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Counsellors at Law

VIA HAND DELIVERY

March 11, 2005

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

Re: **Docket 272**

Dear Chairman Katz:

I enclose an original and 20 copies of the Proposed Findings of Fact (the "Findings") and the Appendix to the Findings (the "Appendix") of The Connecticut Light and Power Company and The United Illuminating Company. For the convenience of the Council, also enclosed are electronic versions of the Findings and Appendix. The Findings will be sent via electronic mail to the Siting Council and the electronic service list. In addition, a hard copy of the Findings and a copy of the Appendix on a CD ROM be mailed to each party and intervenor.

Very truly yours,

Linda L. Randell

cc: Service List

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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 11, 2005

PROPOSED FINDINGS OF FACT
OF

THE CONNECTICUT LIGHT AND POWER COMPANY
AND
THE UNITED ILLUMINATING COMPANY

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1.0 Introduction and Summary Description

1. On October 9, 2003, pursuant to Connecticut General Statutes ("CGS") § 16-50k, CL&P and UI submitted an application with the Council for a Certificate of Environmental Compatibility and Public Need ("Certificate") 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 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 ("Application"). *Companies' Ex. 1.*

2. Although population density, electricity demand, and load growth are higher in Connecticut's southwest quadrant than in other portions of the state, the 54-municipality southwest Connecticut ("SWCT") electrical region has the weakest electric supply system. The Federal Energy Regulatory Commission ("FERC") has designated SWCT as one of the nation's most severe reliability risks and the Independent System Operator New England ("ISO-NE") has indicated that the need to upgrade the SWCT electric system is the most urgent in New England. *Companies' Ex. 1* (Application, Vol. 1, pp. ES-1, F-1 to F-5); *Council's Administrative Notice Item 20* (Comprehensive Assessment and Report, Part I, Energy Resources and Infrastructure of Southwest Connecticut, Working Group on Southwest Connecticut and the Long Island Sound Pursuant to Public Act 02-95 and Executive Order No. 26, January, 2003, p. 99).

3. The Connecticut Light and Power Company ("CL&P") and The United Illuminating Company ("UI") (together, the "Companies") propose to address the critical need for reliable electric service in SWCT by constructing and operating their respective portions of a new 345-kilovolt ("kV") electric transmission line and associated facilities (including substations, switching stations, reconstruction of portions of existing 345-kV and 115-kV transmission facilities, and the reconfiguration of certain interconnections) between the City of Middletown (Middlesex County) and the City of Norwalk (Fairfield County). *Companies' Ex. 1* (Application, Vol. 1, pp. ES-1, A-1).

4. The Middletown to Norwalk Project ("Project") will complete a 345-kV transmission loop to 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. *Companies' Ex. 1* (Application, Vol. 1, pp. ES-1, A-1).

5. The Project will extend approximately 69 miles, crossing portions of 18 municipalities in Middlesex, New Haven and Fairfield counties. *Companies' Ex. 1* (Application, Vol. 1, p. ES-3 (Figure ES-1); Vol. 9, *Aerial Photographs – 400 Scale*); *Companies' Ex. 98* (Visual Presentation on Segments 1 and 2, June 1, 2004); *Companies' Ex. 173* (Maps Showing Facilities along Segments 3 and 4, December 28, 2004).

6. The Project will encompass four principal segments:

Segment 1:

- Scovill Rock Switching Station (Middletown) to Chestnut Junction (Middletown)
- Black Pond Junction (Meriden) to proposed Beseck Switching Station (Wallingford)
- Oxbow Junction (Haddam) to Beseck Switching Station

Segment 2:

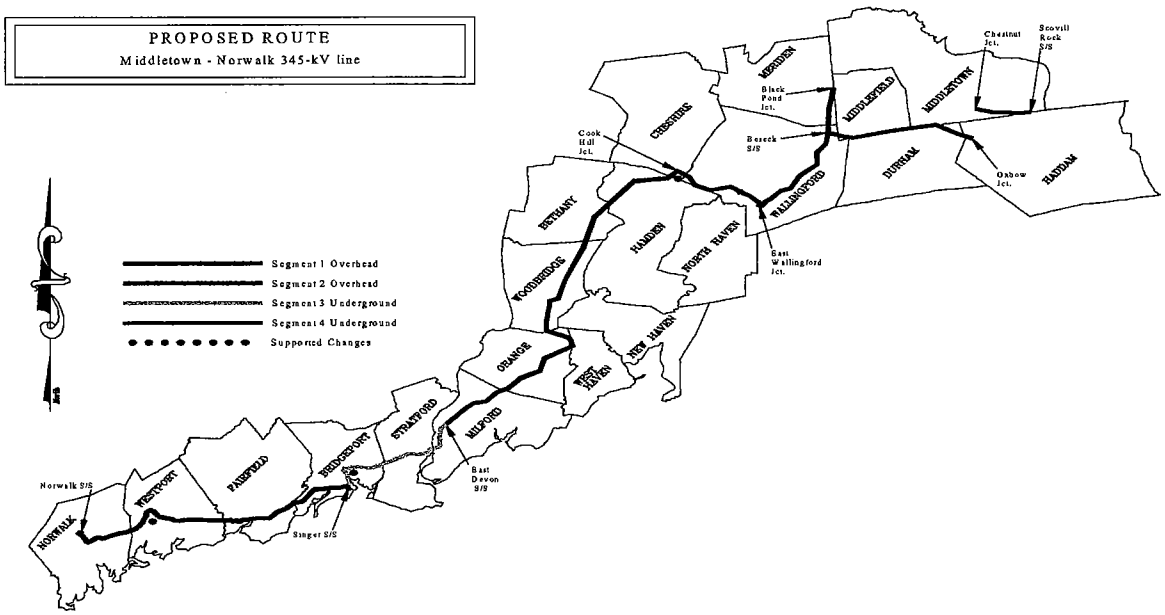
- Beseck Switching Station (Wallingford) to proposed East Devon Substation (Milford)

