STATE OF CONNECTICUT

SITING COUNCIL

Re:	The Connecticut Light and Power Company and The United Illuminating Company Application for a Certificate of Environmental Compatibility and Public Need for the Construction of a New 345-kV Electric Transmission Line and Associated Facilities Between Scovill Rock Switching Station in Middletown and Norwalk Substation in Norwalk, Connecticut Including the Reconstruction of Portions of Existing 115-kV and 345-kV Electric Transmission Lines, the Construction of the Beseck Switching Station in Wallingford, East Devon Substation in Milford, and Singer Substation in Bridgeport, Modifications at Scovill Rock Switching Station and Norwalk Substation and the Reconfiguration of Certain Interconnections	)	Docket 272
		)	March 16, 2005

POST-HEARING BRIEF OF THE CONNECTICUT LIGHT AND POWER COMPANY AND THE UNITED ILLUMINATING COMPANY

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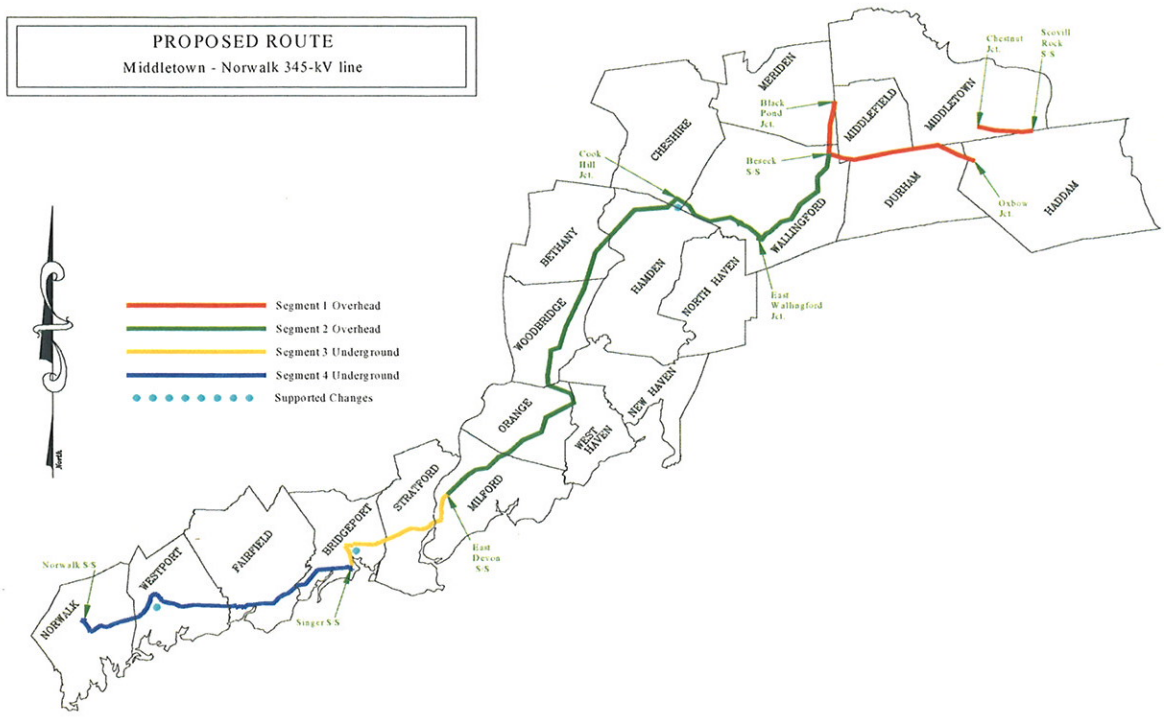
I. EXECUTIVE SUMMARY

The Connecticut Light and Power Company ("CL&P") and The United Illuminating Company ("UI") (together, the "Companies") request that the Connecticut Siting Council ("Council") issue a Certificate of Environmental Compatibility and Public Need for the construction of a new 345-kilovolt ("kV") electric transmission line and associated facilities (including reconstruction of portions of existing 345-kV and 115-kV transmission facilities, substations and switching stations and the reconfiguration of certain interconnections) between Middletown and Norwalk ("the Project"). The Project includes 24 miles of underground 345-kV cable, which is the maximum amount of underground 345-kV construction that is technologically feasible.

The Project

The Project will extend approximately 69 miles, crossing portions of 18 municipalities in Middlesex, New Haven and Fairfield counties. The proposed transmission line will be overhead for approximately 45 miles, from the existing Scovill Rock Switching Station in Middletown to the proposed East Devon Substation in Milford (*i.e.*, Segments 1 and 2). A 345-kV XLPE cable system will be installed underground, primarily beneath public roadways, for approximately 24 miles, from the proposed East Devon Substation to the proposed Singer Substation in Bridgeport and from Singer Substation to the existing Norwalk Substation (*i.e.*, Segments 3 and 4). In addition, the Project will include the construction of the proposed East Devon and Singer substations and the Beseck Switching Station in Wallingford, as well as modifications to the existing Norwalk Substation and the existing Scovill Rock Switching Station.

The proposed route is shown in the map below.



CL&P will own approximately 80% and UI will own approximately 20% of the constructed Project. UI will construct and own Singer Substation and associated generator interconnects and most of the transmission line from Singer Substation to East Devon Substation. The final refinement of the specific lengths of line to be owned by each company will be made shortly after the Council's final decision in this Docket. At that time, the Companies will ask the Council to separate the Project Certificate into two sections (one for the CL&P facilities and one for the UI facilities).

The Docket Record

The docket record reflects the comprehensive discussion and evaluation of all issues relevant to transmission line siting required by the Public Utility Environmental Standards Act ("PUESA"), both before and after the enactment of Public Act 04-246, An

Act Concerning Electric Transmission Line Siting Criteria ("P.A. 04-246" or the "Act"). The Companies' work began more than two years before they filed the Application with the Council in October 2003. Prior to filing the Application, the Companies undertook significant technical and routing analysis of overhead and underground technology options, and had extensive consultations with municipal and state officials about the Project. The formal municipal consultation filing provided eight volumes of information to the municipalities through which the Project might traverse. In addition, the Companies held sixteen informational "open houses" as well as 14 public meetings to provide members of the public with an opportunity to provide input regarding their primary concerns about the Project.

The Application comprised 12 volumes of detailed information regarding the Project. From the fall of 2003 through the winter of 2004/2005, the Companies responded to hundreds of interrogatories and supplied thousands of pages of technical documents. In June 2004, after two months of hearings, of the Companies and the Independent System Operator-New England ("ISO-NE") formed the Reliability and Operability Committee ("ROC") to determine the maximum amount of underground 345-kV cable that could be included in the Project, consistent with maintaining the reliability and operability of the electric system. Thirty-four hearing days, including public comment hearings, were conducted over the last year and a half.

The evidentiary record is massive, and the scope of this docket is unprecedented. The Companies have submitted detailed Findings of Fact to the Council, and are submitting this Brief to focus on significant issues that were addressed in the record.

Need

The Project will address the urgent need to complete a 345-kV transmission loop into SWCT (the only part of the state not presently served by such a loop), thereby connecting SWCT to the rest of the 345-kV electric grid in Connecticut, New England, and New York state. The Project will improve system reliability by enhancing the interconnections between SWCT and the remainder of New England, eliminating generation restrictions, eliminating short-circuit problems at substations, and eliminating most violations of national and regional standards regarding thermal overloads.

The Maximum Amount of Underground Cable

After extensive study by the ROC Group and its technical consultants, and analysis by the Council's independent technical consultant, there is no dispute as to the maximum linear amount of underground cable that is technologically feasible for the Project. The Companies' revised proposal, including 24 linear miles (48 circuit miles) of XLPE 345-kV underground cable between Norwalk and East Devon, is technologically feasible. Because the potential for high temporary overvoltages ("TOVs") increases with the amount of cable, adding any incremental cable to the 24 miles proposed by the Company is not technologically feasible. The Companies have made modifications to the technology and equipment to be utilized in the Project in order to address TOV problems that would otherwise have rendered the 24 miles proposed by the Companies technologically infeasible. There are no mitigation techniques, with proven reliability, that could reasonably be used to increase the amount of underground cable in this Project, and the risk of using unproven theoretical techniques is unacceptable. "Reallocating" any portion of the 48 circuit miles of underground cable between East Devon, Singer, and

Norwalk substations proposed by the Companies would not increase the maximum amount of underground cable adjacent to categories of facilities listed in P.A. 04-246. In fact, any "reallocation" of undergrounding to the portion of the route north of East Devon Substation will result in a decrease in the total linear miles of undergrounding, given the need to install three circuits north of East Devon.

Magnetic Fields and Buffer Zones

The overhead right of way ("ROW") in Segments 1 and 2 (Beseck to East Devon) will buffer the lines adequately to protect public health and safety. The lines will pose no "undue hazard," and will be consistent with the Council's Best Management Practices that were in place at the time the Application was filed and as revised in December 2004. This Brief discusses the scientific and evidentiary record that supports the Council's findings on these matters in great detail.

In addition, the Brief addresses "prudent avoidance." Although not necessary to protect the public health and safety, the Council may order, on the basis of prudent avoidance, that magnetic fields be reduced through the implementation of low magnetic field designs. This Brief includes an evaluation of low magnetic field line designs, by cross section, of the overhead portion of the line, in relation to the doctrine of prudent avoidance.

Specification of Line Designs in the Decision and Order

The Companies are requesting that the Council select the overhead configurations for segments 1 and 2 of the route in its Findings of Fact, Opinion, and Decision and Order, rather than deferring this decision until the Development and Management Plan ("D&M Plan") stage. Such a deferral would delay the in-service date, thereby increasing

reliability risks in SWCT and increasing the costs of the Project. For similar reasons, the Companies are also requesting that the Council now determine certain fundamental issues regarding underground construction.

II. THE PROJECT SATISFIES THE REQUIREMENTS UNDER THE PUBLIC UTILITY ENVIRONMENTAL STANDARDS ACT FOR THE ISSUANCE OF A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED.

A. Evolution of the Project

Prior to filing the Application, the Companies conducted an extensive analysis of underground and overhead routing and technology options. Based on this analysis, the Companies selected the proposed route because it would not require the acquisition of any homes or businesses, would minimize environmental effects, would require minimal expansion of existing rights-of-way ("ROWs"), and would conform to sound engineering practice. The route that the Companies are requesting the Council to approve is essentially the same as that originally proposed in the Application.

Although the proposed route is virtually unchanged, the underground 345-kV cable technology that the Companies are asking the Council to certify has changed since the filing of the Application, and there has also been an extensive post-Application investigation of alternative designs for overhead structures. Two significant events in June of 2004 played the principal role in driving these changes: (1) ISO-NE determined that it could not support the Project as proposed based upon operability and reliability concerns; and (2) the Connecticut Legislature passed Public Act 04-246, An Act Concerning Electric Transmission Line Siting Criteria ("P.A. 04-246" or "the Act").

The Companies had proposed in the Application to install two sets of 345-kV high-pressure fluid filled ("HPFF") cables in the underground segments of the route between Milford and Norwalk because of the proven reliability of HPFF technology at 345 kV. *Companies' Ex. 1* (Application, Vol. 6, Evaluation of Potential 345-kV and 115-kV Cable Systems as part of the Middletown-Norwalk Project, pp. 3-4). However, as they testified during the March and April hearings in this docket, ISO-NE and the Companies were then still working to resolve operability issues arising out of the capacitance introduced by the use of 24 miles of underground cable. ISO-NE subsequently testified in June that the Project, as then designed with the use of HPFF cables, would not operate reliably because it would introduce too much capacitance into a weak system, and would pose the risk of system failures, including cascading outages, and damage to transmission system equipment. *ISO-NE's Ex. 1* (Testimony of Whitley, March 9, 2004, p. 26); 3/23/04 Tr. at 49-51 (Zaklukiewicz); 4/21/04 Tr. at 121-22 (Zaklukiewicz); *ISO-NE's Ex.* 8 (Testimony of Whitley, June 7, 2004, p. 6.); 6/17/04 Tr. at 45-47 (Whitley). ISO-NE therefore advised the Council that it could not support the Project as proposed in the Application. 6/17/04 Tr. at 90-93 (Whitley).

The passage of P.A. 04-246 also forced the Companies to reevaluate the amount and type of underground facilities it had proposed in the Application. P.A. 04-246 created a presumption that, for a transmission line of 345-kV or more, the placement of the overhead portions of the line "adjacent to residential areas, private or public schools, licensed child day care facilities, licensed youth camps or public playgrounds" (hereinafter, "statutory facilities") is inconsistent with the purposes of the Public Utilities Environmental Standards Act ("PUESA"), C.G.S. §§ 16-50 *et seq.*; P.A. 04-246, § 7;

C.G.S. § 16-50p(h). The Act further provides that the presumption can be overcome by demonstrating that it will be technologically infeasible to bury the line and that in determining such infeasibility, the Council shall consider the effect of burying the facility on the reliability of the electric transmission system of the state. *Id.*

Following the June hearings, the Companies and ISO-NE formed the Reliability and Operability Committee ("ROC" or "ROC Group") in order to determine the maximum linear length of underground 345-kV transmission cable that could be undertaken for the Project, consistent with the reliable operation of the electric system. FOF ¶ 18. To satisfy the statutory directive to maximize the amount of technologically feasible 345-kV cable installed adjacent to statutory facilities, the ROC Group considered a variety of potential options, including alternating current ("AC") technology, high voltage direct current ("HVDC") technology, as well as electric system devices such as static synchronous compensators ("STATCOMS") and synchronous condensers. *Companies' Ex. 176* (Reliability and Operability Committee (ROC) Report dated December 20, 2004, pp.1-13). In determining the limits of technological feasibility, the ROC Group relied on the engineering and operational experience of ISO-NE, the Companies, and their consultants to model potential configurations and perform sophisticated transient network analysis ("TNA") studies to evaluate the risk of temporary overvoltages ("TOVs") arising from the amount of underground cable proposed. *Id.*

After approximately six months of study and analysis, the ROC Group determined that the Companies' proposed route (with 24 linear miles of underground cable) as set forth in the Application is technologically feasible, provided that the

following modifications are made to the proposal contained in the Application: (i) XLPE cable is used rather than HPFF cable as had originally been proposed; (ii) approximately 1,200 surge arresters are replaced and upgrades of other equipment are completed at about half of CL&P's transmission substations and all of the UI transmission substations to improve the capability of the equipment to withstand TOVs; (iii) 500-kV class equipment is installed at certain substations; and (iv) other changes to remedy local area problems (Rocky River Substation are effected). *Companies' Ex. 176* (Reliability and Operability Committee (ROC) Report dated December 20, 2004, pp. 23-24); 2/17/05 Tr. at 111 (Prete).

The Council required comprehensive information regarding potential structure configurations that could reduce magnetic fields. The overhead structure configurations that the Companies proposed in the Application were based largely on input received during the pre-Application municipal consultation process from the towns and the residents along the route that one of the principal concerns was the aesthetic impacts of higher structures. *Companies' Ex. 1* (Application, Vol. 1, pp. R1-R7 and Vol. 6, "Electric and Magnetic Field Assessment: Middletown-Norwalk Transmission Reinforcement"); *Companies' Ex. 35* (Letter to Pamela B. Katz, Chairman, regarding updates to EMF modeling, dated March 15, 2004). As a result, the Companies placed a priority at the time of their Application in minimizing structures height to reduce such visual impacts. *Id.* However, the Act forced the Companies and the Council to devote a significant portion of this docket to efforts to reduce the magnetic field levels along the overhead ROW by evaluating "low magnetic field designs" that utilized taller structures,

split phasing, and other design techniques to achieve lower calculated magnetic fields at statutory facilities along the ROW. *See* FOF ¶¶ 496-526.

To assist the Council in deciding whether to order low magnetic field options and if so, which option, the Companies have included an Appendix to the Companies' Proposed Findings of Fact ("FOF Appendix") from evidence in the record. The FOF Appendix, which is discussed in greater detail in Section VI below, provides information to evaluate the trade-offs of magnetic field reduction and structure configuration, number and height. In addition, in Section VIII of this brief the Companies review overhead transmission line designs by cross section in relation to the doctrine of "prudent avoidance." The Companies ask the Council to choose overhead structure designs in its Findings of Fact, Opinion, and Decision and Order. Deferring this decision until the D&M Plan stage would delay Project construction, thereby increasing reliability risks to Connecticut consumers as well as increasing Project cost.

B. Review of the Requirements of PUESA, as Amended by Public Act 04-246, for the Granting of a Certificate of Environmental Compatibility and Public Need.

C.G.S. § 16-50p sets forth the findings required as a condition to the issuance of a Certificate for the Project. Section 16-50p(a)(3), as amended by P.A. 04-246 (the language in bold below), provides in pertinent part:

> [t]he council shall not grant a certificate, either as proposed or as modified by the council, unless it shall find and determine:
>
> (A) ... public need[1] for the facility and the basis of the need;
>
> (B) The nature of the probable environmental impact of the facility alone and cumulatively with other existing facilities, including a specification of every significant adverse effect, **including, but not limited to,**

[1] C.G.S. § 16-50p(h) provides that "a public need exists for an energy facility if such facility is necessary for the reliability of the electric power supply of the state."

electromagnetic fields that, whether alone or cumulatively with other effects, on, and conflict with the policies of the state concerning, the natural environment, ecological balance, public health and safety, scenic, historic and recreational values, forests and parks, air and water purity and fish, aquaculture and wildlife;

(C) Why the adverse effects or conflicts referred to in subparagraph (B) of this subdivision are not sufficient reason to deny the application;

(D) In the case of an electric transmission line, (i) what part, if any, of the facility shall be located overhead, (ii) that the facility conforms to a long-range plan for expansion of the electric power grid of the electric systems serving the state and interconnected utility systems and will serve the interests of electric system economy and reliability, and (iii) that the overhead portions, if any, of the facility are cost effective and the most appropriate alternative based on a life-cycle cost analysis of the facility and underground alternatives to such facility, are consistent with the purposes of this chapter, with such regulations **or standards** as the council may adopt pursuant to section 16-50t, **including, but not limited to, the council's best management practices for electric and magnet fields for electric transmission lines** and with the Federal Power Commission "Guidelines for the Protection of Natural Historic Scenic and Recreational Values in the Design and Location of Rights-of-Way and Transmission Facilities" or any successor guidelines and any other applicable federal guidelines **and are to be contained within an area that provides a buffer zone that protects the public health and safety, as determined by the council. In establishing such buffer zone, the council shall take into consideration, among other things, residential areas, private or public schools, licensed child day care facilities, licensed youth camps or public playgrounds adjacent to the proposed route of the overhead portions and the level of the voltage of the overhead portions and any existing overhead transmission lines on the proposed route. At a minimum, the existing right-of-way shall serve as the buffer zone**;

(E) In the case of an electric or fuel transmission **line, that the** location of the line will not pose an undue hazard to persons or property along the area traversed by the line....

C.G.S. § 16-50p(a)(3) (emphasis added to indicate language added pursuant to P.A. 04-246). In addition, P.A. 04-246 created a rebuttable presumption that a proposal to create a 345-kV line overhead adjacent to, "residential areas, private or public schools, licensed child day care facilities, licensed youth camps or public playgrounds, is inconsistent with

the purposes of" PUESA (the "Presumption"). An Applicant may rebut the Presumption by demonstrating "that it will be technologically infeasible to bury the facility." P.A. 04-246, §7.

In its notice dated February 17, 2005, the Council requested briefing on a number of issues related to P.A. 04-246, including, but not limited to, the meaning and effect of the provisions of the Act regarding the Presumption and "buffer zones." The Companies address each of these issues in this brief as set forth below:[2]

Question Number (Council 2/17/05 Notice)	Statutory Section at Issue	Topic	Reference to Portion of Brief Where Addressed
1.	C.G.S. 16-50p(h)	Underground Presumption • Relevance of cost • Meaning of "adjacent" • Meaning of "technologically infeasible"	§ V(A)1
2.	C.G.S. 16-50p(h)	Limitation on amount of the proposed line that can be technologically and reliably buried	§ V(A)2
3.	C.G.S. 16-50p(h)	Relevance of ISO-NE approval of configuration	§ V(A)4
4.	C.G.S. 16-50p(a)(3)(D)	Buffer Zones	§ VI(A)1
5.	C.G.S. 16-50p(a)(3)(D)	Meaning of "residential area"	§V(A)3

[2] During the course of this Docket, the Companies have filed several briefs on the meaning and effect of P.A. 04-246, which the Council may also find useful. *See Companies' Ex. 129* (Applicants' Comments on Public Act 04-246, dated July 19, 2004); *Companies' Ex. 128* (Applicants' Response to Council's Interrogatory Concerning "Buffer Zone" Determination Pursuant to Public Act 04-246, dated July 19, 2004); Letter Brief to Chairman Katz, dated August 10, 2004 Concerning P.A. 04-246.

C. The Project Meets the Requirements for Issuance of a Certificate of Environmental Compatibility and Public Need.

The evidentiary record demonstrates that the Project satisfies each of the requirements under PUESA for issuance of a certificate of environmental compatibility and public need. (*See* FOF.) The FOFs detail the evidence supporting the issuance of a certificate under C.G.S. §16-50p, Attachment 2 to this brief lists the requirements under PUESA, including P.A. 04-246, and provides citations to the relevant sections of the FOFs.

This Brief focuses the on the most important issues in this docket:

- The Project is needed urgently; (Section III)
- The proposed route provides the optimal balance of reliability and economic and social impacts; (Section IV)
- The Companies have satisfied the directive of P.A. 04-246 to maximize the amount of underground construction adjacent to "statutory facilities" that is technologically feasible; (Section V)
- The existing ROW provides a buffer zone that will protect public health and safety and will be consistent with the Council's Best Management Practices; (Section VI)
- The Council should include in its decision the standard underground construction practices that should be utilized for the Project. The Council should exercise its jurisdiction over the Department of Transportation ("DOT") to resolve potential issues between the DOT and the Companies concerning underground construction (Section VII).

Finally, in Section VIII, the Companies review transmission line designs for all cross sections of the overhead portions of the route, including configurations adjacent to the Royal Oak subdivision in Durham, and the Jewish Community Center and Congregation B'nai Jacob/Ezra Academy in Woodbridge.

III. THERE IS AN URGENT NEED FOR THE PROJECT.

A. Introduction

The existing 115-kV transmission system in SWCT fails to meet regional and national standards. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 4); FOF ¶ 127); Attorney General's proposed Findings of Fact ¶ 12. The Project is needed immediately. The Federal Energy Regulatory Commission ("FERC") considers SWCT to be one of the most critical reliability issues in the country. ISO-NE has recognized that New England's most urgent reliability need is the upgrade of the transmission system in SWCT. *Companies' Ex.* 1 (Application, Vol. 1, pp. F-1 to F-5); 3/23/04 Tr. at 109 (Whitley); *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 3-4).

These reliability issues will only worsen over time as the load in SWCT continues to grow and the likelihood increases that existing generation becomes uneconomic. *Companies' Ex. 1* (Application, Vol. 1, p. F-7); *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 5); *Companies' Ex.* 32 (Testimony of Coretto, March 9, 2004, p. 4). Serious reliability issues will still exist even after the Bethel-Norwalk 345-kV line is in service. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 4-5). The urgent need for the Project was summarized by Stephen Whitley, the Chief Operating Officer of ISO-NE:

> Connecticut is in jeopardy. The load is continuing to grow. We need this project yesterday. And every day that it's delayed is going to be bad. . . .
> 6/17/04 Tr. at 55 (Whitley).

> [G]etting this project in service as soon as possible is critically important from a reliability standpoint to keep the lights on.
> 2/17/05 Tr. at 88 (Whitley).

The Project is needed to complete a 345-kV transmission loop into SWCT (the only part of the state not presently served by such a loop), thereby connecting SWCT to the rest of the 345-kV electric grid in Connecticut, New England, and New York State. SWCT is the only significant load area in New England that is solely dependent on 115-kV transmission lines and substations. Significantly, no party or intervenor in this Docket questioned the need for the Project, and experts retained by other parties concurred that the Project is badly needed. The Office of Consumer Counsel's consultant, Marc Montalvo, stated that the need for the Project is "severe." 6/2/04 Tr. at 118 (Montalvo). Mr. Montalvo also corroborated the Companies' testimony that the reliability of the transmission system in SWCT will continue to deteriorate without remediation of the problems in SWCT. *OCC's Ex. 1* (Testimony of Montalvo, March 9, 2004, p. 4). In addition, the Towns' consultants acknowledged that the Project would provide needed improvement to the reliability of the electric transmission system. 6/3/04 Tr. at 29 (Schlissel and Lanzalotta).

B. Basis for the Need

1. Violation of Reliability Criteria:

CL&P and UI must comply with the reliability standards developed by The North American Electric Reliability Council ("NERC"), The Northeast Power Coordinating Council ("NPCC") and the New England Power Pool ("NEPOOL") for transmission planning, as CL&P and UI's bulk power delivery systems are part of ISO-NE's bulk power grid. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 23). The existing 115-kV transmission system in SWCT does not meet these national and regional transmission reliability standards. *Companies' Ex. 31* (Testimony of

Zaklukiewicz, March 9, 2004, pp. 4-5). Failure to bring SWCT into compliance with reliability standards exposes the region to the risk of blackouts, pre-cautionary load shedding and service interruptions that are costly and detrimental to the region's economy. 1/11/05 Tr. at 23-24 (Whitley).

