel to Norwalk Project is placed into service, and will become more likely once the Middletown to Norwalk Project is placed in service.

g. Please refer to the response to CSC-04; Q-CSC-073.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
With reference to GE's August 2004 Report on Study Cases 5, 6, and 7, please state whether system resonance results were obtained for a peak load case. If so, please describe and discuss all results. If not, why was a peak load case not studied?

Response:
System resonance results were not obtained for the case that GE designated as a "peak load" case. GE's designation of "peak load" refers to the generation dispatch and not the level of demand. This case assumes more generation in service than that assumed in the subject report. The addition of generation increases the short circuit strength of the area, which increases the frequency of the natural resonance of the system. Consequently, the "peak load" generation dispatch case will not result in a limiting case; therefore, GE was not requested to conduct a system resonance frequency scan for this generation dispatch scenario.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
Has the Applicant or GE run any resonance studies of the XLPE Alternative in the Middletown and Norwalk Project for either a peak load (or a heavy load) scenario? If so, please provide the results of all such studies and discuss the reasons for any differences between these results and those for other study cases. If not, please discuss in detail the rationale for not examining such a loading scenario.

Response:
No. Please see the response to CSC-04; Q-CSC-083.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
In further studying Case 7, does the Applicant intend to look at variations in the total amount of STATCOM Capacity and in its deployment at the various transmission stations in southwest Connecticut? If so, please describe what variations will be studied and why. If not, please discuss why there is no need to examine such options.

Response:
The Companies are not currently analyzing variations in the total amount of STATCOM capacity in Case 7. The Companies believe that there will likely be control interaction problems between STATCOMs located in such close electrical proximity to each other. The Companies are also concerned that, even if the manufacturers claim the control interactions could be mitigated, system wide events, similar to those that occurred on August 14, 2003, would cause the STATCOMs to misoperate simultaneously. Thus, the Companies have concluded that the deployment of multiple STATCOMs within SWCT will not improve the reliability of the Project beyond the level identified in the August 16, 2004 ROC Report.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
Has the Middletown-Norwalk Project been designed to accommodate the delivery of power from existing and new generating plants? If so, please describe all aspects of the design that accommodate such deliveries. If not, please explain why.

Response:
Yes. The proposed 345-kV alternating current (AC) Project has been designed to accommodate the delivery of power from existing and new generating facilities. The interdependencies of the existing generating plants in SWCT will be resolved through the construction of East Devon and Singer substations. The interconnection of Bridgeport Energy to the 345-kV transmission grid and changing the connection of Milford Power from the Devon Switching Station to East Devon Substation will allow simultaneous operation of both of these facilities. In addition, the Project, as proposed, will allow merchant generating companies to economically connect new generating facilities in SWCT.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
Does the Applicant have any ability to influence the siting and/or operation of generating plants in southwest Connecticut? If so, please describe all ways that the Applicant can influence either plant siting or plant operation.

Response:
The Companies do not currently have the ability to directly influence the siting and/or operation of generating plants in SWCT. Pursuant to Connecticut's 1998 restructuring legislation, the Companies divested their respective generation assets.

Through participation in the ISO-NE Transmission Expansion Advisory Committee ("TEAC"), the Companies have raised concerns regarding electric system deficiencies in SWCT. The Regional Transmission Expansion Plans ("RTEP") provide advanced information to industry participants including the identification of deficient "load pockets" that could be improved through the siting of new generation.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
Please describe in detail the Applicant's current system plan for future generation in southwest Connecticut. Please identify plant location, size, number of units, prime movers, fuel type (if known), and year of initial operation.

Response:
The Companies do not have, nor are they required to have, a "system plan for future generation in southwest Connecticut." Pursuant to Public Act 98-28, the Companies divested their respective generation facilities. Please see response to CSC-04; Q-CSC-087.

The ISO-NE study queue identifies potential generation additions, as listed in the table below. Since these additions have been proposed by third parties, the Companies have no information on number of units, prime movers or fuel type.

Project Name	MW	Location	In-service Date
South Norwalk Repowering	50.4	Norwalk	1st Quarter 2002
Waterside Power*	180	Stamford	6/01/2004
Bridgeport Harbor Units 5 & 6*	160	Bridgeport	5/01/2005
Ridgebury Power*	10	Ridgefield	6/01/2004
Third Taxing District Units 1,2, and 3	6	Norwalk	8/01/2004

*System impact studies have not been performed for these proposed generating facilities.

This information can be found at http://www.iso-ne.com/smd/transmission_planning/New_Interconnections/Interconnection_Study_Status.xls

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
Is it reasonable for the Applicant to assume that little or no local generation will operate to meet the future needs of southwest Connecticut? Why or why not? Please answer this question separately for a 5-year and a 10-year planning horizon.

Response:
Yes. Much of the generation in SWCT consists of older, inefficient, more polluting, and higher cost generating units, which are the target of Connecticut environmental concerns that may limit or restrict future operations.

Bridgeport Energy, Milford, and Wallingford are all newer plants which have been built in SWCT. Although these units are more efficient, and would likely be more economical to operate than older oil-fired units, both Milford and Wallingford have sought Reliability Must Run (RMR) contracts with ISO-NE. This could indicate that the energy marketplace does not provide sufficient financial incentives to support continued operation of these generating facilities. This is a concern over the next five years, and the likelihood of stricter environmental controls and continued marketplace uncertainty would only increase such concerns over a 10 year period.

The permanent retirement of inefficient, higher cost generating stations will lead to a need for additional generation. The addition of transmission infrastructure such as the proposed Project will facilitate the connection of more economical generating stations in SWCT. Locating and siting generation in populated areas of Connecticut, and in particular SWCT, is expected to remain challenging. New generation to meet future Connecticut customer demands for electricity may be located in less populated areas, outside of SWCT.

Witness: **Allen W. Scarfone**
Request from: **Connecticut Siting Council**

Question:
Could the presence and operation of local generation in southwest Connecticut have a direct effect on the region's transmission design and cost?

a. If so, please discuss what effects are possible.

b. If not, please describe why additional generation would not affect future transmission needs.

Response:
a. Yes. However, it is difficult to predict the impact of any new generating plant in SWCT on the transmission design and cost unless the size, number of units, and exact point of connection to the transmission grid are known. Any new generation would have to be connected such that the available fault current at Pequonnock and Devon substations remains below their equipment capabilities. A system impact study must be conducted before any generating facility is allowed to connect to ensure the generating facility does not adversely impact the transmission grid. The system impact study will identify transmission line and equipment overloads during normal and emergency conditions and evaluate increased fault duties on substation equipment such as circuit breakers. In accordance with the NEPOOL Tariff, the cost of transmission facilities identified in the system impact study that are required for the connection of a new generating plant, under the minimum interconnection standard, are paid for by the developer.

Absent the completion of the Project, the possible effects of siting new generation in SWCT are higher short circuit currents at existing substations, increased power flows on transmission lines that could exceed the thermal capabilities of the line and, depending on the location of the new generating facility, could impact the dispatch of multiple generating stations in the area. The interdependency of generating stations could adversely impact the viability of older less economic generating facilities.