Segment 3:

- East Devon Substation (Milford) to proposed Singer Substation (Bridgeport)

Segment 4:

- Singer Substation (Bridgeport) to Norwalk Substation (Norwalk). *Companies' Ex. 1* (Application, Vol. 1, pp. ES-3 (Figure ES-1), E-1 to E-5; Vol. 9, *Aerial Photographs – 400 Scale*).



Companies' Ex. 1 (Application, Vol. 1, p. ES-3).

7. The proposed transmission line will be overhead for approximately 45 miles, from CL&P's existing Scovill Rock Switching Station to the proposed East Devon Substation (i.e., Segments 1 and 2). *Companies' Ex. 1* (Application, Vol. 1, p. ES-3 (Figure ES-1); Vol. 9, *Aerial Photographs – 400 Scale*; Vol. 11, *Aerial Photographs – 100 Scale*).

8. The 345-kV overhead transmission line as proposed in the Application will be located primarily within CL&P's existing 115- and 345-kV transmission line rights of way ("ROW"). About 9.5 acres of new easement will have to be acquired from private landowners for the overhead transmission portion of the Project. Along the rest of the overhead portion of the route, the ROW will be on lands either owned by or already within the Companies' utility easements. These easements allow for the construction and maintenance of overhead transmission lines. *Companies' Ex. 1* (Application, Vol. 1, pp. ES-2, E-1, E-3 to E-4, I-2, I-21); *Companies' Ex. 90* (Testimony of Zaklukiewicz, May 25, 2004, p. 8 and errata dated June 1, 2004); *Companies' Ex. 15,* Response to D-W-01, Q-D-W-031 Attachment 2, Middletown to Norwalk Project Property Costs.

9. The transmission line will be installed underground (primarily beneath public roadways) using 345-kV cross-linked polyethylene cable ("XLPE"), for approximately 24 miles, from the proposed East Devon Substation to UI's proposed Singer Substation and from Singer Substation to the existing Norwalk Substation (i.e., Segments 3 and 4). At certain locations (e.g., river crossings), deviations from public roadways will require the acquisition of underground easement rights from the affected property owners. *Companies' Ex. 1* (Application, Vol. 1, pp. ES-2 to ES-3 (Figure ES-1), E-1, E-4 to E-5, I-22; Vol.

9, *Aerial Photographs – 400 Scale*; Vol. 12, *Aerial Photographs – 100 Scale*); *Companies' Ex. 176* (Reliability and Operability Committee Report, 12/20/04, pp. 4-5).

10. The Companies will have to acquire easements over approximately 3.5 acres to install the underground cable in segments 3 and 4 of the Proposed Route where the cable will deviate from public streets and cross private property, typically near the sites of river and stream crossings. *Companies' Ex. 54* (Testimony of Zaklukiewicz et al., April 8, 2004, p. 6).

11. The Project will include the construction of the proposed East Devon and Singer substations and the Beseck Switching Station, as well as modifications to the existing Norwalk Substation and the existing Scovill Rock Switching Station. Transition stations, which are required at points where the line changes from overhead to underground cable. The Project also will involve the reconfiguration of certain interconnections and the reconstruction of certain existing 115-kV transmission facilities. *Companies' Ex. 1* (Application, Vol. 1, p. ES-3 (Figure ES-1); Vol. 7, Proposed Substation and Switching Station Drawings; Vol. 9, *Aerial Photographs – 400 Scale*; Vol. 12, *Aerial Photographs – 100 Scale*).

12. In evaluating overhead routes the Companies considered the following criteria: (i) availability of existing ROW; (ii) avoidance of conflicts with developed areas; (iii) consideration of visual impacts; (iv) avoidance or minimization of impacts to environmental resources; (v) construction feasibility constraints; and (vi) accessibility. *Companies' Ex. 1* (Application, Vol. 1, p. H-5).

13. In evaluating an underground route the Companies considered the following criteria: (i) environmental considerations; (ii) availability of useable ROW; (iii) engineering and social considerations; (iv) cable technology; (v) operability limitations; and (vi) power quality. *Companies' Ex. 1* (Application, Vol. 1, pp. H-8-9).