2. Short Circuit Issues:

The Project is needed to address short circuit duty issues, particularly in the Bridgeport area. Short circuit current occurs when one or more phases of a three-phase transmission system accidentally contact earth or each other. High currents occur on the transmission network until the condition is isolated. These currents pose a significant danger if the current's magnitude can surpass the rating of substation equipment. At Pequonnock Substation in Bridgeport, available currents can reach 63,000 amperes, which is the existing limit of the substation equipment. If the currents exceed this level, the equipment could fail and cause multiple transmission line outages and endanger anyone in the vicinity. These currents also restrict expansion of the 115-kV transmission system and prevent the addition of any large generating stations in SWCT. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 26-27); *Companies' Ex. 1* (Application, Vol. 1, pp. F-29 to F-30, F-34 to F-35).

3. Generation Issues:

SWCT has to rely on inefficient and expensive local power generation and imports from surrounding areas to meet demand. As such, generation resources located in SWCT are required to operate as "must run" in some circumstances to provide reliable service. Additionally, access to generation outside SWCT is limited by the congested 115-kV transmission pathway. *Companies' Ex. 1* (Application, Vol. 1, p. F-7).

The situation in SWCT is exacerbated by the inability of all generation in SWCT to be operated simultaneously. Generation in SWCT is connected to the 115-kV transmission lines, which are inadequate to move power from the generating centers to the load centers and to consumers. 3/23/04 Tr. at 31-32 (Brandien and Zaklukiewicz); *Companies' Ex. 1* (Application, Vol. 1, p. F-30). For example, during certain operating conditions, the generators connected to the Devon and Pequonnock Substations experience restrictions. All the generators connected to the Pequonnock Substation cannot be operated at full capacity simultaneously, because the 115-kV transmission lines originating from Pequonnock would overload. There are certain dispatch scenarios in which the Devon-Pequonnock-Weston and Devon-Pequonnock-Old Town 115-kV lines would overload. In these instances, generators at Devon has to be backed down. *Companies' Ex. 1* (Application, Vol. 1, p. F-30).

In early 2004, ISO-NE sought to cover the deficiency in transmission and generation resources in SWCT by issuing a Gap RFP for 300 MW of various resources, including temporary generation, emergency generation, demand reduction, load response and energy conservation, which would be called upon in emergencies to avoid blackouts. *Companies' Ex. 32* (Testimony of Coretto, March 9, 2004, p.7); 3/23/04 Tr. at 71-72 (Brandien and Mutchler); 3/23/04 Tr. at 155-56 (Whitley and Kowalski). The Gap RFP has been a difficult process because of the limited number of sites in SWCT, and short circuit duty limitations and interconnect issues make it difficult to connect even emergency generation to SWCT's transmission system. Accordingly, the Gap RFP is an emergency backup measure with very limited use, and not a long term solution to the problems in SWCT. 3/23/04 Tr. at 116-17, 155 (Whitley).

Further, the majority of existing generators in SWCT are older, less-efficient fossil fueled plants, whose continuing availability is in question. The situation in SWCT is so serious that ISO-NE has had to enter into "reliability must run" ("RMR") contracts to ensure that uneconomic generators in SWCT will be available when necessary for reliability purposes. Finally, the addition of new generation is constrained by the inadequacy of the 115-kV transmission system. *Companies' Ex. 1* (Application, Vol. 1, pp. F-2, F-7); *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 31-32).

C. The Project Will Address the Critical Reliability Issues in SWCT.

The Project will satisfy the electrical system needs in SWCT. Specifically, the Project will provide the following reliability benefits:

- **Violations of Reliability Criteria:** The Project greatly reduces the risk of overloads by removing generation from the constrained 115-kV transmission system and by providing a lower impedance path to the load in SWCT. Implementation of the Project will substantially reduce the number of line segments that could overload under various contingencies. *Companies' Ex. 1* (Application, Vol. 1, p. F-32); *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 28); *see* FOF ¶¶ 4, 180.

- **Short Circuit Issues:** The Project will reduce the short circuit current by connecting the Bridgeport Energy generating station to the 345-kV system, adding series reactors at the 115-kV East Devon Substation and moving the Milford Generating Station interconnection from the Devon 115-kV Substation to the new East Devon 115-kV Substation. *Companies' Ex. 1* (Application, Vol. 1, p. F-32); *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 26-27); *see* FOF ¶ 133.

- **Generation Interdependencies:** The Project will connect new substations in Milford and Bridgeport as well as Norwalk Substation. This will allow generating plants in SWCT to link to the 345-kV transmission system. By altering the interconnection of Bridgeport Energy and Milford Power, the Project will eliminate the restriction on simultaneous operation of generators in SWCT.

Companies' Ex. 1 (Application, Vol. 1, p. F-32) *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 28); *see* FOF ¶¶ 201-203.

- **Interconnecting New Generation**: The Project will allow interconnection of new generation. Newer generation is mainly in the 550 MW class, which cannot be connected to the existing 115-kV transmission system. *Companies' Ex. 1* (Application, Vol. 1, p. F-32); *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 28); 3/23/04 Tr. at 91 (Zaklukiewicz); *see* FOF ¶ 137.

- **Increase in Transfer Limits and Corresponding Flexibility to Meet New Load:** In 2002, peak load in SWCT was 3,465 MW, which exceeded the approximately 2,200 MW of generation in the region. As such, SWCT businesses and residents rely on power imported from generating stations outside of SWCT, and this reliance on imported power is likely to increase as the load grows and as the continued availability of the existing generation and the siting of new generation in SWCT remains uncertain. The Project addresses this need by increasing transfer limits into SWCT to between 3,200 and 3,400 MW. In addition, the Project will also allow the addition of new autotransformers along the route as an additional means to address future load growth. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 11, 20); *see* FOF ¶ 135.

By improving the overall reliability of the grid, the Project reduces the risk of cascading outages, such as the blackout that occurred on August 14, 2003. The economic and social dislocation caused by such blackouts, and the corresponding benefit of substantially reducing the risk of such events, cannot be underestimated. 2/17/05 Tr. at 88 (Whitley).

Finally, although the main purpose of the Project is to address the SWCT reliability issues, the Project will provide important ancillary benefits. These benefits include reduced reliance on RMR contracts, increased efficiency of the power system through reductions in line losses, and the promotion of the development of a competitive

generation market in the region. *See Companies' Ex. 1* (Application, Vol. 1, pp. F-33 to F-34); 2/17/05 Tr. at 84 (Whitley); FOF ¶¶ 134-140.

IV. THE COMPANIES' PROPOSAL IS ENVIRONMENTALLY, TECHNICALLY, AND ECONOMICALLY PRACTICAL AND PROVIDES THE OPTIMAL BALANCE OF RELIABILITY AND ENVIRONMENTAL AND SOCIAL IMPACTS.

A. Route Selection

The Project maximizes the amount of underground cable that is technologically feasible, provides much needed system reliability benefits, and minimizes adverse social and environmental impacts. *Companies' Ex. 181,* Response to OCC-03, Q-OCC-017-RV01; 1/13/05 Tr. at 205 (Zaklukiewicz and Prete).

The Companies investigated potential overhead and underground routes for the Project using an iterative process whereby potential alternatives for the transmission facilities were identified and evaluated to meet the following objectives:

- Maintain system operability.
- Minimize the need to acquire (by condemnation or voluntary sale) residential homes and commercial buildings to accommodate the construction of the 345-kV transmission line.
- Maximize the use of existing linear corridors (e.g., transmission line, highways, railroad, pipeline), consistent with the long-established siting guidelines of the Federal Energy Regulatory Commission.[3]
- Minimize the need to expand existing ROWs to accommodate the proposed 345-kV facilities.
- Minimize impacts to sensitive environmental resources, including inland and tidal wetlands, steep slopes, erodible soils, parks, watercourses, and vegetation/wildlife/fisheries resources of concern.

[3] FERC's *Guidelines for the Protection of Natural, Historic, Scenic, and Recreational Values in the Design and Location of ROWs and Transmission Facilities*, Docket No. R-365, Appendix A.

- Minimize impacts to significant cultural resources (archaeological and historic).
- Minimize or avoid conflicts with local, state, and federal land use plans and resource policies.
- Minimize aesthetic impacts on scenic resources.
- Maintain public health and safety.
- Achieve an economic solution, consistent with good engineering practice, while balancing the consideration of the above routing factors. *Companies' Ex. 1* (Vol. 1, pp. H-1 to H-3).

The Companies identified and analyzed a number of potential alternatives: (1) use or widening of existing transmission line ROWs; (2) new ROWs; (3) railroad and highway alternatives; (4) combination overhead and underground/marine routes; (5) combinations of use or widening of existing overhead transmission line ROWs and underground cable along streets; and (6) all underground, either within existing transmission line ROWs or road ROWs. Many alternatives were rejected as they proved infeasible or unsuitable, but the alternatives that were potentially feasible were examined in greater detail. *See* FOF ¶¶ 12-14; *Companies' Ex. 1* (Application, Vol. 1, pp. H-1 to H-3, H-9 to H-11, H-18 to H-25); 6/1/04 Tr. at 10-14 (Prete).

For the potentially feasible alternatives, the Companies conducted field reviews, evaluated aerial photography and compiled and compared data concerning land use features. As reviewed in the Application, this analysis resulted in the selection of the proposed route and Alternatives A and B, as the routes that were technically, environmentally, and economically feasible. *Companies' Ex. 1* (Application, Vol. 1, section H); *see* FOF ¶¶ 336-353. After the Connecticut Legislature enacted P.A. 04-246, the Companies, in conjunction with the ROC Group, conducted extensive studies to

ensure that the Project complied with P.A. 04-246 and that the Project was technologically feasible. 1/13/05 Tr. at 158 (Zaklukiewicz); *Companies' Ex. 176* (Reliability and Operability Committee (ROC) Report, December 20, 2004). The Proposed Route, which includes approximately 24 miles of underground cable, remains preferable to Alternatives A (including approximately 13 linear rules of underground construction) and B (including approximately four linear miles underground), given the need to comply with P.A. 04-246. Alternatives A and B are technologically feasible from an electrical engineering perspective. In fact, both Alternatives A and B would be preferable to the proposed route from a strictly engineering viewpoint. *Companies' Ex. 181,* Response to OCC-03, Q-OCC-017-RV-01. However, both Alternatives A and B have greater environmental and social impacts than the proposed route. *Companies' Ex. 1* (Application, Vol. 1, pp. ES-6, H-26); 6/1/04 Tr. at 14 (Prete); *Companies' Ex. 181,* Response to OCC-03, Q-OC-017-RV-01.

B. The Proposed Route is Preferable to Alternatives A and B.

The Companies support the proposed route over Alternatives A and B for the following reasons:

- The proposed route maximizes the use of underground cable adjacent to statutory facilities, in compliance with P.A. 04-246.
- The proposed route will not require the acquisition of any homes or commercial structures.
- Alternatives A and B will require the acquisition of substantial acreage of additional ROW between East Devon and Norwalk substations, whereas the proposed route will be constructed underground within road ROWs and will require the acquisition of only a minimal amount of easements where the route deviates from road ROW.
- The proposed route avoids the environmental impacts associated with Alternatives A and B.

- The Project can be installed along the proposed route with fewer outages on existing circuits in SWCT during the construction period than Alternatives A and B. (FOF ¶ 347)
- The proposed route provides a more direct route between East Devon, Singer and Norwalk Substations thereby minimizing the length of the new 345-kV line.
- The proposed route's use of underground cable, which is more expensive on a per mile basis than overhead construction, is offset somewhat by the proposed route's shorter length and the fact that the proposed route will not require the acquisition of any homes or businesses or significant ROW expansion. *Companies' Ex. 1* (Application, Vol. 1, pp. H-41 to H-42); *Companies' Ex. 49* (Errata pages for changes read into the record by applicants' witnesses during hearings on March 23-25, 2004, dated April 2, 2004, pp. ES-6, H-41 (errata)); *Companies' Ex. 53* (Testimony of Mango, April 8, 2004, p. 23); *Companies' Ex. 172* (Testimony of Bartosewicz et al., December 28, 2004, pp. 2-3 and Appendix A).
- Because there are residential areas adjacent to the overhead portion of Alternatives A and B, the use of Alternative A rather than the proposed route (in conjunction with the installation of underground cable north of East Devon Substation) would not provide any benefit in terms of avoiding "statutory facilities" (see discussion in section V below).

1. Alternative A:

Alternative A would involve the construction of the 345-kV facilities in a combination of overhead and underground configurations in Bridgeport, Fairfield, Easton, Weston, Wilton, and Norwalk. This alternative would be approximately 73 miles comprising of 60 miles of overhead construction and 13 miles of underground facilities. Alternative A follows the same route as the proposed route from Middletown to the proposed Singer Substation in Bridgeport. However, Alternative A would involve the installation of the 345-kV transmission line underground in roadways from Singer Substation to UI's Hawthorne Substation in Fairfield. From Hawthorne Substation to Norwalk Substation, the 345-kV transmission line would be installed overhead along

CL&P's existing transmission corridors. *Companies' Ex. 1* (Application, Vol. 1, pp. H-28 to H-33).

In contrast to the Project as proposed, construction of Alternative A would result in greater environmental and social impacts. The Companies would have to acquire 62 acres of privately-owned land for the expanded ROW and approximately two to four acres of privately-owned land for the Hawthorne Transition Station. Alternative A would cross 49 more wetlands and watercourses, including wetlands with potential for productive amphibian habitat. The Companies would also have to clear approximately 62 more acres of mainly forested areas, assuming that existing vegetation on all of the expanded ROWs would need to be cleared. Further, Alternative A involves considerably longer alignment through residential areas and 15 more miles of overhead transmission line. *Companies' Ex. 1* (Application, Vol. 1, p. H-33); 12/17/03 Tr. at 17-20 (Prete); 3/23/04 Tr. at 19-20 (Zaklukiewicz); 4/20/04 Tr. at 196-197 (Zaklukiewicz); 4/20/04 Tr. at 207-210 (Mango).

2. Alternative B:

Alternative B would involve the construction of most of the 345-kV facilities in an overhead configuration using existing overhead transmission line corridors. From Scovill Rock to East Devon Substation, Alternative B is the same as the proposed route. From Hawthorne Substation to Norwalk Substation, the route for Alternative B is the same as the route for Alternative A. Alternative B would be approximately 74 miles, consisting of 72 miles of overhead facilities and two route miles (eight circuit miles) of underground facilities. Between East Devon and Norwalk Substations, Alternative B

passes through Milford, Stratford, Bridgeport, Trumbull, Fairfield, Easton, Weston, Wilton, and Norwalk. *Companies' Ex. 1* (Application, Vol. 1, pp. H-34 to H-40).

From East Devon to Trumbull Junction, Alternative B would be installed overhead along an existing 115-kV transmission line ROW. At Trumbull Junction, Alternative B would proceed south along another transmission line ROW to Seaview Transition Station in Bridgeport. From Seaview to Singer Substation in Alternative B, the 345-kV line would be installed underground. Between Trumbull Junction and Singer Substation, two 345-kV lines consisting of two cables each would be required to make a loop. From Trumbull Junction to Hawthorne Substation, the 345-kV line would be overhead along the existing ROW. Alternative B follows the same route as Alternative A from Hawthorne Substation to Norwalk Substation. *Companies' Ex. 1* (Application, Vol. 1, pp. H-34 to H-40).

Unlike the proposed Project, the construction of Alternative B would have significant environmental and social impacts. Alternative B would require the potential acquisition of 29 homes or businesses for ROW expansion in Stratford, Trumbull, Bridgeport and Fairfield. The Companies would also have to acquire approximately 122 acres of privately-owned land for expanded ROW. Alternative B would require clearing of approximately 122 acres, assuming that the existing vegetation in the entire expanded ROW would have to be cleared. For Alternative B, there would be crossings of 85 wetlands and watercourses, including wetlands with the potential for productive amphibian habitat (as compared to 14 watercourse and wetland crossings for the underground portion of the proposed route). Moreover, Alternative B would result in a significantly longer alignment through residential areas and construction and operation of

approximately six more miles of transmission line. *Companies' Ex. 1* (Application, Vol. 1, pp. H-39 to H-40); 12/17/03 Tr. at 17-20 (Prete); 3/23/04 Tr. at 19 (Zaklukiewicz); 4/20/04 Tr. at 197 (Zaklukiewicz); 4/20/04 Tr. at 207 (Mango).

C. The Companies Considered and Rejected a Number of Other Potential Routes During Their Extensive Routing Analysis Because, Unlike the Proposed Route and Alternatives A and B, these other Routes Were Not Technically, Environmentally, and Economically Practical.

The Companies considered a number of other route alternatives, but these alternatives were rejected because of the social and environmental impacts and technical difficulties. *See* FOF ¶¶ 234-335. The Companies investigated the feasibility of installing the transmission facilities along the Metro-North / Amtrak Railroad corridor between Bridgeport and Norwalk, as well as Airline Railroad (Conrail) and Amtrak corridors in New Haven County, but determined that none of these routes were feasible. Given the significant amount of adjacent development, the narrow railroad ROW, and the presence of the existing 115-kV transmission lines, no available space remains for a new 345-kV transmission line along the Metro-North / Amtrak corridor. As a result, it was eliminated from further consideration as an alternative. The Companies dismissed the Airline and Amtrak corridors because both corridors extend through urbanized areas of greater New Haven, where existing developed land uses would pose severe constraints to the alignment of the 345-kV transmission line. *See* FOF ¶¶ 246-261.

The Companies also explored and rejected the possibility of constructing the facilities along several highway corridors (*e.g.* Interstates 91 and 95 and State Route 15). *See* FOF ¶¶ 262-288. Like the rail lines, the highways cross cities and towns where residential and business developments are next to the highways. Additionally, only

limited sections of the highways could accommodate a transmission ROW. Moreover, along State Route 15, removal of acres of trees and other vegetation would be required to accommodate the transmission ROW. *See* FOF ¶¶ 277-288. Similarly, marine alternatives using Long Island Sound were rejected because of potential environmental impacts to coastal resources and shellfish beds. *See* FOF ¶¶ 289-296.

The Companies evaluated a number of potential routes and transmission configurations for an East Shore route connecting Beseck Switching Station, a new termination facility adjacent to the East Shore Substation in New Haven, and East Devon Substation. None of the potential East Shore route options is "environmentally, technically, and economically practical" so as to merit consideration by the Council as an alternative route. Large amounts of underground construction would be required between East Shore and East Devon substations. Such additional undergrounding has reliability and operability disadvantages that make it technically impractical. In addition, the East Shore options would have environmental and/or social impacts comparable to or greater than the proposed route and would be significantly more expensive than the proposed route. *See* FOF ¶¶ 310-335.

Accordingly, the Project is the best alternative as it minimizes social and environmental impacts and is economically and technically practical.

V. THE COMPANIES' PROPOSAL INCLUDES THE MAXIMUM AMOUNT OF UNDERGROUND 345-KV CONSTRUCTION ADJACENT TO STATUTORY FACILITIES THAT IS TECHNOLOGICALLY FEASIBLE.

Section 7 of Public Act 04-246, codified at C.G.S. § 16-50p(i), provides:

> For a facility described in subdivision (1) of subsection (a) of section 16-50i with a capacity of three hundred forty-five kilovolts or greater, there shall be a presumption that a proposal to place the overhead portions, if any, of such facility

adjacent to residential areas, public or private schools, licensed child day care facilities, licensed youth camps or public playgrounds is inconsistent with the purposes of this chapter. An applicant may rebut this presumption by demonstrating to the council that it will be technologically infeasible to bury the facility. In determining such infeasibility, the council shall consider the effect of burying the facility on the reliability of the electric transmission system of the state.

In its notice dated February 17, 2005, the Council posed a series of questions regarding this provision of P.A. 04-246 that provide a framework for its review of the undergrounding issues in this docket.

A. Response to Council's Request for Briefs on Public Act 04-246, § 7

1. Response to Question 1:

Item 1 of the Council's February 17, 2005 notice asks that participants address three issues relating to § 7 of Public Act 04-246: (a) whether this section prohibits the Council from considering costs in determining whether to order portions of the Project to be installed underground; (b) the meaning of the term "adjacent" with respect to a facility listed in the section; and (c) the meaning of "technologically [in]feasible." Question 5 asks for briefing on the definition of "residential area". Each of these issues is addressed below.

Relevance of Cost

Question 1(a) of the Council's request for briefs, reproduced below, asks whether cost is a relevant consideration with respect to whether 345-kV transmission lines should be installed underground adjacent to categories of facilities listed in § 7 of P.A. 04-246:

Council Question 1(a)

(a) Given that the above provision [§ 7] is in a separate subsection from C.G.S. § 16-50p(a)(3)(D), which considers costs, does subsection (h) prohibit the Council from considering costs in determining whether to order portions of

the proposed line adjacent to the listed facilities to be underground? If the answer is "no", does the overall statute (C.G.S. § 16-50p) require the Council to consider costs in determining whether to order portions of the proposed line adjacent to the listed facilities to be underground? If the answer as to whether the Council is prohibited from considering costs in determining whether to order portions of the proposed line adjacent to the listed facilities to be underground is "yes", then is there some point where the potential costs to Connecticut consumers become so great as to permit the Council to consider costs?

Short Answers to Question 1(a)

- The Council is not prohibited from considering costs in determining whether to order that portions of a proposed 345-kV transmission line be installed underground adjacent to categories of statutory facilities listed in § 7 of PA 04-246.

- The PUESA requires the Council to consider costs with respect to all proposed transmission line projects, overhead or underground.

Discussion of Question 1(a) Issues

Section 7 of P.A. 04-246 does not prohibit the Council from considering costs in determining whether to order that portions of a proposed transmission line be underground adjacent to facilities listed in §7. The Council must consider whether costs of undergrounding would be so high so as to render the transmission line inconsistent with other, pre-existing provisions of the PUESA, specifically, that the line must serve the interests of electric system economy. *See* C.G.S. section 16-50p(a)(3)(D). Otherwise, the Council would be in the position of having to order undergrounding under one section of the PUESA, but being prohibited from granting a certificate for undergrounding under other sections of the PUESA. Section 7 cannot reasonably be interpreted to require such a result. Long-standing judicial rules of statutory interpretation, as well as P.A. 03-154, require that statutes be interpreted to avoid absurd results.

Cost is not mentioned in §7. However, cost and economic considerations are key components of other sections of the PUESA. For example, the purposes of the PUESA are listed in C.G.S. § 16-50g, and explicitly reference cost as a critical consideration:

> The purposes of this chapter are: To provide for the balancing of the need for adequate and reliable public utility service *at the lowest reasonable cost to consumers* with the need to protect the environment and ecology of the state and to minimize damage to scenic, historic, and recreational values; to provide environmental quality standards and criteria for the location, design, construction and operation of facilities for the furnishing of public utility services at least as stringent as the federal environmental quality standards and criteria, and technically sufficient to assure the welfare and protection of the people of the state .... (emphasis added).

The General Assembly added this language about costs to the statutory purposes in 1975, thereby stating the legislative understanding that the Council must consider cost in implementing the PUESA, of which §7 is now a part. Other key words in this statement of purpose are "balancing" and the related term "reasonable," which instruct the agencies applying PUESA's provisions to balance cost with other considerations when exercising their discretion in determining where the fulcrum should be set with respect to any portion of a project subject to the Act. *See, City of Torrington v. Connecticut Siting Council*, 1991 WL 188815, at *12-13 (Conn. Super. Ct. Sept. 12, 1991) (dismissing administrative appeal and discussing Council discretion to perform balancing under C.G.S. § 16-50g when decision is supported by substantial evidence in the record).

Cost and economics are also explicitly included as statutory elements in the sections of the PUESA that implement the purposes quoted above. Section 16-50*l* requires that an application for a certificate to construct an electric transmission line include information for the Council on: "estimated costs"; "how the facility conforms to

a long-range plan for expansion of the electric power grid serving the state and interconnected utility systems, that will serve the *public need for* adequate, reliable and *economic service*"; "justification for adoption of the route or site selected, including comparison with alternative routes or sites which are environmentally, technically and *economically practical*"; and "life-cycle *cost studies* comparing overhead alternatives with underground alternatives." C.G.S. § 16-50*l*(a)(1)(A)(i), 16-50*l*(a)(1)(A)(ii), 16-50*l*(a)(1)(A)(iv), 16-50*l*(a)(1)(A)(vi) (emphasis added).

Section 16-50p similarly requires the Council to consider cost and economics in determining whether to grant a certificate for a transmission line. In order to grant a Certificate, the Council must "find and determine" that, "the facility . . . will serve the interests of *electric system economy* and reliability" and "the overhead portions, if any, of the facility are *cost effective,* and the most appropriate alternative based on a life-cycle cost analysis of the facility and underground alternatives to such facility, are *consistent with the purposes of this chapter* ...." C.G.S. § 16-50p(a)(3)(D)(ii); C.G.S. § 16-50p(a)(3)(D)(iii) (emphasis added).

Notably, the legislature left these statutory sections intact when it enacted P.A. 04-246. The General Assembly is assumed in statutory construction to be aware of the existing statutes. *Plourde v. Liburdi*, 207 Conn. 412, 417 (1988). It is therefore presumed to have known that PUESA required the Council to take cost into account when determining whether to grant a certificate. Under Connecticut law, "[t]he meaning of a statute shall, in the first instance, be ascertained from the text of the statute itself *and its relationship to other statutes*." P.A. 03-154 (emphasis added). *See also In re Steven M.*, 264 Conn. 747, 757 (2003) ("We construe a statute as a whole and read its

subsections concurrently in order to reach a reasonable overall interpretation"); *Ferrigno v. Cromwell Development Associates*, 244 Conn. 189, 196 (1998) ("We presume that the legislature had a purpose for each sentence, clause or phrase in a legislative enactment, and that it did not intend to enact meaningless provisions . . . It is a basic tenet of statutory construction that the legislature did not intend to enact meaningless provisions . . . ."); *Hayes v. Smith*, 194 Conn. 52, 58 (1984) ("A legislative act must be read as a whole and construed to give effect and to harmonize all of its parts"). The silence of § 7 regarding cost cannot and should not be read to mandate that the Council effectively repeal the other applicable provisions of PUESA or its fundamental statement of purpose. *See, State v. Carbone*, 172 Conn. 242, 256 (1977) ("Repeals by implication are not favored and will never be presumed where the old and new statute may well stand together").

It would therefore be patently unreasonable, and against the rules of statutory construction in this state, to interpret § 7 as undoing all the rest of PUESA with regard to undergrounding. Requiring the Council to order that portions of a transmission line be installed underground even if such installation was not economically practical, and even if it would be inconsistent with system economy and the provision of service to consumers at the lowest reasonable cost, would violate the very statement of purpose governing the Act.

If the cost of undergrounding is so high that, as a matter of factual determination, the Council cannot find that a proposed transmission line meets the requirement that a facility support system economy and reasonably priced service to consumers, then the Council must find that the statutory presumption that overhead construction is

"inconsistent with the purposes of" PUESA has been overcome. As explained above, § 7 cannot be interpreted to preclude the operation of other sections of PUESA in a reasonable manner.

This analysis can be applied to the Project in the following manner. The first step is to determine the maximum amount of 345-kV underground cable adjacent to statutory facilities that is technologically feasible. As set forth in the Companies' proposed findings of fact, the Companies, ISO-NE and the Council's independent consultant, KEMA, all agree that 24 linear miles (48 circuit miles) of 345-kV underground XLPE cable is the maximum amount that is technologically feasible. Any incremental cable is not technologically feasible and would have an unacceptable adverse impact on the reliability of the electric transmission system of Connecticut.

The next step is to determine the cost associated with utilizing the technologically feasible amount of 24 route miles of underground cable, compared to the cost of utilizing less cable and more overhead lines for the Project. The Companies submitted updated cost estimates for the proposed route (with 24 linear miles of underground), Alternative A (with 13 linear miles of underground), and Alternative B (with 4 linear miles of underground). Based upon the cost estimates, the differential between the configuration with the least amount of underground cable and the proposed route with the maximum technologically feasible amount of underground cable is expected to be about 15%. Because the drivers for the low and high estimates should move in the same manner in all the alternatives (Proposed, A and B), the comparison is made separately for the low ends of the range ($837.0M for the Proposed, $810.8M for Alternative A and $753.7 for Alternative B) and for the high ends of the range ($993.1 for the proposed, $947.2 for

Alternative A and $863.8M for Alternative B). The cost estimate ranges for the three configurations actually overlap. Companies' Ex. 172 (Testimony of Bartosewicz et al., December 28, 2004, p. 2).

A likely differential of 15%, and perhaps no differential at all, is not so significant as a matter of factual determination to preclude the required findings that a project be consistent with system economy and reasonable cost to consumers. Accordingly, the Council is not faced here with the possibility of ordering a line to be installed underground, where such order would be contrary to other statutory sections.

Meaning of "Adjacent"

Question 1(b) of the Council's request for briefs, reproduced below, asks whether the term "adjacent" in §7 of P.A. 04-246 means that the proposed line goes through or borders the property on which a listed statutory facility is located, and whether there is a distance requirement for "adjacent":

Council Question 1(b)

(b) In interpreting C.G.S. § 16-50p(h), does the term "adjacent" mean that the proposed line goes through or borders the property (parcel) of the listed facility? Or does it mean that the proposed line has to be within a certain distance from a listed facility? If the protected facility is on a large parcel of land, does the underground requirement still pertain if the proposed line is adjacent to the property, but a substantial distance (such as 300 feet) from the actual facility? Conversely, does the underground requirement still pertain if the proposed line (or its ROW) does not actually border or go through the property of a protected facility, but the protected facility is relatively close (such as less than 100 feet) from the proposed line (or ROW)?

Short Answers to Question 1(b)

The Companies submit that the answers to these questions are:

- A transmission line is "adjacent" to a facility if the facility is located on a parcel of property that the transmission line ROW traverses or if the edge of the ROW is on the boundary of the property on which the facility is located.

- The presumption that overhead 345-kV lines are inconsistent with PUESA near listed categories of facilities[4] applies if a transmission line is adjacent to a facility (see definition of "adjacent," above), regardless of distance.

- If a facility is not located on a parcel of property that the transmission line ROW traverses or is not located on a property that borders the edge of the ROW, then the transmission line is not adjacent to the facility, regardless of distance.

Discussion of Question 1(b)Issues

The Council should find that "adjacent" means adjoining, or next to, without a distance component. In practice, this means that a facility is "adjacent" to a transmission line if it is located on a parcel of property that the transmission line ROW traverses or if the edge of the ROW is on the boundary of the property on which the facility is located. This is the most readily understandable and enforceable definition of "adjacent." It can be readily determined from maps that are on record at municipal governmental offices whether or not a facility is on the property crossed by the transmission line ROW or if the edge of the ROW bounds the property on which the facility is located. While parcel boundaries are not always apparent on visual inspection, whether a listed facility is on a parcel of property next to a transmission line can generally be confirmed by visual inspection.

If the Council were to determine that there is a distance component to "adjacent," it would have to determine the specific distance to be applied. There would need to be a fixed, established distance for this determination, in order to provide clear guidance to

[4] Briefing question 1(b) references "the underground requirement." P.A. 04-246 does not establish an "underground requirement." Section 7 provides a rebuttable presumption that overhead portions of a 345-kV transmission line are inconsistent with the purposes of the PUESA in locations adjacent to certain listed categories of facilities.

applicants and to the owners of listed facilities. Moreover, even if a specific distance were selected, there could still be argument about whether the distance should be measured to the facility structure or to some other location on the parcel. If distance were measured to something other than a permanent facility structure, it would invite "gaming" the process by placing a movable object within the stated distance in order to trigger the statutory requirement, even if a permanent structure was much farther away. There could also be argument on measuring.

The Companies identified in the record the facilities in the categories listed in P.A. 04-246 that (1) are located on property traversed by the transmission line ROW or (2) are located on property that borders the edge of the ROW. In addition to being the most reasonable, the Companies' proposed interpretation would also simplify application with respect to the proposed Project.

Meaning of "Technologically Feasible"

The Council's requests for briefs asks for specific consideration of questions related to the definition of "technologically infeasible" and the determination of whether a technology of application is infeasible:

Council Question 1(c)

(c) In defining "technologically infeasible", is the Council free to consider theoretically possible, but unproven, technology to not be reliable and therefore infeasible? Or must the Council approve theoretically possible systems or approaches unless proven unworkable or unreliable? Does the Council have the discretion to approve technology not proven reliable, but not proven unreliable? Also, if placing a segment underground increases exposure to EMF, may the Council deem it technologically infeasible to bury that segment?

Short answers to Question 1(c)

- If the Council determines that the record supports a finding that a technology is theoretically possible, but unproven, then the Council can and should

determine that the technology is not reliable and therefore infeasible. The burden is on the proponent of a technology to establish that a technology is reliable. There is no presumption that a technology is reliable unless proven to be unworkable or unreliable.

- If the Council determines that the record does not support a finding that a technology is reliable, then the Council does not have discretion to approve the technology. The Council has the discretion, in making its determination of reliability, to consider the impacts of failure of the technology.

- If the Council were to determine that placing a segment underground would preclude a determination that a transmission line is safe and not an undue risk, then the Council would need to find that placing the segment underground is technologically infeasible.

Discussion of Question 1(c) Issues

The technology to be utilized in a project must be shown reliable to the Council's satisfaction in order to qualify for a certificate. Under the PUESA, the Council can and should consider whether technology is just a theoretical possibility, and it should approve only technology that experience or other satisfactory proof establishes as reliable. It should also consider the consequences of a potential technology failure in the context of a particular project. An electric system must be adequate and reliable in real world operation, not just on a computer monitor or spreadsheet. If the lights go out, it is little comfort that the technology used was theoretically possible.

The purposes of the PUESA include "the need for adequate and reliable public utility services." C.G.S. § 16-50g. Under the PUESA, the Council can grant a Certificate for a transmission line only if the Council finds that the line "conforms to a long-range plan for expansion of the electric power grid of the electric systems serving the state and interconnected utility systems" and that the transmission line "will serve the interests of electric system economy and reliability." C.G.S. § 16-50p(a)(3)(D)(ii). If technology is no more than theoretically possible, and there is no assurence, from experience or

otherwise, that it work in practice, there is insufficient basis for the Council to conclude that the technology will be reliable. Absent such a finding that the technology will be reliable, the Council cannot find that a transmission line conforms to a long-range plan for grid expansion.

Section 7 of P.A. 04-246 acknowledges the importance of reliability in determining technological feasibility and infeasibility by stating that "the reliability of the electric transmission system of the state" must be considered. The legislative history of P.A. 04-246 elaborates on the General Assembly's intent with respect to the importance of reliability and the requirements for a conclusion that a given technology is sufficiently reliable to qualify for a certificate.

In floor debate, Representative DelGobbo, ranking member of the Energy and Technology Committee, asked – for the expressed purpose of establishing legislative intent – if "by definition reliability is a broad issue of the technological capacity to have these lines be there and in fact have the kind of service life so that you don't need to [be] in there every other day to repair them." Comments of Representative DelGobbo, 2004 House Proceedings at pp. 237-38, May 3, 2004.[5] Representative DelGobbo asked to confirm his understanding of the term "reliability" to include practicality and "operability." *Id.* Representative Backer, then co-chair of the Committee, responded affirmatively:

> When we speak of reliability in the bill we obviously are speaking to a system that would function. That it would function in accordance with the standards of ISO and what is technically feasible. So I think the simple answer is to that question is yes. Reliability and operability are very much one in the same. You can't have something that is operable if it's not reliable.

[5] The transcript of the floor debate is published on the General Assembly's website; a full copy of it is attached to the "Applicant's Comments on Public Act 04-246", dated July 19, 2004.

Comments of Rep. Backer, 2004 House Proceedings at pp. 239, May 3, 2004. Later in the floor debate, Rep. Backer referred to the "various caveats of reliability, operability and the technical feasibility of burying the lines." *Id.* at 253-254. Representative Backer's statements on the floor debate, as the co-chair of the Committee that reported the bill are particularly valuable indications of legislative intent. [6]

Finally, in concluding the floor debate, Rep. DelGobbo once again focused on the legislative intent regarding reliability. In addition to the prior colloquy on reliability, Rep. DelGobbo asked whether "reliability" included failure rate and whether the line would likely be in service or not, and over what periods. Comments of Rep. DelGobbo, 2004 House Proceedings, May 3, 2004, p. 288. Again, Rep. Backer responded affirmatively. Reliability, he said, includes "the functionality of the cable," and the fact that "it needs to work." He continued, "[C]ertainly reliability of the underground transmission would have to do with the installation and the success rate of the type of equipment and cables used." Comments of Rep. Backer, 2004 House Proceedings, May 3, 2004, pp. 288-89.

Thus reliability is established as a required consideration in the PUESA both before and after enactment of P.A. 04-246. If a technology is only a theoretical

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[6] Statements made on the floor of the legislature by the chair of the legislative committee that reported the bill are particularly valuable indicators of legislative intent; these remarks have the same status as a favorable committee report on which the legislature acts. *Bird v. Plunkett*, 139 Conn. 491, 504 (1953); *and see Manchester Sand and Gravel Co. v. Town of South Windsor*, 203 Conn. 267, 275, 276 (1987); *Computaro v. Stuart Hardwood Corp.*, 180 Conn. 545, 554-55, n.6 (1980). The House floor debate provides the only such source of legislative intent with respect to the Act; there was no floor debate in the Senate because the bill was place on the consent calendar In contrast to the remarks of the chair of the reporting committee during floor debate, "post-enactment views of those involved with the legislation should not be considered when interpreting the statute." *Doe v. Bridgeport Police Dept.*, 198 F.R.D. 325, 348 n. 16 (D. Conn. 2001); *See, Salem-Keizer Ass. v. Salem-Keizer School District*, 61 P.3d 970 (Ore. App. 2003) (Rule against considering post-enactment statements of legislators to determine legislative intent is universal; such statements are not part of the legislative record on which the body as a whole acted.)

possibility, without proven actual experience, it should not – and indeed, cannot – be certified by the Council under the PUESA[7].

A similar analysis applies with respect to the second question posed in Question 1(c): whether the Council has discretion to approve technology "not proven reliable, but not proven unreliable." The answer to this question must depend upon particular circumstances. If the reliability of the technology for a particular application is not demonstrated by a long history of its successful use, the Council must ask whether there is other evidence that enables it to find the technology will perform as intended. For instance, as summarized in FOF ¶¶ 605-620, although XLPE cable does not have the same long record of proven reliability at 345-kV as HPFF cable, the evidentiary record establishes the reliability of XLPE cable. The evidence of recent improved quality control and performance, together with the engineering judgment of the Companies and ISO-NE, provides a sound basis to conclude that XLPE cable is an appropriate technology choice for this Project.

The final question in 1(c) of the Council's request for briefs asks whether the Council can deem it technologically infeasible to bury a transmission line if this would increase exposure to EMF (presumably compared to installing the transmission line overhead). Since there are magnetic fields associated with every conductor on which current is flowing, and these fields do not hinder the operation of properly designed underground or overhead transmission systems, it is hard to see how any magnetic field

[7] For example, C-Type filters are not technologically feasible as mitigation for TOVs. Given the size and scope of the Project, the severity and number of the TOVs that potentially could occur, and the fact that C-Type filters have never been used for the purpose of mitigating TOVs, KEMA does not recommend that C-Type filters be utilized to attempt to extend undergrounding beyond the 24 miles proposed by the Companies. *Companies' Ex. 199* (Applicant and ISO-NE summary report of the February 14, 2005 meeting dated February 15, 2005 including data sheets distributed at the February 14, 2005 technical meeting, p 2-4); 2/17/05 Tr. at 16, 44-45 (Wakefield and Enslin).

level could qualify a transmission line – overhead or underground – as "technologically infeasible." Of course, technological infeasibility is not the only ground on which the Council could disapprove proposed underground transmission. Hypothetically, if the Council could properly find that the "electromagnetic fields" that would be associated with proposed underground transmission were such that their "significant adverse effect[s]" provided "sufficient reason to deny the application," the Council could then deny the application. Conn. Gen. Stat. § 16-50p(a)(2) and (3), as amended by P.A. 04-246. That is only a hypothetical postulate, however, because – as reviewed in detail in Section VI of this Brief – there is no basis on which the Council could find that such fields have any significant adverse effects.

2. Response to Question 2 of the Council's Request for Briefing: What is the maximum amount of underground 345-kV transmission line that is technologically feasible? Can and should this amount be "allocated" among portions of the line?

Question 2 of the Council's request for briefing reproduced below, focuses on the factual issue of whether there is a maximum amount of 345-kV cable that can be installed underground and still be technologically feasible for the Project; whether and how to "allocate" this amount if it is not technologically feasible to bury the entire line, or whether the underground portion of the line must be in one continuous segment:

Council Question 2

2. A crucial factual issue that has arisen in these hearings is whether there is a limitation to the amount of the proposed line that can be technologically and reliably buried, and, if there is a limit, just what is that limit (in terms of the number of miles). The Council is asking parties and intervenors to present their positions on this issue, whether in proposed findings of fact or in the briefs themselves, and to point to the evidence supporting their positions. For those parties and intervenors taking the position that there is a limit to the portion of the line that can be buried, the Council further requests that parties and intervenors state whether they believe that the underground portion must be one

continuous portion OR does the evidence demonstrate that the Council can allocate underground miles along different portions of the route (such as dividing the underground portions between Fairfield, New Haven and Middlesex counties, as opposed to a continuous underground strip)? For those parties and intervenors who believe that the Council can divide the allocation of underground portions, the Council further requests that those parties and intervenors be explicit in describing how the porpoising of the line (the line going from underground to above ground and back again) can be accomplished. For those who advocate burying portions of the line that were not proposed to be buried by the applicants, the Council would like to know what portions of the line are being proposed for burial. The Council would also like to know whether the proposed buried portions are in addition to the burial proposed by the applicant, or in lieu of burying portions of the line proposed by the applicant. A related legal issue is whether the Council must take underground portions from segments of the line not passing adjacent to facilities protected by C.G.S. § 16-50p(h) and reallocate them to cover segments adjacent to protected facilities. Can this be technologically and reliably accomplished?

Short answers to Question 2

- Yes, there is a limitation to the amount of the proposed line that can be technologically and reliably buried in this Project.

- The 24 linear miles (48 circuit miles) of 345-kV underground cable between East Devon and Norwalk that comprise the Companies' proposed route is the maximum amount of underground cable that is technologically feasible in this Project.

- Locating the underground portion of the line in a single continuous portion (East Devon to Singer to Norwalk) as proposed by the Companies results in a more reliable system than porpoising.

- A single continuous underground line between East Devon and Norwalk maximizes the linear route miles of underground cable because three circuits would be required north of East Devon, whereas two circuits are required from East Devon to Norwalk. Locating any underground cable north of East Devon, including porpoising, will reduce the linear length of underground cable that is technologically feasible for the Project.

- "Reallocating" any portion of the 48 circuit miles of underground cable from the East Devon to Singer to Norwalk location proposed by the Companies would mean that the 345-kV transmission line would be overhead along the ROW adjacent to facilities listed in §7 of P.A. 04-246 along the overhead portions of Alternative A or Alternative B. While some statutory facilities in the section of the line north of East Devon would be "avoided" by a

reallocation of the underground circuit miles, the reallocation would result in overhead 345-kV lines adjacent to statutory facilities south of East Devon.

Discussion of the Question 2 Issues

The evidence summarized at FOF 561 conclusively establishes that the Project as proposed includes maximum undergrounding and that any additional undergrounding beyond the proposed 24 linear miles would present unacceptable reliability and operability risks. *Companies' Ex. 176* (Reliability and Operability Committee (ROC) Report dated December 20, 2004, pp. 7-8). The issues raised in Question 2 of the Council's request for briefing were addressed comprehensively in this Docket. These proposed findings provide a detailed review of the evidence in the record relating to the determination of the maximum feasible use of 345-kV cable. The Companies' proposed summary findings with respect to the maximum linear amount of underground cable are repeated below:

> The Companies' proposed route, including 24 linear miles (48 circuit miles) of 345-kV underground cable between Norwalk and East Devon, and Alternative A, including 13 linear miles (26 circuit miles) of underground cable, are technologically feasible.
>
> The potential for high TOVs increases with the amount of cable (capacitance) as the linear miles of underground cable increases from 24 linear miles (48 circuit miles).
>
> Adding any incremental underground cable to the 24 miles proposed by the Company is not technologically feasible.

The Companies' proposed findings on underground cable reflect an extensive record developed over the period October 2003 to February 2005. Considerations relating to underground cable were addressed in the Companies' Application. The discussion in the Application was followed by interrogatories; reports of the Companies' technical consultants in the fall of 2003 and winter 2003/2004; the formation of the ROC

Group in June 2004; the work of the ROC Group and its consultants, including more technical studies in the summer and fall of 2004 and winter 2004/2005; the discussion of reliability and operability issues related to undergrounding contained in ROC Reports in August, October and December 2004; and the studies and reports of the Council's consultant in the fall of 2004 and winter of 2005; and many, many days of hearings spanning nearly a year.

Hundreds of studies, over a period of more than a year and at a cost of over one million dollars, were devoted to the attempt to make undergrounding "work" for this Project. Notably, after all of this study, the record establishes that there is no dispute among the technical experts as to the amount of underground cable that is technologically feasible for the Project. The Council retained KEMA, Inc. to perform an independent technical review of technological feasibility of installing underground cable in the Project. KEMA reviewed the August 2004 ROC Report and developed its own system model in order to evaluate different system alternatives. In October 2004 KEMA recommended the use of C-Type filters and that TNAs be conducted. Thereafter, the ROC Group evaluated C-Type filters and retained additional consultants in order to perform hundreds of TNA screening analyses. FOF ¶¶ 585-589. After review of all the studies and based upon their own experience and engineering judgment, the Council's experts from KEMA agreed with the ROC Group's conclusion that the Companies' proposal for 24 linear miles (48 circuit miles) of underground 345-kV transmission, with equipment modifications as set forth in the December 20, 2004 Final ROC Report, is technologically feasible, and that any addition of more underground cable would render the Project technologically infeasible.

The next part of the Council's briefing Question 2 asks whether the underground cable should be one continuous portion of the Project. As discussed in the FOFs, maintaining the underground cable in one continuous portion of the Project is preferable from a reliability standpoint. In addition, any relocation of the underground cable from the East Devon to Singer to Norwalk part of the route to the Beseck to East Devon part of the route will reduce the route miles of underground transmission that can be included in the Project. FOF ¶ 624. The Companies' proposed findings on these points are repeated below, with citations omitted for ease of reading:

> Changing the location of the underground cable, to another portion of the Project route from the East Devon to Singer to Norwalk location proposed by the Companies, will not increase or decrease the number of circuit miles of underground cable that is technologically feasible. Because three circuits would be required north of East Devon, whereas two circuits are required from East Devon to Norwalk, moving the location of the underground cable to north of East Devon will result in reduced linear length of underground cable that is technologically feasible for the Project.
>
> Combining overhead and underground sections in the same circuit (sometimes referred to as "porpoising") exposes the transmission line to an increased risk of damage due to overvoltages caused by lightning strikes and switching events on the network.
>
> Porpoising is a particularly critical concern when using XLPE cable. At least one of the termination points of the underground section must be extremely well grounded, such as would be the case at a substation, such as Norwalk or East Devon.
>
> From an operational standpoint, a utility should ideally have a well-grounded system. But when a cable comes from underground to an overhead line, it is not as well-grounded as if it were connected to a substation. Under some circumstances, having two different grounds can cause problems on a power system.

The final part of Question 2 seeks comment on the legal issue of "whether the Council must take underground portions from segments of the line not passing adjacent to facilities protected by C.G.S. § 16-50p(h) and reallocate them to cover segments adjacent

to protected facilities" and the associated question, "Can this be technologically and reliably accomplished?"

The Council may determine that it need not reach these questions because maintaining the underground portion of the Project as one continuous line is preferable from a reliability standpoint. If the Council were to reach these questions on "reallocating" the underground portions of the line, the Council will need to consider not only the areas that "receive" the underground cable but the portions of the Project in the areas south of East Devon that will now need to be constructed overhead. Any such "reallocation" would necessarily entail the construction of either Alternative A or Alternative B, and the reallocation of the circuit miles of underground thereby "freed up" north and east of East Devon.

The rights of way along the overhead sections of Alternative A and Alternative B are densely settled. If Alternative A were selected, the underground construction west of East Devon would be shortened by 11 route miles (22 circuit miles); but 15 route miles of overhead construction would be added through Fairfield, Easton, Weston, Wilton and Norwalk (cross sections 17-22). *See,* FOF ¶¶ 339-344. The "reallocated" overhead line ROW would be adjacent to more than 200 developed residential parcels of property in these towns. *Companies' Ex. 17,* Response, to AG-01, Q-AG-013. One can not say how many "residential areas" these properties comprise until the Council defines that term as used in P.A. 04-246.[8] But under any reasonable definition, many of the 15 miles of overhead line that would replace underground construction in Alternative A would be through residential areas. In addition, part of the line would pass through a public park, Keene Park, in Weston. *Companies' Ex. 17,* Response to AG-01, Q-AG-013.

[8] *See* discussion of "residential areas" in Section V(A)3 below.

If Alternative B were selected, the underground construction west of East Devon would be shortened by 22 route miles (40 circuit miles),[9] and 27 miles of overhead construction would be added. The "new" overhead route would include that described above with respect to Alternative A, and there would also be "new" overhead sections in the towns of Milford, Stratford, Trumbull, and Bridgeport. *See* FOF ¶¶ 348, 349. The overhead sections of Alternative B west of East Devon would be adjacent to more than 450 developed residential parcels of property, six parks, three schools, and two day care centers that would not be adjacent to overhead lines if the Project were built as proposed. *Companies' Ex. 17,* Response to AG-01, Q-AG-013; FOF Appendix, Tab 5, "Route Variations." Alternative B would also require the acquisition of approximately 29 homes and businesses, without regard to any further widening of the ROW that might be required to install low magnetic field structures. *See* FOF ¶ 352.

Thus, the line would still have to be overhead adjacent to many statutory facilities. It is not "technologically feasible" to install the line underground adjacent to all statutory facilities under any circumstances.

Moreover, the magnetic fields along the sections of ROW that would become overhead under any such reallocation would be higher than the magnetic fields on the portion of the line north and east of East Devon. The portions of the ROW on which overhead lines would be installed under both Alternative A and Alternative B are shown in *Companies Ex. 35* (Letter to Pamela B. Katz, Chairman, regarding updates to EMF modeling, dated March 15, 2004) as Cross Sections 17-22. The existing magnetic fields at the edge of the ROW, and those projected under the "15 GW Case" for these sections

[9] The only underground construction in Alternative B is comprised of two underground circuits from Seaview to Singer, and back from Singer to Seaview, in the same path. Thus, there are only two route miles, but eight circuit miles of underground cable.

of the ROW (cross sections 17-22 in Ex. 35), and for the proposed overhead ROW (shown as cross sections 1-8 on Ex. 35) are as follows:

Overhead Line Sections	**mG ROW edge** **Existing**	**mG ROW edge** **Proposed New OH Structures**
North & East of E. Devon (Ex. 35, Cross Sections 1-8)	0.2 – 33.8	5.4 – 30.4
West of Hawthorne (Ex. 35, Cross Sections 17-22)	4.9 – 57.7	9.0 – 75.9

The currents in Segments 3 and 4 are higher than those in Segments 1 and 2, and therefore produce higher fields. Accordingly, the same magnetic fields at edge of ROW could not be reduced along the Alternate A and B route to as low a level as can be achieved in Segments 1 and 2, even assuming the proposed 45 foot expansion of the Alternate A and B ROW to 125 feet. 2/01/05 Tr., at 281-286 (Prete).

North and east of East Devon (Segments 1 and 2 of the route), three circuit miles of underground cable would be required for every route mile, as opposed to two circuit miles west of East Devon (Segments 3 and 4) for every route mile. Therefore there would be fewer route miles to allocate in Segments 1 and 2 than would be taken from Segments 3 and 4. "Reallocation" would result in fewer route miles of underground cable, reduced system strength because the cable would not be in a single continuous line and higher magnetic fields. The reallocation would neither satisfy the Presumption nor constitute "prudent avoidance."

3. Response to Question 5 of the Council's Request for Briefing: What is the definition of "residential area?" Is it where people actually live, regardless of zoning? Is it the areas zoned residential by municipalities? Does the Council have discretion to choose its own definition within reason?

Since this question is closely related to the discussion of reallocation of the underground construction, it is taken up here. The only clear answer to the Council's queries is that the Council does have discretion to choose its own definition. The text of the statute offers no definition or other guidance as to the content of this term. Moreover, the legislative history of the Act makes clear that the legislature is leaving it to the Council to define the term. Thus, Representative Backer acknowledged:

> In terms of the areas we are looking at in terms of very sensitive areas it includes the laundry list that's in the bill, residential and so forth. Of course residential is something very difficult to determine, is it a five-acre zone, is it a quarter acre lot residential zone?
>
> What is the extent of the exposure of EMFs and what potential harm they can cause? ***It's going to be left to the Siting Council to define that.*** For the most part, almost all of Connecticut could be deemed residential. A farmer's field is residential, a lot of places in our cities where there are commercial zones there are residents. ***So we've left up to the Siting Council to try to define residential based upon on hopefully what they can determine about electromagnetic fields.***
>
> Comments of Rep. Backer, 2004 House Proceedings, May 3, 2004, pp. 239, 263. (emphasis added)

Rep. Backer provided no further illumination as to how the Council should go about defining the term. However, other legislators' remarks, while entitled to less weight than those of the co-chair of the Committee that reported the bill, shed some light on the issue. Rep. Klarides characterized the areas included in the list as "*particular areas where there is a high concentration of children*" (Tr. 264); and Rep. Hamm characterized her

understanding of a "residential area" as " residential, suburban, subdivision kinds of homes." (Tr. 267)

Following the guidance of these remarks, the Companies sought to develop a working definition for the purpose of identifying residential areas in their mapping assignment - "a cluster of houses within 300 feet of the transmission ROW and within a length of approximately 2,000 feet along the ROW." *Companies' Ex. 132* (Map satisfying requirement C.G.S. § 16-50l(a)(1), as amended, dated July 26, 2004). This effort, like that which the Council may undertake, was an attempt to put an "I know it when I see it" evaluation into quantitative terms. The Companies' working definition sought to capture densely developed clusters of homes – not to identify any place someone lives or might live in the future. Alternative approaches such as using zoning classifications would do the latter. If zoning designation were utilized, virtually the entire state would constitute a statutory facility, which would undercut the apparent goal of P.A. 04-256 to provide special consideration where siting transmission lines in certain areas.

In any case, the precise definition of "residential area" would not change the decision in this case. The areas adjacent to Segments 3 and 4, as well as those adjacent to much of Segment 2, are so densely settled that they must be recognized to be residential areas under any reasonable definition. The only question is whether there are many areas appearing at frequent intervals, or fewer but larger contiguous areas.

4. Response to Question 3 of the Council's Request for Briefing: What is the effect of likely ISO approval or disapproval on the Council?

Question 3 of the Council's request for briefing focuses on the end result – whether the project can be interconnected with the bulk power system in New England and, if not, whether the likelihood that ISO would not approve the project would render it technologically infeasible.

> *3. May the Council consider whether the configuration approved by it will likely be approved by the Independent System Operator (ISO)- New England? Must the Council consider likely ISO-New England approval or disapproval?*
>
> Short answer to Question 3
>
> - Yes, the Council not only may, but must, consider likely ISO-NE approval or disapproval when determining whether to grant a certificate for a particular route or technology.

Under the PUESA, the Council can grant a Certificate for a transmission line only if it finds that the line "conforms to a long-range plan for expansion of the electric power grid of the electric systems serving the state and interconnected utility systems" and that the transmission line "will serve the interests of electric system economy and reliability." C.G.S. § 16-50p(a)(3)(D). Council proceedings that do not, at the end of the proceeding, result in a project that resulted in "adequate and reliable public utility service" would simply be a meaningless exercise for all involved.

A Certificate from the Council does not guarantee that a project will be allowed to be energized and interconnected to the regional grid. Each project that receives certification from a state siting agency must be submitted to ISO-NE by the companies proposing to build the project. ISO-NE, with input from the NEPOOL Reliability Committee pursuant to Section 18.4 of the Restated NEPOOL Agreement, must

determine whether a project can be reliably connected to the bulk power system in New England, and whether the project may have an adverse effect on the regional electric system. *Companies' Ex. 176* (Reliability and Operability Committee (ROC) Report, dated December 20, 2004, p. 37); *ISO-NE's Ex. 8* (Testimony of Whitley, June 7, 2004, pp. 2-3, 11); 3/23/04 Tr. at 134-35 (Kowalski). If the ISO-NE does not conclude that a proposed project will be reliable, the project will be rejected under Section 18.4, and that project cannot be connected to the bulk power system in New England. 1/13/05 Tr. at 79-80 (Whitley). At the same time, the Council may consider the conclusions of ISO-NE regarding the reliability of a particular technology, such as ISO-NE statements in this docket regarding its review of 345-kV XLPE cable technology. (FOF ¶ 617)

The legislators enacting P.A. 04-246 also recognized the importance of ISO-NE approval when making a reliability determination: "When we speak of reliability in the bill we obviously are speaking to a system that would function. That it would function in accordance with the standards of ISO and what is technically feasible. . . . Reliability and operability are very much one in the same. You can't have something that is operable if it's not reliable." Comments of Rep. Backer, 2004 House Proceedings at p. 238, May 3, 2004.

In short, a stand alone project – isolated from the grid because ISO-NE will not approve it – serves no one's interests. For the Council to perform its duties under PUESA, it must therefore take likely ISO-NE approval into account when determining the technological feasibility of any project.

VI. THE OVERHEAD RIGHT-OF-WAY WILL BUFFER THE LINES ADEQUATELY TO PROTECT PUBLIC HEALTH AND SAFETY, AND THE LINES WILL POSE NO "UNDUE HAZARD" AND WILL BE CONSISTENT WITH THE COUNCIL'S BEST MANAGEMENT PRACTICES. NEVERTHELESS, THE COUNCIL MAY ORDER, ON THE BASIS OF "PRUDENT AVOIDANCE," THAT MAGNETIC FIELDS BE REDUCED THROUGH THE IMPLEMENTATION OF LOW MAGNETIC FIELD LINE DESIGNS.

Question 4 of the Council's February 17 Notice, asks that several specific points relating to the "buffer zone" finding required by C.G.S. § 16-50p(a)(3)(D) be briefed. February 17 Notice, ¶ 4. Previously, the Council had asked the parties to brief whether that buffer zone provision applies, or should be applied, to underground lines. Part (A) of this section responds to those questions; part (B) briefs related points.

VI(A). Response to Council's Question 4 Regarding P.A. 04-246 Posed in its February 17, 2005 Notice and During the Course of the Hearings.

VI(A)1. Response to Question 4 in Council's February 17, 2005 Notice

In Question 4 the Council asked:

> *In interpreting C.G.S. §16-50p(a)(3)(D), what is the effect of the establishment of a "buffer zone" by the Council? Does the establishment require the taking of homes and other facilities with the zone? Or does it affect only future building? Or does it require only warnings be posted? Or does the Council have the discretion to determine the consequences? If the proposed lines cross a road (so that an individual person should have only fleeting contact with the zone), can the Council determine that there should be no buffer zone, or that the buffer zone should have no consequences? Can the Council alter the size of the buffer zone, depending upon whether the proposed line is passing by a facility frequented by children (such as a school) or a facility frequented almost exclusively by adults (such as a golf course)*

The Companies' response to this multiple part question is set forth below.

VI(A)1(a). The Council is Not Required to Define a Buffer Zone, But Only to Make a Factual Determination That There Will Be a Buffer Adequate to Protect Public Health and Safety.

Section 16-50p(a)(3)(D) prescribes a series of specific factual determinations that the Council is to make with respect to overhead transmission lines. It requires findings of fact in each specific docket, based on the evidence in that docket. This section does not prescribe the adoption of a regulation or standard of general application. If it did, the Council would have to wrestle with questions such as how to "define" a buffer zone – by milligauss levels at the edge of the "zone;" by distance; by the activities that will be permitted within the zone, etc. As the Council's questions reflect, crafting a standard that would define how the "zone" is determined in all places and under all conditions, would be extremely challenging, and may be impossible to do in a reasonable manner that accommodates the various objectives (reliability, health and safety, environmental protection, cost) that the Council is required to take into account in executing its mission. Fortunately, P.A. 04-246 does not require the Council to attempt to do that.

The statute's reference to a "buffer zone" cannot be considered in isolation, but must be read in the context of the provision of which it is a part. *Office of Consumer v. Dep't of Pub. Util. Control*, 234 Conn. 624, 642 (1995) ("In every case … we interpret a statutory term in light of its context and not in isolation."); *McCarthy v. Bronson*, 500 U.S. 136, 139 (1991) quoting *KMart Corp. v. Cartier, Inc.*, 486 U.S. 281 (1988) ("In ascertaining the plain meaning of [a] statute, the court must look to the particular statutory language at issue, as well as the language and design of the statute as a whole.")

In § 16-50p(a)(3)(D), the buffer zone provision is one of a number of factual findings that the Council is required to make as a condition of issuing a certificate.

Prior to its amendment by P.A. 04-246, §§ 16-50p(a)(1)-(4) provided that if the Council issued a certificate for any overhead transmission line, the Council had to "find and determine" the need for the facility; its environmental effects; why the adverse environmental effects were not sufficient reason to deny the application; what parts would be located overhead; several findings related to cost; and that the facility would be consistent with the purposes of PUESA, and with federal guidelines for the design and location of rights of way and transmission facilities. P.A. 04-246 added to this list another factual determination that the certificated facility will be "contained within an area that provides a buffer zone that protects the public health and safety, as determined by the council." P.A. 04-246, § 3; Conn. Gen. Stats. § 16-50p(a)(3)(D).

Thus, in context, the reference of §16-50p(c)(3)(D) to "establishing such buffer zone" refers to the making of a factual determination that is a predicate to the issuance of a certificate on a specific application, not to a requirement that the Council adopt "buffer zone" regulations or create a defined buffer zone with reference to distance limits or magnetic field values.

VI(A)1(b). The Council May and Should Find That a Right of Way That Complies with the National Electric Safety Code Is Adequate to Protect the Public Health and Safety.

Since the buffer zone must be at least the existing ROW, the Council's inquiry begins with the question – does the existing ROW provide a buffer that will be adequate to "protect… the public health and safety, *as determined by the council.*" C.G.S. § 16-

50p(a)(3)(D). (emphasis added). The Council should have no difficulty making such a finding.

It is undisputed that, in this case, "the vast majority of the existing ROWs are wide enough to allow operation of the proposed and existing facilities in accordance with the requirements of the Department of Public Utility Control ("DPUC"), the National Electrical Safety Code (NESC) and the Companies' standards." *Companies' Ex. 1* (Application, Vol. 1, p. I-21). In one section of the line, in Middletown and Haddam, some additional ROW must and will be acquired to provide that compliance. *Id.* As the Council's recently adopted Best Management Practices recognize:

> Buffer zone distances may...be guided by the standards presented in the National Electric Safety Code (NESC) published by the Institute of Electrical and Electronic Engineers. These standards provide for the safe installation, operation, and maintenance of electrical conductors including clearance requirements from vegetation, buildings and other natural and man-made objects that may arise in the right-of-way area. The safety of power line workers and the general public are considered in the NESC standards.
>
> Electric and Magnetic Field Best Management Practices, December 21, 2004, p.4

The clearance requirements of the NESC are both vertical and horizontal. *See,* National Electric Safety Code, incorporated by reference in *Companies' Administrative Notice Item 7,* Part 2, Safety Rules for the Installation and Maintenance of Overhead Electric Supply and Communication Lines. Accordingly, a ROW provides not only a horizontal, but also a vertical buffer from the lines.

The Council should find the buffer provided by the ROW to be adequate to protect public safety whether the electric and magnetic fields from the new lines are assumed to be those built with low magnetic field designs; those that would be associated

with the lines as originally proposed; or those that are associated with the existing lines; and regardless of whether the Council considers the anticipated typical fields or maximum fields. That is so because as stated at more length in Section VI(A)1(e) following, the scientific evidence simply provides no basis for the Council to conclude that magnetic field exposure at any of these levels would be detrimental to human health, and the Council has consistently so recognized.

Moreover, the general assembly did not, in P.A. 04-246, legislate a new standard of "public health and safety." Rather, the legislature explicitly left it to the *Siting Council* to determine what would be adequate to protect "public health and safety." C.G.S. 16-50p(a)(3)(D). This legislative deference, clear in the language of P.A. 04-246 quoted above, is emphasized by the legislative history of the Act. The bill that became P.A. 04-246 was reported to the House by Representative Terry Backer, co-chair of the Energy and Technology Committee, whose remarks during the floor debate of the bill represent the most reliable extrinsic source of the intent of the legislature in passing the bill. In responding to a query from another representative asking "what...standards of public health and safety we're using" in the buffer zone provision, Representative Backer said emphatically:

> [W]e have not set the standard for public health and safety here. We will leave that to those who are better qualified than we are here today.
>
> Floor Debate on H.B. 5418, May 3, 2004, p. 262.

Accordingly, the Council may and should find that the ROW as it will be modified by the acquisition of additional rights where necessary to comply with the National Electric Safety Code, will be adequate to protect public health and safety. However, as discussed in Section VI(A)1(f), the Council may nevertheless require

various "prudent avoidance" measures to lower the magnetic fields that will be associated with the line.

VI(A)1(c). As With Other Factual Determinations Required of It, the Council Has Great Discretion in Making "Buffer Zone" Determinations.

The scope of judicial review of an agency's factual determinations in specific cases is "very restricted." *MacDermid, Inc. v. Department of Environmental Protection*, 257 Conn. 128, 136 (2001). The agency's determination must be upheld "if the administrative record affords a substantial basis of fact from which the fact in issue can be reasonably inferred. This substantial evidence standard is highly deferential and permits less judicial scrutiny than a clearly erroneous or weight of the evidence review." *Id.*, at 137. A determination calling for a "technical, case-by-case review…is precisely the type of situation that calls for agency expertise," and therefore for reliance on the agency's discretion. *Id.*, at 139; *Sielman v. Connecticut Siting Council*, 36 Conn. L. Rptr. 400, 2004 WL 203046 (2004).

VI (A)1(d). The Council Need Not, and Should Not, Require a "Buffer Zone" to Have Any Characteristics Other Than Those of an Overhead Right of Way, Nor Require Widening of the Right of Way, By the Taking of Homes or Otherwise.

Public Act 04-246 recognizes that an "existing Right Of Way" may "*serve as* the buffer zone." Thus, the legislation recognizes that not only the dimensions, but also the well-known characteristics of an electric ROW can be found to provide an adequate buffer. The rights of a utility pursuant to a transmission line easement, while substantial,

are limited.[10] However, notwithstanding the limited nature of the rights that commonly make up a "Right Of Way," the legislature provided that an existing ROW may "serve as" the buffer zone. Therefore, there is no need for the Council to require the acquisition of greater rights – such as a fee interest that would allow the utility to fence off the ROW or otherwise exclude the landowner and the public from the ROW[11] – unless the Council were to determine that such a step was required to protect public health and safety. Similarly, there is no need to require that the ROW be expanded to achieve some very low milligauss level at the edge unless the Council so finds. As discussed in Section VI(A)1(e) following, such a finding would be baseless and gravely mistaken. The Council must bear in mind the significant difference between ordering magnetic field reduction on a prudent avoidance basis, and ordering action that is required to protect the public health.

The World Health Organization has advised against the adoption of quantitative exposure limits on a cautionary basis:

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[10] "[T]he right-of-way granted to an electric company does not entitle it to occupy any part of the surface of the land except the space occupied by the equipment and necessary for access thereto...[It] does not entitle an easement holder to exclusive possession [so that] the power company may not erect a fence so as to cut off the strip of land from the remaining property of the landowner." *Hartford Elec. Light Co. v. Town of Wethersfield,* 165 Conn. 211, 220-221 (1973). While the owner of the underlying land may not make any use of it that will materially interfere with the electric transmission use, he typically may make any other use of the land. *Connecticut Light & Power Co. v. Holson Co.,* 185 Conn. 436 (1981).

[11] As a practical matter, the Council has no means of providing for a buffer zone that is wider than, or more restrictive than, a utility ROW that complies with the National Electric Safety Code, other than conditioning a Certificate on the applicant's use of its eminent domain power to acquire these rights. The Council has not been vested with any jurisdiction to regulate uses that landowners (other than those building regulated facilities) may make of their property; or to require towns or other governmental bodies to enact such regulations. In theory, the Council could condition a certificate on a requirement that the applicant widen its ROW to a specific width or to various widths at different locations, taking property as necessary to do so; or that the applicant post warning signs. The Council cannot, however, mandate a defined ROW as the line crosses a public highway. Utilities do not have, and cannot condemn, defined rights of way in public highways. Rather, they have a chartered right to locate their facilities in highways, subject to certain regulatory requirements. *See, Companies' Ex. 9* (Applicants' Memorandum Concerning Their Eminent Domain Powers and Their Franchise Rights to Install Facilities in Highways, dated December 22, 2003, pp. 7-13).

> Prudent Avoidance and other cautionary policies regarding EMF exposure have gained popularity among many citizens, who feel that they offer extra protection against scientifically unproven risks. However, such approaches are very problematic in their application. The chief difficulty is the lack of clear evidence for hazard from chronic exposure to EMF below recommended guidelines, or any understanding of the nature of a hazard should one exist...
>
> A principle requirement [for precautionary policies] is that such policies be adopted only under the condition that scientific assessments of risk and science-based exposure limits should not be undermined by the adoption of arbitrary cautionary approaches. This would occur, for example, if limit values were lowered to levels that bear no relationship to the established hazards or have inappropriate arbitrary adjustments to the limit values to account for the extent of scientific uncertainty.
>
> *Woodbridge Organizations' Ex.* 1 Attachment Item I, Word Health Organization "Backgrounder" on Electromagnetic Fields and Public Health Cautionary Policies, p.6 ("WHO 2000"),[12] p. 20

Where such "arbitrary cautionary policies" are adopted, the consequences can be grave, as the Vermont Public Service Board ("Vermont Board") recently recognized when it approved the Vermont Electric Power Company ("VELCO") Northwest Vermont Reliability Project, a project (like this one) that entails the construction of a new 345-kV line and the reconstruction of existing 115-kV lines. In that proceeding, an intervenor group argued that the Board should "require VELCO 'to purchase any structure and lands that fall within a right-of-way where measured EMF exposure exceeds 3 mG.'" The Vermont Board explained its refusal to adopt such a requirement as follows:

> Such a requirement would establish a chronic exposure standard for EMF, something that none of the numerous health agencies that have reviewed the state of knowledge concerning EMF have yet done and the record before us does not support. *Companies' Administrative Notice Item 29 (*Order of Vermont Public Service Board in Dkt. No. 6860) ("VELCO Decision")

[12] A copy of this WHO Backgrounder is also attached to *Companies' Ex. 129* (Applicants' Response to Council's Interrogatory Concerning 'Buffer Zone' Determinations Pursuant to Public Act 04-246, dated July 19, 2004).

Similarly, the Vermont Board rejected the proposition that a requirement that VELCO purchase "any lands or structures used by children under the age of 15 where they are exposed to EMFs resulting from the proposed Project" would be "consistent with the policy of prudent avoidance," noting:

> Although the policy recommendations that arise from following prudent avoidance are unclear, under no credible reading can prudent avoidance be read as equivalent to a standard of zero additional exposure to any population group from EMF.
>
> *Companies' Administrative Notice Item 2* (VELCO Decision, p. 77).

Finally, commenting on all of the recommendations of the intervenor group – which were strikingly similar to recommendations made by some parties and intervenors in this docket – the Vermont Board quoted the California and American Medical Associations:

> There can only be harm to society when uncorroborated, inaccurate and/or unproven beliefs which fuel public fear become institutionalized in court rulings.
>
> *Companies' Administrative Notice Item 29 (* VELCO Decision, p. 77) (emphasis added).

The Vermont Board relied largely on a thorough review of EMF science and policy by the Department of Health. *Companies' Administrative Notice Item 15* ("Position Paper on Electric and Magnetic Power Frequency Fields and the VELCO Northeast West Vermont Reliability Project," prepared by the Vermont Department of Health, Division on Health Protection, December 15, 2003") ("VDH Report").

The Vermont Department of Health carefully analyzed the magnetic fields that were likely to be associated with the new lines and concluded that they were "well below the health based ICNIRP guidelines [or 833 mG] at the edge of the ROW," which it applied in its analysis. VDH Report, pp. 36, 44, 45. It reviewed edge of ROW standards and guidelines adopted by other states, but did not recommend that any of them be

adopted. VDH Report, p. 22. The Vermont Department of Health then recommended that "modifications to the [Northwest Reliability Project] are not required for health reasons, but Vermont's policy of prudent avoidance to mitigate EMF exposure as identified in the Vermont Twenty Year Electric Plan (1994) should be continued." VDH Report, p. 47.

As the Vermont authorities acutely recognized, it is one thing to undertake to reduce fields if new lines where that can be done at a reasonable cost, and quite another to find that a 3 mG or 6 mG edge of ROW value or a widening of the ROW is necessary to protect public health. The latter course sends an unfounded and alarming message to the public that they are living in unsafe conditions – not just people who live near the 1800 miles[13] of overhead transmission lines in the state, but to those who live near the much more common distribution lines, and to those who are exposed to magnetic fields from multiple other sources. The following table compares magnetic fields that would be associated with the overhead lines proposed in this docket with the magnetic fields commonly found elsewhere and near Connecticut:

[13] *Companies' Ex. 1* (Application, Vol. 1, p. F-9)

Summary of Evidence in this Docket re: Common Magnetic Field Levels from Transmission Lines and Other Sources

Source	Magnetic Field Range (mG)	Citation
Existing Lines - Middletown-E. Devon (edge of ROW)	*0.2 – 33.8* *average loading* *0.9 – 80.6* *stressed peak loading*	*Companies' Ex. 35 (Letter Updating Magnetic Field Calculations, 3/15/04; Cross Sections 1-8)*
Existing Lines – E. Devon – Norwalk (edge of ROW)	*1.5 – 62.2* *average loading* *0.3 – 73.6* *stressed peak loading*	*Companies' Ex. 35 (Letter Updating Magnetic Field Calculations, 3/15/04, Cross Sections 11-22)*
Overhead Lines Proposed in Application (Middletown – E. Devon) (edge of ROW - no additional magnetic field reduction)	5.3 – 30.4 average loading 3.8 – 61.3 stressed peak loading	*Companies' Ex. 35* (Letter Updating Magnetic Field Calculations. 3/15/04, Cross Sections 1-8)
Proposed M-N XLPE Cables (above center of cable trench, 3' cover)	10-25 average loading	*Companies' Ex. 162,* Calculations for Middletown-Norwalk 345-kV XLPE Transmission Cables)
Existing Bethel – Norwalk 115-kV Overhead Lines (edge of row)	0.9 - 26.8 average loading	*Council Administrative Notice Item 15,* Dkt. 217 FOF, ¶ 256
B-N Approved Overhead 345-kV/115-kV Lines (edge of ROW)	0.6 - 39.4 average loading	*Council Administrative Notice Item 15,* Dkt. 217 FOF, ¶ 256
B-N Approved Underground 115-kV XLPE Cables (above center of trench)	79.1 average loading	*Council Administrative Notice Item 15,* Dkt. 217 FOF, ¶ 256
Approved Pequonnock-Ely Ave. 115-kV Lines (edge of ROW)	16.1 – 22.5 average loading	*Council Administrative Notice Item 14,* Dkt. 141 FOF ¶ 131
Approved Stevenson-Newtown-Plumtree 115-kV Lines (edge of ROW)	6 -15 typical loading 82 -196 peak loading	*Council Administrative Notice Item No. 13,* Dkt. 105, FOF ¶¶ 119-121
Overhead 115-kV / 345-kV Lines Approved by Vermont PSC 1/28/05 (edge of ROW)	14 – 42 average loading	*Companies' Administrative Notice Item 29* (Final Decision of Vermont Public Service Commission in Dkt. 6860, Northwest Reliability Project), p. 66

Measurements at various locations in Connecticut near overhead and underground distribution lines	<1 – 18	*Companies' Ex. 165* (Testimony of Johnson, 10/12/04, p.2)
Measured Outside in downtown New Britain near CCSU Building	0 – 21	*Companies' Ex. 190*, (EMF Measurements taken on 10/13/04, submitted January 28, 2005)
Selected Measurements Along Proposed Underground Route – No Existing Transmission Lines		
St. Cyril St. Methodist Church	13.6	*Companies' Ex. 142,* Response to Q-AG-014
Waterview Park	10.0	
Waterfront Park	23.8	
Shiloh Baptist Church	20.0	
Went Field	9.7	
West End Park	8.8	
Venings' Park	14.4	
Office Sources (e.g., fluorescent lights, fax machines)	<1-300	*Companies' Administrative Notice Item 22* (NIEHS Q&A, p. 33)
Bathroom Sources (e.g., hair dryer, electric shaver)	<1 – 1,000	*Companies' Administrative Notice Item 22* (NIEHS Q&A, p. 33)
Kitchen Sources (e.g., blender, dishwasher)	<1 – 1,500	*Companies' Administrative Notice Item 22* (NIEHS Q&A, p. 34)

Highly developed countries all over the world, including 30 countries in Europe, have been careful not to confuse ROW definition or standard setting with prudent avoidance. These countries have adopted exposure limits based only on the known effects of magnetic fields, as recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This standard allows public exposures up to 833 mG at 60 Hz (1,000 mG at 50 Hz). *Companies' Administrative Notice Item 15,* (Vermont Department of Health Position Paper, pp. 21-22); *Council Administrative*

Notice Item[14] (EMF Exposure Standards Applicable in Europe and Elsewhere, May, 2003); *Companies' Ex.169* (Testimony of Bailey, et al., October 12, 2004, pp. 8, 9 and Appendix). Many of these countries also apply policies of prudent avoidance, but not by means of establishing arbitrarily low magnetic field exposure limits.

Where exposure limits have been adopted on a precautionary or "prudent avoidance" basis, it has been with the objective of not significantly increasing magnetic field exposures above existing levels. This approach does not seek to "freeze" field levels at every location along every ROW at existing levels, but rather to maintain fields generally within a commonplace range. Thus, as the Council's new Best Management Practices recognize, the States of New York and Florida adopt edge of ROW magnetic field limitations of 150 mG – 250 mG, based on the continuous current carrying capacity of the line. *Council Administrative Notice Item 19* (Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Lines in Connecticut, p. 4). Similarly, the Massachusetts Siting Authority has a goal of limiting magnetic fields at the edge of a transmission ROW under 85 mG, based on calculations assuming average load. *Woodbridge Organizations' Ex. 8 (*Supplemental Testimony of Bell, et al, May 11, 2004, Appendix Item 5, Decision of Massachusetts Siting Board on Petition of U.S. Generating Co., EFSB 96-4, 11/3/97, pp. 122, 124. There is no evidence of any lower edge of ROW value recommended anywhere, and in Massachusetts this value is not incorporated in any standard nor adopted on the basis that it is required to protect public health. *Id.*

[14] The Council distributed this document at the February 1, 2005 hearing and Chairman Katz stated that the Council intended to take administrative notice of it. 2/01/05 Tr. at 11. However, it was not formally noticed during the hearings nor assigned a number. The Council may nevertheless take notice of it. *See* Tait and LaPlante, Handbook of Connecticut Evidence, §6.2 (3d ed. 2001).

The Council's announced policy of "attempt[ing] to avoid or minimize exposure to magnetic fields above existing levels," when reasonable, practical, and cost effective, is consistent with the approaches of New York, Florida, and Massachusetts. Indeed, the proposed construction, even without any of the low magnetic field designs developed during the hearings, is consistent with that policy. The fields that would be associated with the originally proposed overhead construction would be well within those permitted by New York, Florida, and Massachusetts; similar to those expected to be associated with the Northwest Vermont Reliability Project; well within the range of fields commonly associated with transmission lines in this state and elsewhere throughout the nation (*see,* Table above) and a small fraction of the health-based ICNIRP 833 mG standard.

Moreover, looking only at the ROW on which the overhead construction is proposed, while edge of right or way magnetic fields would increase in some specific locations, the resulting higher fields would still be within the range of the fields present along the existing line. (*See* Table above)

VI(A)1(e). There Is No Basis On Which the Council Could Reasonably Find that a Buffer Zone Other Than the Existing Right of Way Is Required to Protect Public Health and Safety.

Over the last 30 years, a massive research effort has been conducted in the United States and around the world to examine whether exposures to 60 Hz electric or magnetic fields, such as are associated with power lines, have health or environmental effects, particularly leukemia in children. FOF ¶¶ 485-487. The totality of this research has been evaluated by many multidisciplinary national and international scientific panels, and none of them have found the evidence to support a conclusion that such fields are harmful.

FOF ¶ 485. The organizations sponsoring these reviews include the National Institute of Environmental Health Sciences (NIEHS); the National Academy of Sciences (NAS); (United Kingdom) National Radiological Protection Board (NRPB); the Health Council of the Netherlands (HCN); and the International Agency for Research on Cancer (IARC). FOF ¶ 485, 490.

In order to assess whether magnetic fields might cause cancer in humans, large numbers of animals, some with a genetic predisposition to cancer, have been exposed to very high levels of magnetic fields under controlled conditions for virtually their entire lifetimes, without developing excess cancers, as compared to unexposed populations. FOF ¶¶ 489-490. Attempts to identify a plausible mechanism by which 60-Hz magnetic fields, which are too weak to damage DNA, could cause cancer, have been robustly negative. FOF ¶¶ 486-487; *Companies' Ex. 41* (Testimony of Aaronson, March 16, 2004, pp. 5-6).

Contentions that transmission line magnetic fields are likely to be harmful are based primarily on a selective interpretation of the results of epidemiology studies. The witnesses for the Woodbridge Organizations have not presented a scientific evaluation of the totality of the evidence, but have rather "cherry picked" from isolated studies to support their contentions. Moreover, they have consistently overstated the evidence for an association between magnetic field exposure in their discussion of the likelihood that reported associations could be due to "chance". As the Woodbridge Organizations' witnesses admitted when pressed, "chance" used in this sense means random error only, and does not include sampling error, measurement error, selection bias, or errors attributable to risk factors for the disease that were not measured or even sought to be

measured. 6/16/04 Tr. at 33-37 (Rabinowitz & Gerber); 1/20/05 Tr. at 107-110 (Bell). With respect to leukemia, the inability to know whether other risk factors are accounted for is particularly significant, since the causes are virtually entirely unknown. 2/01/05 Tr. at 32-34 (Cole). Moreover, although there are several strong suspect factors, such as viruses, air pollution, background radiation, and general correlates of development, very few of the epidemiological studies have accounted for these potential risk factors. 2/01/05 Tr. at 32, 33 (Cole).

While the Woodbridge Organizations' witnesses worked hard to exaggerate the possible risks of transmission line magnetic fields, they nevertheless acknowledged that "nobody claims that EMF has been established as a cause of childhood leukemia. The concern is that there are suggestions in the literature that that might be a possibility." 5/13/04 Tr. at 244 (Bell & Rabinowitz).

The Connecticut State Department of Health ("CT DPH") filed comments in this Docket on March 15, 2004, in which it advised that "the application to the Siting Council presents a thorough review of recent scientific research regarding the potential for health effects from EMF exposure," and that the CT DPH's "own conclusions about EMF and health effects are generally consistent with the conclusions presented in the application to the Siting Council." *State Agency Comment 1* (CT DPH Comments, dated March 15, 2004, p. 1). The CT DPH summed up its view as:

> Despite extensive research over the past 20 years, the health risk posed by EMF exposure remains somewhat of an open question. Two national organizations (NIEHS and the National Academy of Sciences) have looked at the studies and concluded that there is not strong evidence suggesting that EMF exposure poses a health risk. However, the NIEHS evaluation concludes that among some of the epidemiological studies, there is a fairly consistent pattern that links EMF exposures above 3 milligauss (mG) with a small increased risk of leukemia in children.

> Interpretation of these findings has been difficult because of the absence of supporting laboratory evidence in animals or a scientific explanation about how EMF exposures could cause leukemia.

Thereafter, Dr. Ginsberg testified that the unproven, but possible, health risks of EMF supported a policy of "prudent avoidance" to "keep the long-term average exposure of those near major EMF sources, for example power lines and substations, to be within a reasonably small factor, for example two-fold of [a] background range" of 3 milligauss, above which there was some evidence of increased risk.[15] 3/25/04 Tr. at 315 (Ginsberg). However, Dr. Ginsberg disclaimed any intent on his part or on the part of the CT DPH to "prescribe any actions to the Siting Council," since the DPH "does not set policy...regarding chemical or radiological risks." 10/14/04 Tr. at 112 (Ginsberg).

The CT DPH has published a comprehensive health plan to promote public health in the State of Connecticut and to identify modifiable behaviors so as to avoid the public's exposure to risk factors. This document discusses air pollution, radon, and asbestos, but makes no recommendations concerning EMF exposures. 10/14/04 Tr. at 113-116 (Ginsberg).

Thus, neither the Woodbridge Organizations' panel nor Dr. Ginsberg made the claim that there are established adverse health effects of exposure to transmission line magnetic fields, against which specific exposure limits or buffer zones will provide protection. Both acknowledge that the question boils down to one of prudent avoidance.

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[15] Before Dr. Ginsberg provided testimony to the Council, he met with "a large contingent" of representatives of "the Towns in the path of the ...proposed power line," including "two scientists who wanted to present information." 3/25/04 Tr. at 282-294, 326, 328, 329 (Ginsberg). These "scientists" were Dr. Bell and Dr. Rabinowitz, the witnesses for the Woodbridge Organizations. *Id.* at 293. The meeting took place in response to a request to the Commissioner of the Department from the First Selectperson of Woodbridge *Id.* at 296; and the Commissioner attended the meeting, along with the legislative liaison of the Department.

It is for the Council to determine what is prudent – particularly what level of social investment is prudent to perhaps reduce a possible small and uncertain risk.

As discussed above, the Vermont authorities have provided invaluable guidance in distinguishing between "prudent avoidance" measures and health based standards or requirements. They have also provided a clear and concise summary of the health research. Based on the VDH Report and much other evidence presented to it, the Vermont Board concluded:

> The evidence presented in this Docket leads us to conclude that there will be no undue adverse health effects from EMF as a result of this project. We recognize that there is concern about the effects of EMF but the analyses by public health agencies show no clear health effects and at best point to EMF as a potential, but uncertain, risk. It is for this reason that the NIEHS and IARC have not classified EMF as "carcinogenic" or "probably carcinogenic." However, some studies have indicated that there is a weak correlation between EMF and childhood leukemia. This uncertainty has led the NIEHS and IARC to classify EMF as "possibly carcinogenic," the same category that includes coffee and pickled vegetables.
>
> The numerous studies on EMF show no correlation between EMF exposure from power lines and increased risk to the public, with the possible exception of childhood leukemia. Epidemiological studies have suggested that EMF exposure may be linked to an increase in childhood leukemia rates. Most health organizations believe that this link is tenuous due to the failure to find a mechanism explanation for any health effects and the negative results from animal testing. In addition, there are basic limitations of epidemiology that preclude any certainty in the determination of a health risk.
>
> In reaching our conclusion, we must balance the uncertainty with the potential adverse health effects of failure to implement the proposed Project. While the effect of chronic exposure to EMF at the levels that would result from the proposed Project is not certain, the health and safety effects of an unreliable electric system are obvious. Reliability is essential to the health and safety of Vermonters, from ensuring adequate health care at hospitals to functioning traffic lights to prevent traffic accidents. This is an issue separate from the economic benefit of a reliable electric system… To take an obvious, but hardly exclusive, example:

> Hospitals, in order to remain open and operating safely at all times, need a reliable supply of electricity. Even temporary disruptions affect the hospitals' ability to deliver essential services because almost every function that goes on in hospitals depends on electricity...
>
> We do not completely discount the potential health risks of EMF. However, we place these potential risks in the context of the risks that people in a technological society face daily. Every-day activities such as walking across a street or simply driving a car present health risks. The possible risk from low-level EMF is simply one more risk that people incur by living in a society that is heavily dependent on electricity.
>
> It is also important to note that transmission lines are not the only, or even primary, source of EMF exposure for most people...[W]e receive significant, albeit short in duration, EMF exposure from household and work-placed electronic devices. Such exposures are typically higher than those experienced at the edge of the transmission line right-of-way at maximum continuous loading.
>
> (VELCO Decision, pp. 72-73)

Like the Vermont authorities, this Council should be careful to distinguish between prudent avoidance measures and measures that will cause undue public alarm by seemingly validating unproven claims of adverse health effects. The next sections of this brief will discuss potential prudent avoidance measures.

VI(A)1(f). Without Requiring Expansion of the Right of Way or Other Severe Measures, The Council May Order Measures to Reduce Magnetic Fields Based On "Prudent Avoidance."

Where the existence of a small risk cannot be ruled out, modest investments that could conceivably reduce the risk, and that may in any case allay public concern about the risk, may be justified, pursuant to the concept of "prudent avoidance." *See Companies' Ex. 75* (Testimony of Bailey, May 3, 2004, pp. 3-6, & Attachment 1; *Companies' Administrative Notice Item 29* (VELCO Decision, pp. 74-78); *Companies' Administrative Notice Item 15* (VDH Report, pp. 37-38). Prudent avoidance is a policy

of minimizing "exposure which is unnecessary or incidental to achievement of service objectives or process requirements, provided that this can be readily achieved at modest expense." *Woodbridge Organizations' Ex. 11* (Testimony of Bell et al., March 16, 2004, Appendix 2, Tab 32, p.6). The Siting Council has defined the policy of prudent avoidance, as it applies to transmission lines, as supporting "measures [that] attempt to avoid or minimize exposure to magnetic fields above existing levels whenever reasonable, practical, and cost effective siting and engineering solutions exist." *Council's Administrative Notice Item 29*, p. 2. "Prudent avoidance" is also the policy of the Vermont Public Service Board, which describes it as "policies that limit magnetic field exposure whenever this can be done for a small investment of money and effort." *Companies' Administrative Notice Item 29* (VELCO Decision, p. 6).

For ease of reference, this brief characterizes potential magnetic field reductions that could be considered pursuant to a policy of prudent avoidance in three generic categories or "orders", based upon increasing difficulty, environmental (including visual) impact, and expense.

In addition to these generic strategies, "site specific" magnetic field reduction measures could be employed. For instance, conductors could be raised in a specific location by adding a structure to reduce the span length, thereby increasing conductor height. Another possible "site specific" measure is relocation of a transmission structure within the ROW to a point opposite an area of concern, such as a house or a statutory facility (so that the point of least conductor sag and therefore greatest distance from the ground is opposite that point). 2/1/05 Tr. at 148 (Bartosewicz).

VI(A)1(f)(i). First Order "Prudent Avoidance" Measures in the Overhead Lines as Proposed

The Council's EMF Best Management Practices ("BMPs") are based on prudent avoidance policies. *Council's Administrative Notice Item 29* (Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Lines in Connecticut, December 21, 2004, p. 2). To comply with the BMPs in effect at the time of their Application, the Companies consolidated circuits on towers where appropriate and optimally phased the lines for magnetic field cancellation wherever possible, while at the same time seeking to minimize both visual and environmental impacts. *Companies' Ex. 1* (Application, Vol. 6, Electric and Magnetic Field Assessment, p. 9, 24, 97). These measures, built into the Project from its inception, may be referred to for convenience as "first order" prudent avoidance measures.

VI(A)1(f)(ii). "Second Order" Magnetic Field Reduction Strategies

Where magnetic field values are of more concern than the number and height of transmission structures, "second order" strategies may be employed. In particular, significant magnetic field cancellation can be achieved by "split phasing" overhead lines. Split phasing entails "splitting" the current between two sets of three conductors instead of the conventional one set of three conductors; and arranging the resulting six conductors to achieve maximum magnetic field cancellation. It is an established, reliable transmission line design that has been proven, both as a matter of physics and practice, to reduce magnetic fields substantially. However, since split phasing requires six, rather than three conductors on a single transmission structure, the structures require more davit arms and they are taller. (FOF ¶¶ 513-517).

In order to identify magnetic field reduction techniques that might be acceptable, the Companies presented a menu of magnetic field reduction options to each of the Towns participating in this proceeding and asked them to select that which they preferred for their Town, or whether they would prefer the originally proposed line design. The long and interactive process by which the Companies winnowed many designs presented to the Council arrived down to an "optimal" set of low magnetic field line designs, presented to the Council in *Companies' Ex. 191,* at the February 17 hearing, is reviewed in the Companies' Proposed Findings of Fact, at ¶¶ 513-526.

These "second order" line designs are somewhat generic in that they are applicable to entire "Cross Sections" of the ROW. "Cross Sections" are linear sections of the ROW where the required structures will be continuously the same. The magnetic fields associated with the existing and new lines were calculated assuming a uniform conductor height equal to the mid point of the span, where the "sag" of the conductors is lowest, and therefore, in nearly all locations along the line, specific calculations would show lower fields. 3/25/04 Tr. at 73 (Bailey). Therefore, in specific locations of interest, site-specific calculations would likely show lower fields.

VI(A)1(f)(iii). "Third Order" Magnetic Field Reduction Strategies

In general, third order strategies are the most difficult and expensive to implement, and go beyond previously recognized boundaries of prudent avoidance. An example of a third order strategy is taking a 115-kV line off the ROW and reconstructing it underground, thereby allowing the 345-kV line to be "split phased" without ROW expansion, and locating the new 345-kV line in the center of the ROW, providing maximum lateral separation. This strategy has been identified as an option for the part of

Cross Section 2 that traverses the Royal Oak subdivision, in Durham. This is a small lot subdivision that has grown up around the transmission ROW, with houses built up to the edge of the ROW.[16] On this Cross Section of the ROW, magnetic field calculations show:

ROW Configuration	Structure Configuration Number & Type	Typical Height (Feet)	mG @ edge of ROW (15 GW Case)	
			S/E	N/W
Existing	2 115-kV H-Frames	57	9.2	13.9
Low MF Design	1 345-kV Split Phase reconstruct 115-kV underground in streets	135	6.2	6.2

Companies Ex. 175 Response to CSC-03, Q-CSC-070 dated 1/5/05; *Companies' Ex. 136* (Magnetic Field Calculations)

Another "third order" strategy identified for Royal Oak would be a ROW "bypass" by which the new 345-kV line would be built, not in the existing ROW, but on a new ROW through presently undeveloped land for which a subdivision has been proposed, but not built. FOF ¶¶ 358-359, 366; Appendix to Proposed Route Variations.

VI(A)1(f)(iv). Cost of Magnetic Field Reduction Strategies

However, low magnetic field reduction strategies were implemented from all Segments 1 and 2, including both "second order" and "third order" strategies, the cost would be very high - an incremental cost of approximately $68 - $80 million for employing low magnetic field designs in segments 1 and 2. This total assumes a low magnetic field strategy for the Royal Oak subdivision that would reroute the 345-kV line on a bypass through the Wilson Property, and includes only an easement cost without an allowance for severance damages. It also assumes that the existing 115-kV line would be

[16] There is also one house that encroaches substantially into the ROW. 2/1/05 Tr. at 163 (Bartosewicz). Should the Council determine that it is necessary for the CL&P to enforce its right to have this encroachment removed, in order to make the required "buffer zone" finding, CL&P will do so.

left as is. *Companies Ex. 172* (Testimony of Bartosewicz, et al., December 28, 2004, p.6). It does not include any allowance for a new right of way on the Reis property or any other costs that would be associated with the relocation of the right of way or of facilities on the JCC and Ezra Academy B'nai/Jacob properties. Moreover, as stated in more detail in the Companies' proposed Findings of Fact, adoption of the low magnetic field strategies would increase somewhat the visual impact of the overhead lines and other environmental impacts. (FOF ¶ 523).

VI(A)1(g). The Council Has the Information It Needs In Order to Determine the Location and Configuration of Low Magnetic Field Line.

The Council has before it all of the information it needs to determine where low magnetic field line designs should be employed, and which designs should be used. The Council should specify these designs in its Decision and Order to avoid continued delay in meeting the urgent need in SWCT.

VI(A)1(g)(i). Magnetic Field Calculations In the "15 GW Case" Fairly Characterize the Typical Magnetic Fields Associated with the Existing Lines, the Proposed Lines, and the Low Magnetic Field Designs.

The Companies have taken great pains to present to the Council reliable information to assist the Council in evaluating the magnetic fields that are associated with the existing lines in the proposed and alternate overhead rights of way, and the fields that would be associated with new overhead lines, whether built as originally proposed in the Application, or according to one of the many low magnetic field designs that were developed during this proceeding. This voluminous information is cited at FOF ¶¶ 496-526, and summarized in the FOF Appendix.

Much of this evidence consists of magnetic field calculations. People have known how to calculate magnetic fields since the time of Newton, and "it's a relatively trivial calculation which is highly accurate." 1/19/05 Tr. at. 77 (Boggs). Today, these calculations are performed with the assistance of a highly accurate computer program developed by an agency of the U.S. Department of Energy. *See* FOF ¶ 499. The inputs to the program are data regarding the current flow, phasing, and conductor configurations of the existing or planned transmission lines. FOF ¶ 499. Thus, while the calculation itself is highly accurate, in order for the output of the model to fairly represent the magnetic fields that will be associated with the line, the input assumptions must be reasonable. The assumptions for current phasing, and conductor configurations are fixed by the line design. The remaining input – current flow – is highly variable.

Current flow is determined by other variables, principally the load (customer demand) that is being served at a given time and the location of the generation that is being dispatched to serve that load. *Companies' Ex. 156* (Testimony of Prete, Sept. 24, 2004, pp. 1-2). Load is influenced by a host of factors such as economic development, population growth, construction of larger homes, increasing use of air conditioning and other appliances, and weather. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 5). Similarly, the location of dispatched generation in relation to the load is influenced by its distance from the load, price, and availability of the generation, among other things. All of these factors are constantly in play; in a free flowing AC power system, it is virtually impossible to have the same flow on a transmission line for more than an hour or two, due to frequent changes in load and generation. *Companies' Ex. 168* (Testimony of Scarfone et al, October 12, 2004, p. 2).

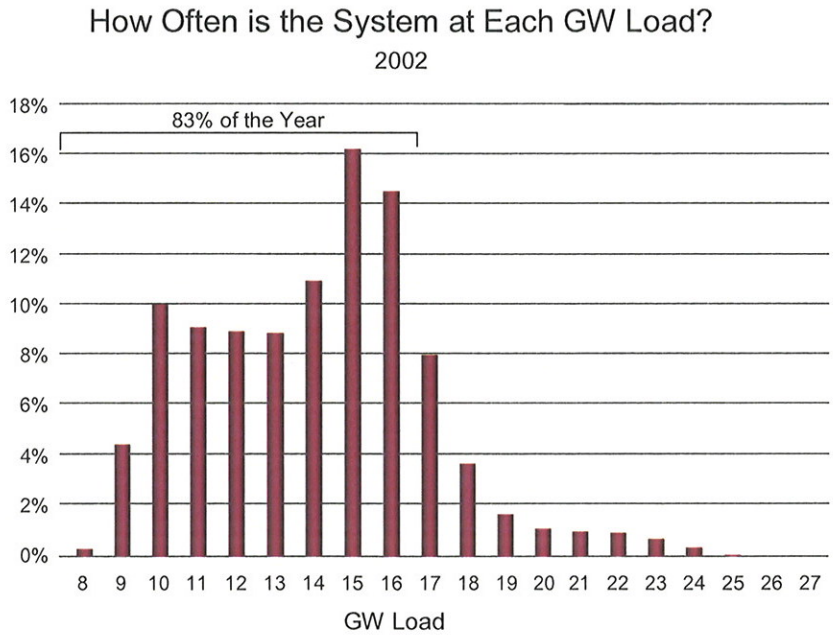
Thus, no set of assumptions will produce calculated magnetic fields that will be present at all times. The best that one can do is to use assumptions that will produce fields that are characteristic of those that are likely to be present for most of the time, today and looking forward into the future for a reasonable time. An "average" value may or may not provide such a fair representation, depending on how far away from the average the high and low values are and (even more important) the length of time for which those high and low values can be expected to persist. The fair representation will be one that is not only an average, but one that is within a reasonable range of the values that will be present for most of the time, both now and going forward.

The Companies have provided such a fair representation to the Council with the "15 GW Case." This "Case" assumes an average customer load, together with a "light" generation dispatch from the local generators in SWCT[17], which is an economic dispatch consistent with average load. *Companies' Ex. 156* (Testimony of Prete, September 24, 2004, pp. 2-3); 10/14/04 Tr. at 241 (Prete); 10/14/04 Tr. at 242-243 (Scarfone). The Companies derived the line current loadings used in the 15 GW Case from the New England wide load data published by ISO-NE, both recorded historic loads and predicted future loads. 5/12/04 Tr. at 34-35 (Bailey); 5/13/04 Tr. at 22-23 (Zaklukiewicz). This was a reasonable assumption because the SWCT load has accounted for a relatively constant percentage of the New England wide load in recent years. 5/13/04 Tr. at 22-23 (Zaklukiewicz). In addition, the validity of the assumption was proven by determining the historic 2003 current flows on the existing lines from the system operator at the Connecticut Valley Electric Exchange and comparing them to the assumed currents

[17] The 15 GW Case assumes that 759 MW of the 2,188 MW of installed capacity in SWCT is "on." *Companies' Ex. 156.* (Testimony of Prete, September 24, 2004, p.3).

derived from the New England load. The two sets of values agreed closely. *Companies' Ex. 168* (Testimony of Scarfone et al., October 12, 2004, pp. 2, 3).

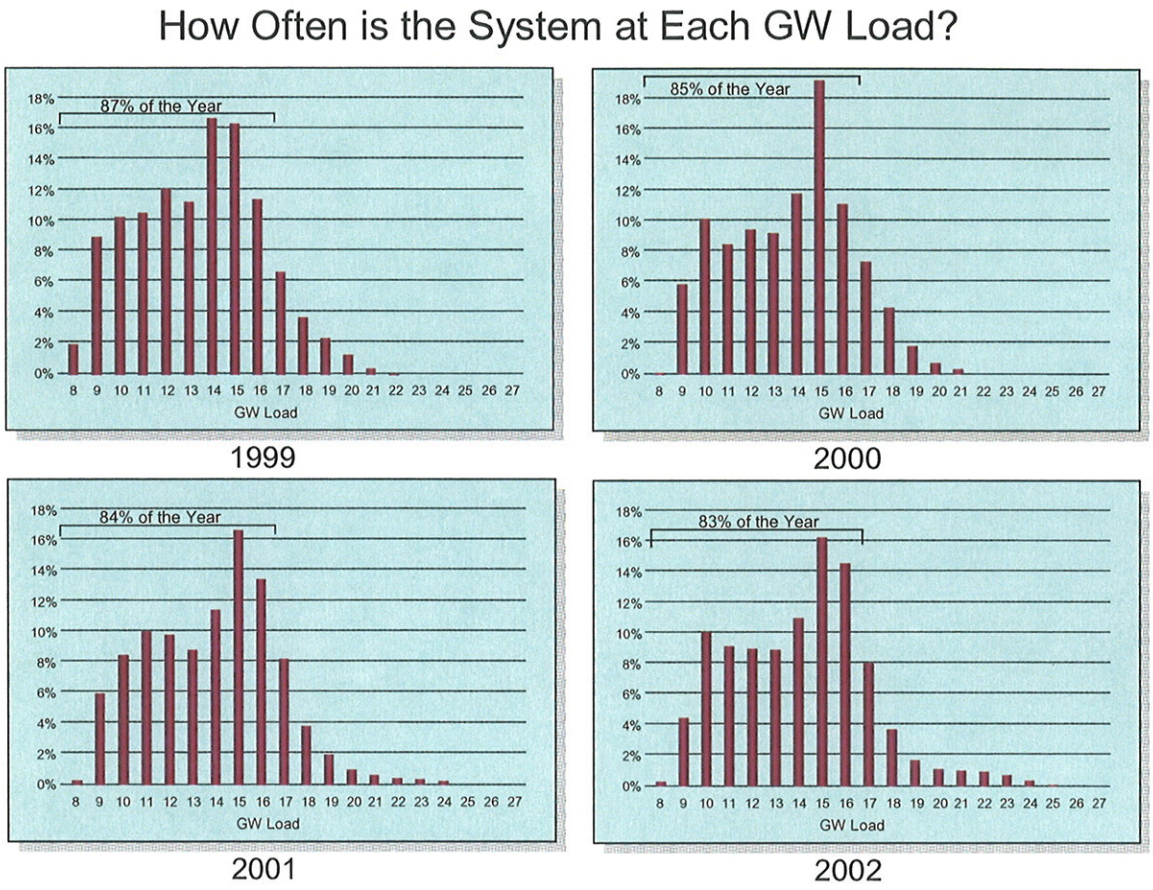
The 15 GW New England load used for modeling the "15 GW Case" is not just an average number, but represents a load within a relatively narrow range in which the system operates most of the time. Minimum load and peak load conditions occur in only a small number of hours in the year. As the following figure illustrates, for most of the year (83% of the hours of the year in 2002) the load is below or, if above, fairly close to, the average load of 15 GW:



Companies' Ex. 156 (Testimony of Prete, September 24, 2004, p.2)

It is, of course, true that the average load will grow into the future; but this growth is gradual, and as average load grows, it remains the case that for most hours in the year, the load will be in a relatively narrow range that includes the 15 GW value. The

following figures show the hourly distribution of loads for the years 1999 –2002, and demonstrate the relatively small change in the range of energy load over the years.



Companies' Ex. 156 (Testimony of Prete, September 24, 2004, p. 6).

Consistently with this pattern, planners estimate that when the average New England wide load reaches 30 GW (about twice today's average load) under average weather conditions (a time that is beyond the 10 year planning horizon of the 2004 CELT Report), the average load will be only approximately 18 GW. *Companies' Ex. 156*, (Testimony of Prete, September 24, 2004, p. 7). Moreover, by the time such a load is achieved, additional transmission lines and/or generation will be required and the load pattern in SWCT will change. *Companies' Ex. 156* (Testimony of Prete, September 24, 2004, pp. 2, 8).

As the average load grows to, for instance, 17 GW or 18 GW, it is likely that new system elements – more generators and transmission lines – will be needed; and the location and use of those elements will change the loads on the Middletown-Norwalk lines. *Companies' Ex. 156* (Testimony of Prete, September 24, 2004, pp. 2, 8). This is particularly likely because one of the benefits of this Project will be to enable the location of new and efficient base-loaded generators in SWCT which at present can not accept them because of the limitations of the existing transmission system. *See* FOF ¶¶ 150, 198, 200, 201.

Thus, the assumptions underlying the 15 GW Case are careful, fair, and appropriate so that calculations based on it fairly represent the typical magnetic fields that will be associated with the existing and proposed lines, now and into the future. These calculations should be an invaluable aid to the Council as it evaluates what prudent avoidance steps are appropriate.

VI(A)1(g)(ii). The "27 GW Case" is not a fair representation of typical fields that can be expected to be present along the right of way in the foreseeable future.

While the 15 GW Case fairly represents typical magnetic field levels, it does not, by definition, produce values that will never be exceeded. In order to provide the Council with an upper bound – values that may not be exceeded even for a very short time under improbably unfavorable conditions – the Companies produced calculations using the "27.7 GW Case." This Case does **not** calculate fields that are expected to be present today, nor those that would be present when the New England average load nearly doubles from its present level to 27.7 GW. *Companies' Ex. 156* (Testimony of Prete, September 24, 2004, pp.3-4). Rather, the 27.7 Case was developed by system

planners to test whether the system could reliably serve the peak hour load, even if multiple generators in SWCT that would ordinarily be "on" to serve a peak load were unavailable. Thus, the Case represents fields that could be present during an unlikely, severe, and very brief set of circumstances. *Companies' Ex. 156* (Testimony of Prete, September 24, 2004, p.4).

Accordingly, the magnetic fields produced by this model are of no relevance in making any kind of a "time weighted average" estimate of magnetic field exposure, and do not fairly represent the magnetic fields that will be associated with the lines at any time.

VI(A)1(g)(iii). The Companies' Calculation of Magnetic Field Reductions That Can Be Achieved Though "Split-Phasing" Are Very Reliable.

Some parties and intervenors claim to doubt the "efficacy" of the split phasing strategy for reducing magnetic fields, on the ground that it has never been used as a magnetic field reduction. *See, e.g.,* Proposed FOF of Town of Milford, ¶ 38; 1/20/04 Tr. at 192-195 (Bell). Orange Proposed Findings of Fact dated March 11, 2005, ¶ 21. In fact, there can be no doubt that split phasing will function as represented in the information submitted by the Companies. While split phasing of a single circuit may not have been employed specifically for the purpose of reducing EMF exposures that is not because there is any doubt that split-phasing will do so. Rather, utilities and regulatory authorities have heretofore deemed magnetic field reduction to be an insufficient reason

to incur the greater expense, taller towers, and greater ROW requirements that split phasing entails.[18]

"Split-phasing" is a simple concept. The current that would ordinarily be carried by the conventional three conductors in a single 3-phase circuit is instead "split" among six conductors, two for each phase. The six conductors are placed on a single transmission structure so that the conductors are as close as possible together to maximize magnetic field cancellation. This is accomplished by placing the conductors on a single transmission structure in a vertical configuration so that the structure appears as a double circuit structure. *See Companies' Ex. 73* (Testimony of Bailey, April 30, 2004, p. 3 & Ex. 1& 2); 5/12/04 Tr. at 51, 52 (Bailey). The three phases on each side of the structure are arranged to produce maximum cancellation of the phases on the other side. The split phase design results in lower fields because the currents on each conductor are lower and the efficiency of cancellation is increased. *Id.* The laws of physics guarantee that the currents on each set of conductors will always be very nearly equal because their impedances are equal. 1/05/05 Tr. at 167-168 (Zaklukiewicz). This phenomenon is analogous to that of a single hose feeding two equally sized smaller hoses arranged in parallel; the water from the larger hose will divide equally between the two smaller ones. 5/12/04 Tr. at 52 (Prete).

While split-phasing has not often, if ever, been done to lower magnetic fields, it is commonly employed for other reasons, throughout New England and around the country.

[18] There has also been no evidence presented of any instance in which 345-kV lines have been constructed underground in order to reduce magnetic field exposure. But that does not mean that it is doubtful whether underground cables eliminate magnetic fields from overhead lines, or that the magnetic fields that will be associated with underground lines cannot be accurately calculated. Certainly, the adversaries of this Project do not seem to be opposing underground construction on the basis that it has not been done before to reduce magnetic field exposure from overhead lines.

There is no question about the reliability of such a line configuration. 7/27/04 Tr. at 210-211 (Zaklukiewicz); 2/17/05 Tr. at 104-105 (Whitley and Zaklukiewicz). An example of split phased lines in Connecticut is the existing 115-kV line on the ROW between Cook Hill Junction and East Devon (the 1690 line). 7/27/04 Tr. at 213-15 (Johnson); 7/28/04 Tr. at 103, 104 (Johnson). This configuration is illustrated by the cross-section drawing in Companies' Ex. 1, Volume 10, DWG. NO. XS-001, Figure 8. The methodology for calculating the magnetic fields from a split phased line on a single structure is no different than that used for a split phased line built on two adjacent structures, or a double circuit line. 5/12/04 Tr. at 56 (Bailey); 7/28/04 Tr. at 103-104 (Johnson).

In an effort to reassure the parties and intervenors that split-phasing functions as the laws of physics say it does, the Applicants' consultants performed a field study and a demonstrative experiment. In the field study, they located a 115-kV line on the system of the New York State Electric and Gas Company in Sidney, New York, which had both a single phase and a split phase configuration in series. They then measured and documented the currents and magnetic fields on each section of the line. As expected, the results showed that the currents divided evenly among the split phases, and the magnetic fields were reduced as predicted. *Companies' Ex. 139* (Memorandum from Gary Johnson and William Bailey, dated July 27, 2004, regarding Measured and Calculated Magnetic Fields from a Split-Phase Transmission Line). In the demonstrative experiment, the Companies' consultants built a physical model of a single phase transmission line that functioned both in the mode of a single line with three conductors, and with the flow split among six conductors, in a "split phase" configuration, that could be optimally phased or not. The currents were controlled and contemporaneously

measured, along with the magnetic fields. This physical model performed as predicted by the computer model and by the laws of physics. *Companies' Ex. 135* (Dr. Bailey's presentation of split phasing bulk file of CD submitted at July 27, 2004 hearing); 7/27/04 Tr. at 35-40 (Bailey).

The Council, at least, should have no doubt that split-phasing will operate as the laws of physics say it will or that it will be effective in reducing magnetic fields as described in the calculations presented to the Council.

VI(A)1(g)(iv). The Council has the information it needs to evaluate the incremental impacts of the low magnetic field strategies.

The Companies have presented to the Council extensive information that will enable it to evaluate the differences in the environmental impact of low magnetic field structures as compared with the proposed structures, as well to evaluate the differences in the magnetic fields that would be associated with the different structures. Those parties and intervenors who assert that the record lacks such information have not been paying attention. The information presented to the Council that will allow it to make such an evaluation includes:

- Extensive aerial photography mapping, and an aerial video of the ROW and its surroundings. E.g., *Companies' Ex. 1* (Application, Vols. 9-12); *Companies' Ex. 8* (Aerial Video).

- Extensive photography of the ROW as it exists, and photo simulations of the ROW with the proposed structures *Companies' Ex. 1* (Application, Vol. 8).

- Comparative analyses and photographic simulations of potential views of different 345-kV structure types (standard design and modified design) along each of the different route segments, ranging from 85' to 135' in height. *Companies' Ex. 4* (Open House "Technology" Station Illustrations, Simulated Illustrations of the Rights of Way and handouts); 2/17/05 Tr. at 280 (Bartosewicz).

- Detailed cross section profile drawings for both the proposed and low magnetic field designs, which identify the juxtaposition of the structures with the ROW along each overhead segment, and indicate where vegetation clearing may be required. *Companies' Ex. 191* (Aerial Mapping, Segments 1 and 2, dated Jan. 28, 2005); *Companies' Ex. 1* (Application, Vol. 10, "Typical Cross Sections," XS-001, Figure Nos. 1 through 8); and *see generally,* FOF Appendix.

- Photographic simulations illustrating the visibility differential between an existing configuration of 2 H-frames with a typical height of 57 feet, and alternative structure designs ranging from 117 feet to 182 feet. *Companies' Ex. 202* (Structure heights and magnetic field calculations for Valley View Drive in Wallingford, dated February 16, 2005); 2/1/05 Tr. at 190-191 (Bartosewicz).

- Information concerning the differing foundation requirements for the proposed and higher transmission structures. *See,* FOF ¶ 63.

This information is summarized, and the incremental environmental impacts of low magnetic fields are evaluated, in the Companies' Proposed Findings of Fact, at ¶¶ 660 – 676. In general, of the potential environmental effects associated with the low magnetic field designs, the most significant will be the increased visibility of the taller structures or the visual effect of the change in structure design (compared to that which exists on the ROW at present). However, the long-term effect of such structures on visual resources will be a function of the same factors as described for the Companies' proposed structure configurations. The Council has ample expertise to evaluate the incremental impacts of taller and more complicated structures from this arsenal of information. *See Companies' Ex. 1* (Application, Vol. 1, pp. M-30 to M-38, including Table M-5, "Summary of ROW and Structure Visual Changes: Overhead Portion of Proposed Route"; Vol. 8 – "Photographs"); *Companies' Ex. 4* (Open House "Technology" Station Illustrations, Simulated Illustrations of the Rights of Way, and Handouts); *Companies' Ex. 191* (Aerial Mapping, Segments 1 and 2, dated January 28,

2005); *Companies' Ex. 202* (Structure heights and magnetic field calculations for Valley View Drive in Wallingford, dated February 16, 2005).

The Council can similarly evaluate the incremental effects associated with increased foundation and clearing requirements. In any case, the Companies have committed to various measures, including the use of existing ROWs, which are designed to avoid or minimize adverse effects on environmental, social, and cultural resources. Such measures will apply to the final design, construction, and operation / maintenance of the Project, regardless of the type of overhead structures selected. *Companies' Ex. 1* (Application, Vol. 1, Section M, "Potential Environmental Effects and Mitigation Measures" see in particular pp. M-1 to M-2); *Companies' Ex. 193* (Letter Describing Temporary Work Areas in Wetlands dated February 1, 2005).

VI(A)(1)g(v). The Council Should Specify Where Low EMF Line Designs Should Be Used in Its Decision and Order.

Although any site specific low magnetic field strategies could well be left to the D&M Plan stage, the Council should, in its Decision and Order, specify the basic line design to be implemented in each cross-section (or other segment) of the line, and should identify any route variations it intends to order. The Companies require this information in order to obtain the 18.4 approval from ISO-NE, to obtain environmental permits, to order materials and to prepare the draft D&M Plan. Postponing the whole issue of structure design to the D&M Phase would significantly delay the project with serious reliability and cost impacts, and simply continue the existing "litigation." The Towns and other participants have had many opportunities to help the Council choose overhead structures, and with a few exceptions, they have spurned them. Perhaps in their final

briefs some Towns will make such an effort. However, if they do not, the whole selection process should not be deferred to the D&M Plan stage just to give them another opportunity.

In order to assist the Council in determining whether low magnetic field designs should be required, and if so, where they should be required, the Companies have filed the FOF Appendix. The FOF Appendix provides information for each cross-section of the line with respect to the physical characteristics, appearance, and magnetic fields of the existing lines, the originally proposed lines, and the "optimum" low EMF design presented to the Council. Moreover, it provides a summary of "statutory facilities' listed in P.A. 04-246 adjacent to the ROW (other than "residential areas"), of all residential properties and certain identified neighborhoods along the overhead ROW; and of other "areas of interest" listed in the Council's new Best Management Practices. The FOF Appendix should prove invaluable to the Council in evaluating the trade-offs of magnetic field reduction and structure number and height.

Finally, the Companies have themselves gone through the exercise that the Council must undertake in order to select structure designs. They have reviewed all of the evidence, putting themselves in the shoes of the Council in order to identify a selection of magnetic field reduction strategies that the Council may consider will best balance all of the considerations the Council must take into consideration in ordering "prudent avoidance" measures: response to public concern about magnetic fields, minimizing environmental impacts, including visual impacts, the preference of the FERC guidelines for existing ROW over new rights of way, and cost. These low magnetic field configurations are set forth in Section VIII of this Brief.

VI(A)2. Response to Vice Chairman Tait's Questions Concerning Buffer Zones and Underground Lines

In response to a request made during the July hearings by Vice Chairman Tait, the Companies filed a letter brief, dated August 10, 2004, in which they responded to, among others, the questions: *"Is there a buffer zone requirement for underground lines?"* and *"What happens if undergrounding creates higher magnetic fields in areas near an underground cable?" Companies' Ex. 194* (Response to restated question dated February 3, 2005). In that letter brief, the Companies showed that the "buffer zone" finding required by the Act unambiguously applies only to overhead lines - even if magnetic fields associated with an underground line might be higher in some areas than those that would be associated with an overhead line.

Thereafter, Vice Chairman Tait asked at the December 14, 2004 hearing whether, although a buffer zone provision for underground lines is "not in the legislation" the Council should nevertheless imply such a requirement on the basis of the "intent" of the legislation. 12/14/04 Tr. at 202. For the following reasons, the Companies' response to that question is an emphatic "No."

VI(A)2(a). A provision of a "buffer zone" finding for underground lines may not be read into P.A. 04-246 on the basis of the presumed intent of the legislature in adopting P.A. 04-246.

Public Act 03-154, §1 provides:

> The meaning of a statute shall, in the first instance, be ascertained from the text of the statute itself and its relationship to other statutes. If, after examining such text and considering such relationship, the meaning of such text is plain and unambiguous and does not yield absurd or unworkable results, extratextual evidence of the meaning of the statute shall not be considered.

This provision reinstated long established principles of statutory construction from which the Connecticut Supreme Court had briefly departed. Pursuant to this rule, administrative agencies and courts "cannot search out some intent in a statute which is clear and unambiguous, which [they] may believe the legislature actually had, and give effect to it; [they] are confined to effectuating the intention which is expressed in the words used by the legislature." *Yanow v. Teal Industries, Inc.*, 178 Conn. 262, 277 (1979). Indeed, "[t]he actual intent, as a state of mind, of the members of a legislative body is immaterial, even if it were ascertainable," *Park Regional Corp. v. Town Plan & Zoning Comm.* of Windsor, 144 Conn. 677, 682 (1957). In particular, it is not the role of [a court or agency] to extend the language of a statute to apply to situations analogous to those specified in the statute. *Doe v. Manson,* 183 Conn. 183, 186 (1981).

VI(A)2(b). The "Intent" of P.A. 04-246 Is Uncertain.

Extending the explicit provisions of a statute on the basis of the presumed subjective intent of the legislators is particularly unwarranted in the case of the Act. The Act neither includes an explicit statement of legislative intent nor alters C.G.S. § 16-50g, which explicitly states the legislative intent of PUESA. Moreover, the floor debate (which should be consulted only to resolve ambiguities in the statute) makes clear that the Act was a "compromise;" (*see*, remarks of Rep. Fritz, at 249; Rep. Klarides, at p. 264), without explicitly identifying the competing objectives of the legislators, or how each was compromised. The starkly divergent views of the Act offered to the Council in the correspondence of Representative Fritz and Senator Adinolfi, on the one hand, and Representative DelGobbo and Senator Herlihy on the other, make clear that there is no unified coherent subjective intent of the legislators that could shed light on whether a

buffer zone should be required for underground lines, even if the exercise of trying to divine and follow such an intent were permissible. Even the title of the bill that became P.A. 04-246 sheds no light on its legislative purpose. It is entitled simply "An Act Concerning Transmission Line Siting Criteria." (*See* Transcript of floor debate, at 231.) Without doubt, many legislators supporting the bill expressed concerns about EMF; but the extent to which such concerns were a flag of convenience for forcing underground construction and avoiding visual impacts, or simply an expedient to satisfy vocal constituents, cannot be known. Who is to say that the real objective of most legislators was not simply to maximize undergrounding of this line, rather than to reduce magnetic field exposure? Of course, it would run counter to such an intent to make undergrounding difficult by imposing magnetic field restrictions on it. Where the legislature expresses an explicit statutory intent, a court or agency cannot look behind it; but that does not mean that courts and agencies may properly add provisions to statutes based on their readings of unexpressed subjective legislative intent.

VI(B). Related Points Relevant To The Council's Evaluation Of EMF Issues

VI(B)1. The Council Should Find That the Approved Transmission Lines Will Not Pose An Undue Hazard to Persons or Property Along the Area Traversed by the Line.

Even before P.A. 04-246 was passed – in fact, since PUESA was enacted in 1971 - the provision that now appears §16-50p(a)(3)(E) required a finding with respect to both "electric or fuel" transmission lines: "that the location of the . . . line will not pose an undue hazard to persons or property along the area traversed by the line." This required finding is very similar to the "buffer zone" finding that is now required by § 16-50p(a)(3)(D). The same evidence that supports the newly required "buffer zone" finding

supports and requires the "no undue hazard" finding. Indeed, one of the reasons that the Council should be confident in its evaluation of the health effects evidence presented in this Docket is that it has been regularly evaluating such evidence for many years. See, for instance:

> Although the Council believes that the involuntary risks of living nearby a source of electric and magnetic fields should be minimized, there is insufficient evidence for the Council to conclude that this proposed line or other transmission lines in the State are hazardous to human biological health. Such implications remain an open issue, still debated within the regulatory and scientific communities. *Council Administrative Notice Item 13* (Opinion, Docket No. 105, Reconstruction of Stevenson-Newtown-Plumtree 115-kV Line Aug. 30, 1989, at 4)
>
> [T] here is insufficient evidence at this time to conclude that the proposed transmission line or the electric and magnetic fields that would emanate from the line would be detrimental to human health. *Council Administrative Notice Item 14* (Opinion, Docket No. 141, Construction of a 115-kV Line between Pequonnock Substation in Bridgeport and Ely Ave. Junction in Norwalk, Sept. 18, 1991, at 3; *and see* Findings of Fact ¶¶ 128-145 concerning EMF)
>
> Although magnetic fields of 2 mG are not unusual in homes, the state of scientific knowledge at this time does not permit firm judgments about possible adverse effects of extremely low frequency magnetic fields on human health. Absolute proof of the occurrence of adverse effects of such fields at prevailing magnitudes cannot be found in the available evidence, and the same evidence does not permit a judgment that adverse effects could not occur...(Findings of Fact, Docket No. 153, Construction of Sandy Hook Substation, April 7, 1993, at 3)
>
> Configuration X, as modified, will be constructed in compliance with the National Electric Safety Code, and will not pose an undue hazard to persons or property. There is insufficient evidence to conclude that exposure to the electric and magnetic fields surrounding the lines would pose any risk to human health. *Council Administrative Notice Item No. 15* (Revised Opinion, Docket No. 217, Bethel to Norwalk Line, Sept. 9, 2003, p. 9)

The consistency of these findings reflects that:

> [T]he state of uncertainty that existed ten years ago has remained essentially unchanged. The vast amount of additional research that has occurred since that

time has not increased our understanding of the risks of EMF either in terms of causation or correlation. In other words, researchers keep looking hard but they find little evidence that EMF does produce a health effect, and no evidence of reasons why it should. *Companies' Administrative Notice Item 29,* Order of Vermont Public Service Board in Dkt. No. 6860, Jan. 28, 2005, p. 74)

The legislature deferred to the expertise of the Council when it required, in 1971, that the Council find that a line would not pose an undue hazard; and again in 2004, when it required the Council to find that an existing ROW or, if necessary, a larger area, would be adequate to protect public health and safety. The Council is well equipped to make these two essentially equivalent findings, and should do so.

VI(B)2. The Proposed Lines, and this Docket, Will Be Consistent With the Council's Best Management Practices.

The Project is consistent with both the Council's Electric and Magnetic Field Best Management Practices that were in effect when the Application was filed, and those that the Council recently adopted effective December 21, 2004. This consistency is set forth in detail in the Companies' Proposed Findings of Facts, at ¶¶ 543-544. The Companies' initial compliance with the BMP's with respect to the originally proposed line designs, and their subsequent presentation of voluminous evidence with respect to further potential magnetic field reductions, is summarized in Section VI(A)1(F) above, and detailed in paragraphs 543-544 of the Companies' Proposed Findings of Facts. In addition:

- The Council has taken administrative notice of and otherwise considered completed and ongoing EMF research (FOF ¶ 484)
- The Companies have provided project-specific assessments of EMF, including:

- Measurements of electric and magnetic fields from existing transmission lines on the proposed overhead rights of way and at the sites of existing and proposed substations.

- Information concerning the location of "statutory facilities" (P.A. 04-246) and other BMP "areas of interest," collectively, residential areas, public and private schools, licensed youth camps, public playgrounds, licensed day care facilities, hospitals, and licensed nursing homes within 300 feet of the proposed lines; measurements of existing electric and magnetic fields at such areas of interest; and calculations of expected EMF levels at the above listed locations under normal and peak normal operating conditions.

- Calculations of transmission line magnetic fields at ROW edge, at 15 foot intervals from lines, and at areas of interest under expected normal (average) loads and under peak loads that stress the transmission system, assuming the construction of the overhead lines as proposed, and alternatively the construction of various "low magnetic field" line designs.

- Calculations of magnetic field levels at the edge of the overhead ROW assuming the loading of the lines to 80% and 100% of their rated current carrying capacity, for both the existing and proposed lines.

- Calculations of EMF from the proposed underground XLPE cables;

- Calculations of magnetic fields under expected normal and peak conditions from the proposed underground lines; *Companies' Ex. 174* (AC Magnetic Field from XLPE Cable at 1 Meter Above Ground for 15 GW Case.)

  (FOF ¶¶ 544)

- The Companies presented extensive evidence concerning further potential reduction of magnetic fields by the use of low-EMF designs, including split-phasing of the 345-kV line to achieve optimal magnetic field cancellation; increasing structure height; optimizing the location of structures on the ROW; and adding structures ("compact spacing" of structures); as well as the cost, practicality, and environmental impacts of such measures.

  (FOF ¶¶ 510-517)

With respect to events yet to occur to achieve consistency with the BMP's:

- The lines will be constructed in accordance with the National Electric Safety Code. (FOF ¶¶ 544); and

- The Council may require, as part of its D&M Plan, that post-construction measurements of EMF be obtained and reported to the Council.

The Town of Wallingford has asserted that the Companies failed to comply with the BMP's in effect when the Application was filed because some measurements were not taken in accordance with a "uniform measurement protocol," *Companies' Administrative Notice Item 28* (IEEE Standard 644-1994, Standard Procedures for Measurement of Power Frequency of Electric and Magnetic Fields from AC Power Lines, dated March 7, 1995). The alleged inconsistency is that when many measurements were taken, contemporaneous currents on the line were not ascertained and recorded. Wallingford asserts that the protocol allegedly *requires* that any time a spot measurement of EMF is taken, the contemporaneous currents on the line must be ascertained and recorded. (Procedural Motion of the Town of Wallingford, Feb. 15, 2005, p. 7). The basis for this contention is a "typical background data sheet" included in the protocol, which has lines for recording relevant information that is acquired, including currents; and a statement that certain information, including line voltages and currents "should" be recorded. On the other hand, Dr. Gary Johnson, one of the co-authors of the IEEE standard,[19] and Dr. Bailey, also of Exponent, explained that all measurements were in accordance with the IEEE standard, and that the provisions to which Mr. Boucher referred only counseled that if certain information was obtained it should be recorded. 2/01/05 Tr. at 59-64 (Bailey and Johnson).

Here is what the IEEE standard itself says about the background data sheet on which Mr. Boucher places such emphasis:

> Figure 1 is an example of a typical background data sheet for transmission line field measurements. Figure 1 should not be regarded as being appropriate for all measurement situations. Depending on the measurement objectives (e.g., a comparison of lateral profile with

[19] The authors are listed on p. iii of the Standard.

> theoretical prediction vs. measurement of a typical lateral profile) more or less information may be required.
>
> (*Id.*, p. 22)

Moreover, consistently throughout, the Standard uses "shall" to identify procedures that must be observed for consistency with the standard; and "should" for recommendations that may, but need not, be followed. For instance: "The electric field strength under power lines ***should*** be measured at a height of 1 m above ground level. Measurements at other heights of interest ***shall*** be explicitly indicated." *Id.,* § 5.1, p. 13 (Emphasis added)). Thus, the statement that currents "should" be recorded by no means establishes any inconsistency of the measurements with the IEEE standard.

Similarly, Wallingford claims that the Companies' have not complied with the Council's recently adopted BMP's because they have not provided magnetic field calculations assuming a loading condition of 70% of peak. This contention is based on the following provision in the new BMP's:

> When designing a transmission line project, an applicant shall provide design alternatives and pre-construction estimates of MF resulting from each alternative. Preconstruction MF measurements [should read "calculations"] can be obtained using mathematical modeling under a variety of current flows under normal loading, defined as 70 percent of the peak load, and peak loading conditions during winter and summer conditions."
>
> (Procedural Motion, *supra,* p.8)

Assuming this provision applies to the Project, the information provided to the Council is consistent with it. There can be no doubt that the Companies have literally complied with the only directory sentence in the paragraph: "[A]n applicant *shall* provide design alternatives and pre-construction estimates of MF resulting from each alternative." *See,* FOF ¶¶ 496-526, FOF Appendix), and discussion in section VI(A)1(F) of this Brief.

These calculations presented predict fields under average conditions (average load and "light" economic dispatch) and under extreme (peak load and unavailable generation, thereby stressing the transmission system.) *See, Companies' Ex. 156* (Testimony of Prete re: Magnetic Field Modeling, September 24, 2004, pp. 1-4). As the load distribution information presented by the Companies in Exhibit 156 shows, the BMP's definition of "normal" load as 70% of peak is wrong, assuming that "normal' is meant to mean "average" or "typical". *See also* 1/05/05 Tr. at 146 (Prete). In any case, while the BMP's observe that modeling of such a load "can be obtained," it does not prescribe that approach as the only way to model loads, or require that loads at that level be assumed in the modeling. There is no inconsistency between what the BMP's require, if they do apply, and what the Companies provided.

Finally, Attorney General Blumenthal and the Towns of Durham and Wallingford have asked that the recently adopted BMPs be rescinded. On March 8, 2005, Attorney General Blumenthal wrote to the Council concerning possible improper input received by the Council during the Council's process of updating its BMPs. On March 14, 2005, the Council responded to the Attorney General's letter, detailed the process by which the Council updated the BMPs, and explained that the communication in question related only to technical and editorial corrections. Importantly, neither the Council nor the Attorney General have noted that the Council's conversation with a Northeast Utilities employee, Robert Carberry, took place on December 22, 2004 – the day after the Council voted to adopt its BMP, and after the marked-up draft that was the basis of the Council's discussion and vote had been made available to the public. Accordingly, there never was any opportunity for any representative of the utility to make substantive comments before

the BMPs were adopted, so that in fact the Council "did not consult with the Applicants" before it adopted the BMPs. 1/5/05 Tr. at 146 (Katz). Had there been one, the Companies would have submitted substantive comments. Nevertheless, the Attorney General joins the Towns of Durham and Wallingford in asking that the BMPs be rescinded. The Companies do not agree. However, if the Council would like to purge the document of the input from Mr. Carberry, it can simply revert to the text as it was before the BMPs were adopted, eliminating the minor corrections made before their promulgation.

VII. IN LIGHT OF THE URGENT NEED FOR THE PROJECT, THE COUNCIL SHOULD AVOID POTENTIAL DELAYS AND ADVERSE COST IMPLICATIONS BY SPECIFYING CERTAIN CONDITIONS FOR THE LOCATION OF THE UNDERGROUND SEGMENTS OF THE PROJECT IN PUBLIC HIGHWAYS.

As set forth below, the Companies are requesting that the Council, in its Decision and Order, consider and address certain fundamental issues regarding underground construction, rather than deferring these issues to the D&M Plan process. Deferring these issues poses the risk of substantial construction delay and significant cost impacts, which could be avoided if certain critical issues regarding underground construction are decided now. *Companies' Ex. 54* (Testimony of Zaklukiewicz, April 8, 2004, p. 39). The Companies cost estimates and in-service date assume certain construction parameters, such as a five foot trench depth, the ability to install splice vaults within the road ROW, the ability to use plating over open trenches and reasonable work schedules. *See Id.* It is possible that these additional cost impacts would be borne by Connecticut customers and not the New England region if construction requirements are inconsistent with these assumptions.

If the Companies are required to bury the cable at greater than a five foot depth, this will adversely affect its continuous and emergency current carrying capability, requiring a significant change in the configuration of the duct bank for the cable. These changes could require greater cable spacing, wider duct banks, longer construction times and/or an increase in the size of the cable and the number of splicing vaults. 1/5/05 Tr. at 75-76 (Zaklukiewicz and Johnson).

A. Review of Critical Issues Raised by DOT Testimony in this Docket:

Based upon the testimony of the DOT representatives in this docket and the DOT's proposed Findings of Fact, the Companies prepared the table on the following page that identifies the key areas of concern regarding the cost and schedule for underground construction proposed in segments 3 and 4 of the Proposed Route:

Issue	Companies' Requested Ruling	Rationale/Reasons
Burial Depth of Duct Bank	Typical trench depth of 60" (whenever other utilities or obstructions do not necessitate a change in the duct bank alignment)	• Minimizes amount of excavation (spoil excavated and removed from trench, and backfill trucked in) to be done • Maximizes 345-kV cable rating (deeper burial depths de-rate the cable due to heat build-up) • Minimizes construction time, disruption to businesses, residences, and traffic
Location of Splice Vaults	• Splice Vault location to be optimized with duct bank route location (by not requiring significant deviations in the route)	• Places all of the facilities within a straight linear route, thereby optimizing the remaining available space for future use • Minimizes the number of other utilities crossed (if not required to be placed in locations outside of the duct bank route) • Minimizes the need to acquire additional easements from private landowners • Minimizes overall route length and avoids additional cable pulling tension, thereby providing for minimal number of splicing vaults • Maximizes 345-kV cable rating (by avoiding deeper burial depths under other utilities which de-rates the cable) • Minimizes disruption to traffic (by not having to cross multiple lanes of traffic to place the splice vault off the traveled lanes) • Minimizes construction time, disruption to businesses, residences, and traffic
Open Trench	• Up to 300 linear feet of open trench to facilitate duct bank installation	• Maximizes early detection of existing foreign utility locations, thereby allowing for duct bank alignment adjustments • Minimizes instances of having to excavate and reposition newly installed duct banks

Issue	Companies' Requested Ruling	Rationale/Reasons
		• Allows for multiple construction tasks to occur concurrently (trench excavation, duct alignment, thermal backfill installation) • Minimizes construction time, disruption to businesses, residences, and traffic
Open Trench Plating	• Use of up to 300 linear feet of skid-resistant steel plating to cover open trench	• Provides for undisrupted, safe passage of traffic • Minimizes traffic disruption by making the construction area available during downtime • Greatly minimizes start-up and shut-down time between shifts, greatly increasing the productivity and speed of construction • Minimizes construction time, disruption to businesses, residences, and traffic
Flexible Schedule	• Flexible Schedule to maximize construction hours available, including 24 hours a day, 7 days a week, and year-round work schedules (while accommodating adjacent land uses, seasonal conditions and traffic)	• Minimizes length of time construction activities will require in any specific location, and the entire project • Addresses local considerations (residential in daytime, commercial in nighttime) and special issues (holidays, weather, traffic) • Provides opportunity to construct in the winter season during favorable conditions • Minimizes construction time, disruption to businesses, residences, and traffic
Paving Restoration	• requirements to be in compliance with standard municipal and state ordinances	• Provides clear, consistent expectations and liabilities of the Project • Avoids introduction of self-interest or overly demanding requirements being placed on the Project
River Crossings	• Council authorization for use of DOT bridges at waterbody crossing in accordance with Companies Exhibit 171	• Minimizes environmental impact • Optimizes engineering crossing methods at certain locations which minimizes cost

The Companies have not attempted to itemize each and every potential area of disagreement that may arise with the DOT in the course of construction of the Project. Rather, the above issues represent critical matters that have important schedule and cost consequences.

B. The Companies' Franchise Rights to Occupy Public Highways

The legislature has granted to electric public service companies the critically important right to locate facilities in town and state public highways. *See* 1909 Conn. Spec. Acts, Vol. XV, pp. 1093, 1094; 1963 Conn. Spec. Acts, Vol. XXXI, p. 267. *See also Companies' Ex. 9* (Memorandum Concerning their Eminent Domain Powers and their Franchise Rights to Install Facilities in Highways, December 22, 2003). The power to locate facilities in public highways is a fundamental attribute of electric public service companies, and in Connecticut it is an essential characteristic that distinguishes a regulated public service company from other companies. These rights are subject to reasonable regulation by duly authorized state agencies, principally the DOT and the DPUC.

As discussed below, the Council's authority over locating electric transmission lines in public highways preempts that of the DOT in the event of a conflict between the two agencies, such as when the Council determines that the requirements or conditions sought by the DOT are unreasonable in light of all the facts and circumstances of a particular project.

C. The Council's Jurisdiction over the Siting of Electric Transmission Lines in Public Highways Preempts DOT Jurisdiction.

1. DOT Jurisdiction:

The DOT has the limited authority to issue permits governing public utility work:

> [Public utility companies] desiring to open or make any excavation in a portion of any public highway . . . shall, if required by the authority having jurisdiction over the maintenance of such highway, make application to such authority, which may, in writing, grant a permit for such opening or excavation upon such terms and conditions as to the manner in which such work shall be carried on as may be *reasonable.*

C.G.S. § 16-229 (emphasis added).

The Commissioner of Transportation (the "Commissioner") is authorized to adopt regulations for the issuance of "state highway right-of-way encroachment permits." *See* C.G.S. § 13b-7. The DOT's regulations provide that "[t]he granting of permits to install public utility and other structures does not diminish or waive the jurisdiction of the Transportation Commissioner over State highways." Regs. Conn. State Agencies § 13b-17-17. This regulation further provides that "[n]o work shall be performed within the State's ROW until a permit has been issued, except as provided in Section 13b-17-24--Emergency Permits." Regs. Conn. State Agencies § 13b-17-1.

At first blush, the DOT statutes and regulations appear to give the DOT broad authority over certain types of utility projects. However, the statutes and other provisions governing the authority of the Council over those projects make clear that when the DOT's requirements conflict with those imposed by the Council, the DOT's authority must yield. The DOT cannot use its permitting power to preclude the installation of needed public service facilities in state highways as approved by the Council.

2. Council Jurisdiction

The Council is the state agency responsible for considering the need and siting, and granting certificates for, among other things, electric transmission lines of 69 kilovolts or more such as the Middletown to Norwalk Project. C.G.S. § 16-50i(a)(1).

The PUESA provides that "[n]otwithstanding any other provision of the general statutes to the contrary, *except as provided in section 16-243, the council shall have* exclusive jurisdiction *over the location and type of facilities and over the location and type of modifications of facilities" and "shall give such consideration to other state laws and municipal regulations* as it shall deem appropriate." C.G.S. § 16-50x (emphasis added).

In the event of a conflict, C.G.S. § 16-50x clearly controls over Regs. Conn. State Agencies § 13b-17-17, the DOT regulation cited above that purports to establish that utility permits do not diminish or waive DOT jurisdiction. *See Slimp v. Dept. of Liquor Control*, 239 Conn. 599, 617 n.18 (1996) ("[i]f a regulation is shown to be inconsistent with a statute, the regulation is invalidated, not the statute").[20]

This jurisdictional statute contains exceptions that specifically allow town zoning commissions and inland wetland agencies, but not the DOT or other agencies, to "regulate and restrict" utility locations in conjunction with the Council. C.G.S. § 16-50x(d). Even these listed entities, however, cannot preempt or override Council decisions, as aggrieved parties may appeal zoning and inland wetland agency decisions to the Council for *de novo* review. On appeal, the Council may "affirm, modify or revoke" the orders appealed from "or make any order in substitution thereof by a vote of six

[20] The DOT's own statutes also limit its authority. For example, if the terms of a DOT permit issued for a facility under C.G.S. § 16-229 are unreasonable, C.G.S. § 16-231 provides for a right of appeal to the DPUC and gives the DPUC the right to grant its own permit if the DOT is uncooperative or stalls a pending application. In addition, while the DOT may promulgate regulations for the location and installation of public utilities "for the purpose of protecting the functional or aesthetic characteristics of any state highway" (C.G.S. § 13a-126a), this subsection expressly provides that "no such regulation shall limit, restrict or derogate from any power, right or authority of the Department of Public Utility Control as provided by statute in respect to the location and installation of such public service facilities." *Id.* This statute was enacted before the Council was created and before jurisdiction over certain utility projects was transferred from the DPUC to the Council, and it is reasonable to conclude that Gen. Stat. § 13a-126a limits the DOT's authority with respect to decisions made by the Council, as well as the DPUC, since the Council is "within" the DPUC (C.G.S. § 16-50j) and because § 13a-126a refers to statutes concerning the location of facilities, which for electric transmission and other specified facilities is now clearly under the Council's jurisdiction. In any event, however, in the event of a conflict C.G.S. § 16-50x must control.

[Council] members."[21] *Id.*; Docket No. 95-08-34, *DPUC Investigation of the Process of and Jurisdiction Over Siting Certain Utility Company Facilities and Plant in Conn.*, at 11 (DPUC Oct. 30, 1996).

Moreover, when a utility company applies to the Council for certification of a project, it must serve a copy of the application on various state departments, agencies and commissions, including the DOT, and the Council must consult with and solicit written comments from the DOT and others before it begins public hearings. C.G.S. §§ 16-50l(b), 16-50j(h).[22] These provisions, read in conjunction with § 16-50x, establish that the legislature intended the Council to consider the opinions of the listed entities as it

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[21] In its brief, the DOT argues that the Council's exclusive jurisdiction over the "location . . . of facilities" in C.G.S. § 16-50x means that "while the Council can determine that the new line should go in or on a state highway (i.e. Route 1) as well as the type of facility (either XLPE or HPFF), DOT determines the conditions of how that line is placed within the highway." DOT Brief at 5. As explained above, however, the Council has the final say concerning those conditions, and the DOT has been able to participate in the proceedings to educate the Council about its preferred conditions.

The DOT also argues that C.G.S. § 13-247, which requires permission before excavating "within or under, or place any obstruction or substruction within, under, upon or over . . . any state highway," supports its argument. However, this provision actually undercuts the DOT's position, since the DOT has already conceded that the Council has the authority to determine that a new line should go in or on a state highway, an activity that would otherwise require permission under § 13-247. The DOT also relies on C.G.S. § 13a-126, which simply permits the Commissioner of Transportation to promulgate regulations for the location and installation of public service facilities. However, law is clear that C.G.S. § 16-50x would preempt any DOT regulations promulgated under § 13-247. *See Slimp v. Dept. of Liquor Control*, 239 Conn. 599, 617 n.18 (1996) ("[i]f a regulation is shown to be inconsistent with a statute, the regulation is invalidated, not the statute"). *See also* footnote above discussing C.G.S. §13a-126.

The DOT's reliance on *DPUC Investigation into Coxcom, Inc. d/b/a Cox Communications Connecticut's Installation of Ground-Mounted Back-Up Generators, Decision* (February 7, 2001), DPUC Docket 00-03-09 is similarly misplaced. That decision did not involve the Council, and did not address a situation in which the DPUC's decision conflicted with a DOT decision. Indeed, the DPUC noted that it had the authority to overturn a DOT decision with which it did not agree. *Id.* at 20 ("If Cox is aggrieved by DOT's neglect or refusal to grant any necessary permit, or by any terms or conditions imposed . . . Cox may then appeal to the Department pursuant to C.G.S. § 16-231.")

The DOT also contends that the Companies' interpretation "creates" a statutory conflict. However, the Companies merely assert that if there is a conflict between the *decisions* of the Council and the DOT, the Council's decision should control. Otherwise, the ability of the DOT to impose unreasonable restrictions to prevent construction of a certificated project would improperly usurp the Council's exclusive jurisdiction.

[22] The General Assembly has passed technical amendments to these statutes. The amendments do not change this analysis. *See* 2004 Conn. Acts 246 (Spec. Sess.) (passed June 3, 2004); 2004 Conn. Acts 236 (Spec. Sess.) (passed June 8, 2004).

"deems appropriate" when issuing a certificate, but did not intend for the Council to be bound by those opinions. *See also Bristol Res. Recovery Facility Operating Comm. v. City of Bristol*, No. CV-92-0453461, 1995 WL 410806, at *15-18 (Conn. Super. Ct. 1995) (Council certificate prevailed over a voter initiative opposing a new facility: "[t]he council's authority is defined in such a way as to leave no doubt as to its breadth and scope").

The Council's statutory authority under PUESA is very broad. PUESA addresses the "criteria for the location, design, construction and operation of facilities" and gives the Council the authority to grant or deny an "application as filed, or . . . upon such terms, conditions, limitations or modifications of the construction or operation of the facility as the council may deem appropriate." C.G.S. §§ 16-50g, 16-50p(a). This preemptive authority gives the Council the power to make determinations concerning the location of a transmission line within a highway ROW, as well as the conditions of construction. PUESA includes the legislature's recognition that other agencies may have particular interests and expertise with respect to these issues, which may be useful to the Council, and has created the process discussed above through which those agencies may participate in the siting approval process. The DOT may present its recommendations to the Council, and explain its reasons for those recommendations, but the Council may impose other, or different, conditions as it "may deem appropriate." However, as PUESA makes clear, it is the Council, and not the DOT, that has the final word. Thus, if the DOT opposes a proposed facility or the conditions of its construction, it must make its case before the Council. The DOT cannot insist on any permit condition that would be

inconsistent with the terms and conditions in Council certificates or D&M plans approved by the Council.

Legislative history supports the conclusion that Council decisions take precedence over those of the DOT. When the Connecticut General Assembly debated Public Act 73-458, § 4, which later became C.G.S. § 16-50x, members of the Senate and the House characterized the legislation as providing utilities with a "one-stop" permitting procedure that would consolidate the entire permitting process by giving overarching authority to the Council. *See* Testimony of Senator Costello before the Connecticut General Assembly, pp. 3084-87 (May 9, 1973) (describing the bill as placing "the entire contest over any application . . . before the Power Facilities Evaluation Council"). Representative Wagner similarly testified that:

> Currently amongst the various and sundry state, federal, and local agencies that a power plant or public utility must go before to have a power plant, be [sic] approximately sixteen separate applications. The one-stop does not mean that all of these would be eliminated, but it would consolidate the ones on the state level to one. . . . [W]hat is provided for in this amendment is *to allow everyone to come in at one hearing*.

Testimony of Representative Wagner before the Connecticut General Assembly, pp. 6235-37 (May 14, 1973) (emphasis added).[23] Accordingly, giving the DOT veto power over the Council would be contrary to the legislature's intent, as made clear in the plain language of C.G.S. § 16-50x and its legislative history.

[23] Representative Avcollie stated that the bill allowed the Council to override the Department of Environmental Protection ("DEP"). Testimony of Representative Avcollie before the Connecticut General Assembly, p. 6282 (May 14, 1973). The DEP opposed the bill on these grounds. DEP Comments on Senate Bill No. 2203, presented to the Committee on the Environment, pp. 719, 720-23 (March 23, 1973).

D. Given the Urgent Need for the Project, the Council Should Address Critical Underground Construction Issues Raised by the DOT to Avoid Project Delay.

Given the number and complexities of the issues that the Council faces in this docket, it is tempting to defer decision on highway construction issues until preparation of the D&M Plan. This is what was done in Docket No. 217 (from Bethel to Norwalk), and it appeared to be a reasonable course at the time. However, the certificate in Docket 217 was issued on July 14, 2003, but as of late fall 2004, agreement with the DOT still had not been reached. *See* 9/29/04 Tr. at 70 (Gruhn). If the Companies are subject to similar delays for the M-N Project, the in-service date for the Project will be delayed beyond the current projection of 2009, thereby increasing the cost of underground construction, the risk of outages faced by SWCT, and the cost of the inefficiencies of the existing transmission system. By resolving these issues now, the Council would eliminate a significant source of potential delay for construction of the Project.

Therefore, the Companies request that the Council make the following orders in its Decision and Order:

- Burial Depth: Typical trench depth of 60 inches.
- Location of Splice Vaults: For underground construction, splice vaults may be located within the DOT ROW. Splice vault location should be aligned with the duct bank locations, so as to avoid "zig-zagging" of the cable route within the DOT ROW.
- Length of Open Trench: For underground construction, up to 300 linear feet of open trench is allowed.
- Use of Open Trench Plating: For underground construction, the Companies may use up to 300 linear feet of skid-resistant steel plating to cover open trenches, including intersections.
- Flexible Schedule: Flexible schedule including 24 hours a day, 7 days a week, year round work schedule with municipality consent.

- Paving Restoration: The Companies must only repave work areas, not the entire width of the road at issue

- River Crossings: Authorization for use of DOT bridges at waterbody crossings in accordance with Companies' Exhibit 171.

VIII. STRUCTURE DESIGNS FOR THE OVERHEAD PORTION OF THE ROUTE.

A. Introduction:

As discussed in Section VI above, the Companies recommend that the Council, in its Findings of Fact, Opinion, and Decision and Order, specifically determine the type of overhead structure designs that should be employed in each of the cross sections for the overhead portion of the route. The Companies believe that, if the Council were to defer this decision on structure type until the D&M Plan stage, this will (1) delay the processing of environmental permits required for the Project from the DEP and the ACOE; (2) delay ISO-NE's 18.4 review of the Project because the 18.4 application and evaluation must match the actual configuration of the project that is built. The resulting delay in the in-service date of the Project will increase the probability of sustained outages in SWCT and will have economic consequences for Connecticut consumers. *See* 2/17/05 Tr. at 82-85 (Whitley). In addition, deferring the structure decisions until the D&M Plan stage could turn the D&M Plan review into another lengthy "mini-siting" proceeding that will invite "re-litigation" of numerous issues addressed at great length and at great expense in this docket.

The Companies have urged the Council that it should base any orders to employ low magnetic field line designs on a "prudent avoidance" basis, rather than on a definition of a "buffer zone." *See,* Section VI of this Brief. At the Council's direction,

the Companies have developed and presented magnetic field reduction strategies that, if implemented in their entirety, would require an investment significantly greater than any that has heretofore found to be "prudent" to lower EMF exposure from new lines by any regulatory authority.

The most expensive approach to defining a "modest" level of investment for prudent avoidance of which the Companies are aware is that of the California Department of Public Utility Control, which allows (as prudent for ratemaking purposes) approximately 4% of the cost of a new or upgraded transmission line's budget for EMF reduction. *See, Companies' Administrative Notice Item 17,* Postings Concerning Electric and Magnetic Fields on State Agency Websites, Attachment 1, California Public Utilities Commission Website, "CPUC Actions Regarding EMFs", p. 1 of 2; Draft Order Instituting Rulemaking 04-07, Public Utilities Commission of the State of California, July 8, 2004, Ex. B to Applicants' Brief Concerning Revision Of The Council's Best Management Practices, dated 9/1/04. A similar level of investment could support the incremental cost of implementing "second order" strategies such as increasing line heights and split phasing of lines through densely populated areas along the overhead ROW and adjacent to schools, day care centers, parks, and youth camps. The incremental direct cost of the low magnetic field designs listed in the table is approximately $10.3 million (*Companies' Ex. 96*). This direct cost translates to a "fully loaded" cost of approximately $12.6 million. (*Companies' Ex.15*, Response to DW-01-Q D-W-031) This total is about 3.8 % of the low range estimate of approximately $333 million for Segments 1 and 2 and 3.3 % of the high range estimate of approximately $380 million.

The following table of "Second Order Prudent Avoidance Transmission Line Designs" illustrates how such an investment could be made prudently to reduce magnetic fields in such areas, while at the same time taking other siting concerns into account:

- the nature and density of the land uses along the ROW;
- the magnetic field levels for each configuration for the 15 GW case;
- structure height and the aesthetic impact of the use of taller structures to reduce magnetic fields;
- environmental impacts;
- the cost of the design.

A second table found in Section C below and captioned "Additional Magnetic Field Reduction Measures," summarizes the information presented in the Docket concerning further measures that would entail substantial additional cost, difficulty, or new rights of way, but which the Council may nevertheless decide to implement.

B. Prudent Avoidance Transmission Line Designs in Segments 1 and 2

Applying the criteria set forth above, the "second order" configurations described in the table on the following pages for the overhead portion of the route could qualify as "prudent avoidance" measures, as that doctrine has been applied previously.

SECOND ORDER PRUDENT AVOIDANCE TRANSMISSION LINE DESIGNS

Cross Section	Miles	ROW Configuration	Structure Configuration - Number & Type	Typical Height* (feet)	Calculated Magnetic Field Edge of ROW (mG-15GW Case)	
					S/E	N/W
1	2.5	Existing	2 345-kV H-Frames	80	32.6	33.8
		Proposed in Application	3 345-kV H-Frames	80	18.6	30.1
		Prudent Avoidance Configuration	2 345-kV H-Frames and 1 345-kV Delta (Ex. 96 Option 1)	85	6.2	28.8
2	7.0	Existing	2 115-kV H-Frames	57	9.2	13.9
		Proposed in Application	1 345/115-kV Composite Monopole	105	30.4	17.1
		Prudent Avoidance Configuration	1 345/115-kV Composite Monopole	135	17.6	12.2
		Site Specific Prudent Avoidance	1 345/115-kV Composite Monopole	175	9.2	7.4
3	1.4	Existing	1 345-kV Monopole	130	12.2	4.7
		Proposed in Application	3 345-kV Monopoles	130	5.9	12.9
		Prudent Avoidance Configuration	3 345-kV Monopoles with 35'-40' shift of all structures to the east for 3 spans at north end of ROW	130	Increase (but no adjacent develop ment)	Less than Above
4	1.4	Existing	1 115-kV H-Frame 1 345/115-kV Composite Monopole	57 130	6.1	11.9
		Proposed in Application	2 345/115-kV Composite Monopoles and 1 345-kV Monopole	130	5.3	11.5
		Prudent Avoidance Configuration	N/A			
5	5.9	Existing	1 345-kV H-Frame	90	5.2	24.7
		Proposed in Application	2 345-kV H-Frames	90	15.9	27.8

Cross Section	Miles	ROW Configuration	Structure Configuration - Number & Type	Typical Height* (feet)	Calculated Magnetic Field Edge of ROW (mG-15GW Case)	
					S/E	N/W
		Prudent Avoidance Configuration	1 345-kV H-Frame 1 345-kV Delta Monopole including Traditions Golf Course deviation (Ex 96 Option 2)	90 108	4.2	21.2
6 East	1.4	Existing	1 115-kV H-Frame	57	0.2	1.2
		Proposed in Application	1 345-kV/115-kV Composite Monopole	105	5.4	14.3
		Prudent Avoidance Configuration	1 345/115-kV Composite Monopole (Ex 96 Option 2)	135	4.5	9.4
6 West	0.6	Existing	1 115-kV H-Frame	57	0.3	2.4
		Proposed in Application	1 345/115-kV Composite Monopole	105	5.1	12.4
		Prudent Avoidance Configuration	N/A			
7	2.4	Existing	1 115-kV Double Circuit Lattice	90	0.4	4.4
		Proposed in Application	1 115-kV Double Circuit Lattice 1 345-kV Delta Monopole	90 108	11.9	10.2
		Prudent Avoidance Configuration	N/A			
7B	0.4	Existing	1 115-kV Double Circuit Lattice	90	0.4	4.4
		Proposed in Application	1 345-kV/115-kV Composite Monopole offset in ROW One 115-kV circuits underground in street (Ex 96 Option 2)	130	6.2	17.9
		Prudent Avoidance Configuration	N/A			
8A	0.4	Existing	2 115-kV H-Frames 1 115-kV Lattice	57 80	6.2	2.8
		Proposed in Application	1 345-kV/115-kV Composite Monopole 1 115-kV line underground in street	105	5.0	16.0

Cross Section	Miles	ROW Configuration	Structure Configuration - Number & Type	Typical Height* (feet)	Calculated Magnetic Field Edge of ROW (mG-15GW Case)	
					S/E	N/W
		Prudent Avoidance Configuration	N/A			
8North	7.1	Existing	2 115-kV H-Frames 1 115-kV Lattice	57 80	4.7	2.6
		Proposed in Application	1 115-kV Double circuit Monopole 1 345-kV Delta Monopole	80 85	8.7	15.7
		Prudent Avoidance Configuration	N/A			
8 Middle (to NU property on Clark St.)	2.9	Existing	2 115-kV H-Frames 1 115-kV Lattice	57 80	6.2	2.8
		Proposed in Application	1 115-kV Double circuit Monopole 1 345-kV Delta Monopole	80 85	8.7	15.7
		Prudent Avoidance Configuration	N/A			
8 Middle (NU Property on Clark St. to end, including JCC)		Existing	2 115-kV H-Frames 1 115-kV Lattice	57 80	6.2	2.8
		Proposed in Application	1 115-kV Double circuit Monopole 1 345-kV Delta Monopole	80 85	8.7	15.7
		Prudent Avoidance Configuration	1 115-kV Double circuit Monopole 1 345-kV Split Phase Monopole (Ex 96 Option 4)	80 105	2.7	5.8
8 South (through B'Nai/Ezra to Rt 15 in Woodbridge)	12.0	Existing	2 115-kV H-Frames 1 115-kV Lattice	57 80	3.9	1.6
		Proposed in Application	1 115-kV Double circuit Monopole 1 345-kV Delta Monopole	80 85	11.2	16.0
		Prudent Avoidance Configuration	1 115-kV Double circuit Monopole 1 345-kV Split Phase Monopole (Ex 96 Option 4)	80 105	1.7	5.9
8 South (from Rt 15 to West Haven / Orange		Existing	2 115-kV H-Frames 1 115-kV Lattice	57 80	3.9	1.6
		Proposed in Application	1 115-kV Double circuit Monopole 1 345-kV Delta Monopole	80 85	11.2	16.0

Cross Section	Miles	ROW Configuration	Structure Configuration - Number & Type	Typical Height* (feet)	Calculated Magnetic Field Edge of ROW (mG-15GW Case)	
					S/E	N/W
border)		Prudent Avoidance Configuration	N/A			
8 South (from West Haven / Orange Border to E. Devon SS)		Existing	2 115-kV H-Frames 1 115-kV Lattice	57 80	3.9	1.6
		Proposed in Application	1 115-kV Double circuit Monopole 1 345-kV Delta Monopole	80 85	11.2	16.0
		Prudent Avoidance Configuration	1 115-kV Double circuit Monopole 1 345-kV Split Phase Monopole (Ex 96 Option 4)	80 105	1.7	5.9

* "Typical height" refers to the height of the structures under certain prescribed conditions in topography and the line layout. *Companies' Ex. 1* (Application, Vol. 1, p. I-8, n.4)

Cross section drawings and magnetic field profiles for each of the prudent avoidance configurations are provided as Attachment 1 to this Brief.

The rationale for the selections for these "second order" prudent avoidance transmission line designs is as follows:

- Cross Section 1: Cross section 1 is in a fairly rural section of Middletown. The proposed design required the acquisition of 85 feet along the ROW. The prudent avoidance configuration is a delta monopole.

- Cross Section 2: The prudent avoidance configuration is the proposed design with an additional 30 feet height (for a typical structure of 135 feet) to reduce magnetic fields. To keep the magnetic fields at no "net increase," typical structure height would be 175 feet.

  Site Specific - Foot Hills Rd/Arbutus Street/Johnson Lane, Powder Hill Road/Skeet Club Road/Elihu Drive areas: In these areas, customized structure height and/or longitudinal location on ROW can be considered to further reduce magnetic fields to address local issues.

  Site Specific – Valley View Drive: Since this neighborhood is at the base of Beseck Mountain, poles in this area are required to be much taller than the "typical" pole designs. In an effort to reduce pole height and improve visual aesthetics, the Companies believe

the "Best Engineering" option would provide for considerably shorter poles with only a small increase in magnetic field levels. It will also eliminate one pole within the neighborhood. *Companies Ex. 202* (Structure Heights and Magnetic Field calculations for Valley View Drive); 2/17/05 Tr. at 183-187 (Bartosewicz)

"Additional Magnetic Field Reduction Measures" for the Royal Oak Neighborhood, which is in this cross section, are discussed in the following section.

- Cross Section 3: For most of this cross section "second order" prudent avoidance configurations can not be accomplished, except for very tall towers.

  Site Specific – Birdsey Ave. Condominium: Adjacent to the condominium development at Birdsey Avenue in Meriden, the existing and the proposed structures could be shifted approximately 35 – 40 feet to the east, away from the condominium complex.

- Cross Section 4: No "second order" prudent avoidance configuration adjacent to the settled areas along this cross section is possible, except for very tall towers.

- Cross Section 5: The prudent avoidance configuration is a delta configuration. Although a delta configuration represents a change aesthetically from the existing H-frame structure in this cross section, the delta configuration will allow for a reduction in magnetic field levels from the proposed configuration without dramatically increasing pole height, consistent with the doctrine of prudent avoidance.

- Cross Section 6E: The prudent avoidance configuration is the proposed configuration with an additional 30 feet height (for a pole height of 135 foot pole) to reduce magnetic field levels.

- Cross Section 6W: There is no prudent avoidance configuration for this cross section as the ROW is through an industrial area there are no statutory facilities in this cross section.

- Cross Section 7: There is no prudent avoidance configuration for this cross section as most of this ROW is bounded by forest.

- Cross Section 7B: There is no prudent avoidance configuration identified for this cross section. An "Additional Magnetic Field Reduction Measure" for the Old Farms Neighborhood, which is in this cross section,

is discussed in the following section.

- Cross Section 8A: The prudent avoidance configuration for this cross section is to split-phase the 345-kV and increase structure heights by 30 feet, which will reduce magnetic field levels.

- Cross Section 8 North: There is no prudent avoidance configuration for this cross section because the ROW through Hamden, Bethany and most of Woodbridge traverses primarily rural areas, including property owned by South Central Connecticut Regional Water Authority.

- Cross Section 8 Middle (to NU property on Clark St.): There is no prudent avoidance configuration for this portion of the cross section because the ROW through this portion of Woodbridge traverses a primarily rural area.

- Cross Section 8 Middle (from NU property on Clark St. to the end of the cross section, including the JCC property): The prudent avoidance configuration is to split phase the 345-kV circuit on a 105' monopole with the two 115-kV circuits on an 80' double circuit monopole through the JCC property on the existing ROW to reduce magnetic field levels at low cost. "Additional Magnetic Field Reduction Measures" for this cross section are discussed in the following section.

- Cross Section 8 South (through B'nai Jacob/Ezra Academy to Route 15 in Woodbridge): The prudent avoidance configuration is the same as for the JCC (i.e., 345-kV split phase on 105' monopole and 80' 115-kV double circuit monopoles) through the Ezra Academy property. "Additional Magnetic Field Reduction Measures" for this cross section are discussed in the following section.

- Cross Section 8 South (from Route 15 in Woodbridge into Orange to the West Haven/Orange border): There is no prudent avoidance configuration for this portion of the cross section as the majority of this section of the ROW is undeveloped, forested property owned by South Central Connecticut Regional Water Authority.

- Cross Section 8 South (from the West Haven/Orange border south through Orange and Milford to East Devon Substation): The prudent avoidance configuration is to split phase the 345-kV circuit on a 105' monopole with the two 115-kV circuits on an 80' double circuit monopole because this section of the ROW traverses through settled areas in Orange and Milford (including Lexington Green) and through Eisenhower Park in Milford.

C. Additional Magnetic Field Reduction Measures.

There are several areas of special interest for which specific and, for the most part, elaborate and expensive magnetic field reduction strategies were developed during the proceeding. These strategies included ROW deviations and/or removing the existing 115-kV circuit from the ROW for short distances and reconstructing it underground in streets. Such strategies go beyond "prudent avoidance."

- Royal Oak Subdivision (Durham and Middletown - Cross Section 2)

  The "prudent avoidance" line design through Cross Section 2 calls for a very tall tower (175') in order to maintain magnetic fields at existing levels. Widening of the ROW through Royal Oak is not practical because it is closely bordered by homes on both sides. In an effort to respond to concerns of residents of the Royal Oak subdivision, the Companies identified and agreed to support, a "Bypass," in which the 345-kV line would be placed on a new ROW that would deviate from the existing ROW for a distance of approximately one mile, through undeveloped adjacent land, leaving the 115-kV line in place on the ROW. Companies Exhibit 191 (Aerial Mapping – Segments 1 and 2, January 28, 2005, and see Appendix to Findings of Fact Section 5); FOF ¶¶ 355-57. That proposal proved unacceptable to the Towns of Durham and Middletown, which instead proposed that both the existing 115-kV line and the new 345-kV line be relocated to the "Bypass." See Letter dated 12/30/04 to Chairman Katz from Mayor Thornton of Middletown; Letter dated 12/30/04 to Chairman Katz from First Selectman Boord. Meanwhile, a residential subdivision was proposed for the "undeveloped" property over which the Bypass was routed. That undeveloped land has since been proposed for a residential subdivision, and an easement would have to be acquired by eminent domain. FOF ¶¶ 358-59.

  A third configuration would respond to the concerns of the Royal Oak residents, the Towns, and the owners of the adjacent land. In this configuration, the existing 115-kV line would be removed from the ROW and reconstructed under neighborhood streets, and the 345-kV line would be split-phased and placed in the center of the ROW. This strategy would result in lower fields at the edge of the ROW through Royal Oak than presently exist, significantly reduce the visual impact of the 175' high "prudent avoidance" design; and avoid creating a new ROW through a planned residential subdivision. However, it would be very expensive – requiring approximately $10 million in direct cost. *Companies Ex. 96a,* EMF Mitigation for All Cross Sections, dated July 21, 2004.

- Old Farm Neighborhood (Cheshire – Cross Section 7B)

  The existing ROW traverses front yards of houses that have been built close to its edge in the Old Farms Neighborhood. To reduce the visual impact of the new construction, the Companies proposed a "supported change" in the Application, which called for removing one of two existing 115-kV circuits from a 4,900' stretch of the ROW; and constructing a composite 345-kV / 115-kV structure in that portion of the ROW. FOF ¶ 58. As a magnetic field reduction strategy, both of the115-kV circuits (rather than one) could be reconstructed under neighborhood streets. This would allow for the 345-kV circuit to be split phased on the portion of the ROW that would otherwise be occupied by the combined 345-kV / 115-kV structure. This strategy will lower magnetic fields, but would incur the incremental cost of undergrounding the additional 115-kV line – approximately $4 million of direct cost. *Companies Ex. 96a,* EMF Mitigation for All Cross Sections, dated July 21, 2004.

- Jewish Community Center – Woodbridge – Cross Section 8 Middle)

  The Jewish Community Center was constructed around the existing ROW. Several possible realignments of the ROW on the property were explored during the proceeding. *See,* FOF ¶¶ 370, 371 and "Route Variations" section of the Appendix to the FOF. Any of these route variations could be accomplished at modest cost, if the JCC would provide a new easement for them in exchange for a release of the existing easement rights. However, the JCC is opposed to all of the route variations, with the exception that it would support shifting the ROW over the pool (which is part of a day camp) if the Companies provided land for a new day camp at no charge and funded the move of the camp to that site. FOF ¶¶ 369-71

- B'nai Jacob/Ezra Academy to Route 15 in Woodbridge (Cross Section 8 South)

  As with the JCC, a route variation was identified for the B'nai Jacob/Ezra Academy property that would shift the line to the north, further from the existing building. *See,* FOF ¶¶ 372-374, and Route Variation section of Appendix to FOF. This route variation could be accomplished at a low cost, if the landowner would provide the new easement in exchange for a release of the existing easement, and would result in lower magnetic fields at the building than exist today. B'nai Jacob/Ezra Academy seeks an order that both the new 345-kV line and the existing 115-kV line be constructed on a new ROW on the adjacent Reis property, where an easement would have to be acquired by eminent domain. *Id.*

The following table of "Additional Magnetic Field Reduction Measures" summarizes the evidence with respect to these areas.

Additional Magnetic Field Reduction Measures

Cross Section	Miles	ROW Configuration	Structure Configuration - Number & Type	Typical Height* (feet)	Calculated Magnetic Field Edge of ROW (mG-15GW Case)	
					S/E	N/W
2 Royal Oak	1	Existing	2 115-kV H-Frames	57	9.2	13.9
		Prudent Avoidance Configuration	1 345/115-kV Composite Monopole	135	17.6	12.2
		Other Measures to reduce magnetic fields	1 345-kV Split Phase Monopole with 115-kV circuit underground in street	135	6.2	6.2
		Other Measures to Reduce Magnetic Fields	1 345-kV Split Phase Monopole on Bypass 115-kV lines remain as is on existing ROW	135 57	6.2 8.3	6.2 12.4
7B Old Farm Cheshire	0.4	Existing	1 115-kV Double Circuit Lattice	90	0.4	4.4
		Prudent Avoidance Configuration	1 345-kV/115-kV Composite Monopole offset in ROW One 115-kV circuits underground in street (As Proposed in Application)	130	6.2	17.9
		Other Measures to Reduce Magnetic Fields	345-kV Split Phase offset in ROW Both 115-kV circuits underground in street (Ex 96 Option 2)	130	1.1	5.8
8 Middle JCC	<0.5	Existing	2 115-kV H-Frames 1 115-kV Lattice	57 80	6.2	2.8
		Prudent Avoidance Configuration	1 115-kV Double circuit Monopole 1 345-kV Split Phase Monopole (Ex 96 Option 4)	80 105	2.7	5.8
		Additional Measures to Reduce Magnetic Fields	1 115-kV Double circuit Monopole 1 345-kV Split Phase Monopole (Ex 96 Option 5)	110 135	0.9	2.9
		Other Measures to Reduce Magnetic Fields	Relocated ROW across day camp - *Same as Prudent Avoidance Configuration*	80 105	At Building 0.5	
		Other Measures to Reduce Magnetic Fields	Relocated ROW across ball field - *Same as Prudent Avoidance Configuration*	80 105	At Building 0.03	
		Other Measures to Reduce Magnetic Fields	Relocated ROW across outfield of ball field - *Same as Prudent Avoidance Configuration*	80 105	At Building 0.1	
8 South B'nai Jacob	<0.4	Existing	2 115-kV H-Frames 1 115-kV Lattice	57 80	3.9	1.6

Cross Section	Miles	ROW Configuration	Structure Configuration - Number & Type	Typical Height* (feet)	Calculated Magnetic Field Edge of ROW (mG-15GW Case)	
					S/E	N/W
		Prudent Avoidance Configuration	1 115-kV Double circuit Monopole 1 345-kV Split Phase Monopole (Ex 96 Option 4)	80 105	1.7	5.9
		Additional Measures to Reduce Magnetic Fields	1 115-kV Double circuit Monopole 1 345-kV Split Phase Monopole (Ex 96 Option 5)	110 135	0.6	2.9
		Other Measures to Reduce Magnetic Fields	Relocated ROW on B'nai Jacob Property - *Same as Prudent Avoidance Configuration*	80 105	At Building 0.1	
		Other Measures to Reduce Magnetic Fields	Relocated ROW on the Reis Property - *Same as Prudent Avoidance Configuration*	80 105	No Calculations Performed	

* "Typical height" refers to the height of the structures under certain prescribed conditions in topography and the line layout. *Companies' Ex. 1* (Application, Vol. 1, p. I-8, n.4)

D. In Selecting Designs for the Overhead Portion of the Route, the Council Should Consider Costs and the Potential for Localized Cost Treatment by ISO-NE in the Schedule 12C Review of the Project.

P.A. 04-246 did not modify that portion of PUESA that requires the Siting Council to find, as a condition for the issuance of a certificate for a transmission line, that "**the overhead portions, if any, of the facility are cost effective** ...." C.G.S. § 16-50p(a)(3)(D)(ii), (iii) (emphasis added).

In conducting its review of the "cost effectiveness" of the overhead portions of the route, the Council should consider not just the capital cost and life cycle costs of the overhead portions of the Proposed Route, but also the potential treatment by ISO-NE with regard to its review of what portion of the Project costs will be "socialized" over all New England. *See Companies' Ex. 172* (Testimony of Bartosewicz et al., December 28,

2004, pp. 2-3 & Appendix A) (Capital costs); *Companies' Ex. 181*, Response to OCC-03, Q-OCC-015 (Life cycle costs).

ISO-NE, with input from the NEPOOL Reliability Committee, will decide whether and to what extent the costs of the Project will be treated as a Pool Transmission Facility ("PTF") to be included in regional transmission rates paid by all New England transmission customers under the NEPOOL Tariff. The procedure for this cost allocation review process is set forth in Schedule 12C of the NEPOOL Tariff. *ISO-NE Administrative Notice Item 12*, (NEPOOL Tariff, Schedule 12C); *ISO-NE Ex. 8* (Testimony of Whitley, dated June 7, 2004, p. 5); *ISO-NE Ex. 13* (Power Point Presentation at the FERC Technical Conference, dated January 6, 2005, p. 12); *ISO-NE Ex. 13* (Power Point Presentation at the FERC Technical Conference, dated January 6, 2005, p. 12); 6/17/04 Tr. at 36-37 (Whitley). For projects that qualify for inclusion in regional transmission rates, the costs are shared based on each state's approximate share of the network load and are imposed upon the distribution companies in each state. Connecticut's current share of the network load is approximately 27%. 3/23/04 Tr. at 51-52 (Zaklukiewicz).

Even if a project qualifies for regional cost support as either an RTEP02 Upgrade or a Regional Benefit Upgrade ("RBU"), ISO-NE conducts a review of the cost of a project pursuant to Schedule 12C of the NEPOOL tariff to determine whether any portion of the project costs should be treated as Localized Costs. Localized Costs are not included in regional transmission rates and would have to be recovered through each utility's local transmission rates charged to customers in their service territories. The Companies believe the Project qualifies for regional cost support (as both an RBU and an

RTEP02 Upgrade), but cannot predict the result of the Schedule 12C determination of Localized Costs. *ISO-NE Administrative Notice Item 12*, (NEPOOL Tariff, Schedule 12C); 3/23/04 Tr. at 177) (Whitley); 7/29/04 Tr. at 72-74 (Kowalski); *Companies' Ex. 54* (Testimony of Zaklukiewicz, dated April 8, 2004, p. 38); 3/23/04 Tr. at 50 (Zaklukiewicz); 4/20/04 Tr. at 42-43 (Zaklukiewicz).

The Council should not assume that incremental costs related to low magnetic field designs would be socialized, even if such configurations are required by order of the Council. *See Companies' Administrative Notice Item 30* (ISO-NE Planning Procedure No. 4, pp. 8-9) ("[a]n alternative that is or may not be approved by a Siting or local review board may still be considered a feasible and practical alternative"). In the Companies' opinion, it is unlikely that the additional costs associated with low magnetic field designs would be considered prudent or good utility practice for the purposes of cost regionalization. *Companies' Ex. 194* (Response to restated question, dated February 3, 2005, p. 2).

IX. CONCLUSION

The Companies respectfully request that the Council issue a Certificate of Environmental Compatibility and Public Need for the Project. As set forth above and in the Companies' Proposed Findings of Fact dated March 11, 2005, the record in this docket demonstrates beyond question that the Project meets all the requirements under PUESA for the issuance of a Certificate.

Respectfully submitted,

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