14. Applying the criteria discussed in preceding Findings of Fact, the Companies identified and investigated potential overhead and underground routes for the transmission facilities that involved (i) the use and/or expansion of existing transmission line ROW; (ii) new ROW alternatives; (iii) railroad alternatives; (iv) highway alternatives; (v) combination overhead/underground/marine alignments; (vi) combinations of use or expansion of existing overhead transmission line ROW and use of underground cable along streets; and (vii) an all underground line. Based on an analysis of the route options, the Companies selected the proposed route that would not require the acquisition of any homes or businesses and would minimize adverse environmental effects and would conform to sound engineering practice while taking into consideration cost factors. Additionally, the Companies identified two alternative routes that could be constructed but with greater environmental impacts than the proposed route. *Companies' Ex. 1* (Application, Vol. 1, pp. H-9-11, H-26, H-28).

15. In the March and April 2004 hearings in this docket, ISO-NE and the Companies testified that they were working to resolve design issues but did not yet have a resolution satisfactory to all regarding the adverse effects of underground cables on system reliability and operability. *ISO-NE's Ex. 1* (Testimony of Whitley, March 9, 2004, p. 26); 3/23/04 Tr. at 148-51 (Whitley and Kowalski); 4/21/04 Tr. at 121-22 (Zaklukiewicz).

16. CL&P and UI's consultant, GE Power Systems Energy Consulting ("GE"), discussed harmonics and explained the effects of low order resonant frequency at the June 2004 hearings. ISO-NE testified that "the Project, as proposed and presently designed, will not operate reliably" because it "would introduce too much capacitance into a relatively weak system, resulting in low order harmonic resonances. This phenomenon can cause system failures, including cascading outages, and damage to equipment, including transformers." *Companies' Ex. 110* (GE Energy Report on "Risks Related to System Resonant Behavior Introduced by Transmission Cables," June 2004); *ISO-NE's Ex. 8* (Testimony of Whitley, June 7, 2004, p. 6).

17. ISO-NE therefore determined it could not support the electrical characteristics of the initial Project proposed by the Companies in the application to the Council because, as proposed, the frequency of first resonance was not above the third harmonic. 6/17/04 Tr. at 58 and 91 (Hackwell and Whitley).

18. After the June hearings, the Companies and ISO-NE formed the Reliability and Operability Committee ("ROC" or "ROC Group"). The ROC developed case studies that focused on a combination of new, complex and unique transmission technologies and on modified Project design in order to maximize the linear length of underground 345-kV transmission cable that can be undertaken for the Project, consistent with the reliable operation of the electric system. In determining the limits of technological feasibility, the ROC 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 predict total over voltage ("TOV") conditions that the equipment in SWCT electric system would have to be able to withstand if the underground cable configurations under consideration were constructed. *Companies' Exs. 115, 122, 144, 147, 164, and 176.*

19. Public Act 04-246, An Act Concerning Electric Transmission Line Siting Criteria, was enacted in June 2004 and provides that for an electric transmission line with a capacity of 345-kV or more, there is a presumption that 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 is inconsistent with the purposes the Public Utilities Environmental Standards Act ("PUESA"). 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.

20. In order to meet the statutory direction to maximize the amount of technologically feasible 345-kV cable installed near listed types of facilities, the ROC went beyond established electric transmission system design and considered AC technology, high voltage direct current ("HVDC") technology (which is typically used for long lengths of underwater installations or to provide an asynchronous connection between control areas), as well as other electric system devices are typically used to mitigate specific system conditions rather than to extend the amount of underground installation, including STATCOMs and synchronous condensers. *Companies' Exs. 147, 164, 176*; 7/29/04 Tr. at 25-26, 98 (Walling and Zaklukiewicz); 12/15/04 Tr. at 53-56 (Bahrman).

21. Based on the ROC studies, the Companies' proposed route (with 24 linear miles of underground cable) as set forth in the Companies' October 9, 2003 Application to the Council, is technologically feasible, and the members of the ROC support its construction and operation, provided that the following modifications are made to the Project proposed in the Application: (i) XLPE cable is used rather than high pressure fluid filled ("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; and (iii) more extensive changes are made to remedy local area problems (Rocky River Substation). *Companies' Ex. 176* (Reliability and Operability Committee (ROC) Report dated December 20, 2004, p. 5); 1/11/05 Tr. at 92, 117, 125 (Prete and Zaklukiewicz); 1/13/05 Tr. at 128-29 (Zaklukiewicz); *Companies' Ex. 201* (Revision of Table I-3 in Vol. 1 of the Application substituting description of HPFF with XLPE dated February 16, 2005).

2.0 Summary of Project Conformity with Procedural Requirements, Agency Consultations and Permits and State Agency Comments

2.1 Pre-Application Procedural Requirements

22. Pursuant to CGS § 16-50l(e), the Companies provided all technical reports concerning public need, site selection process, and the environmental effects of the Project to the Chief Elected Official of Bridgeport, Cheshire, Durham, Easton, Fairfield, Haddam, Hamden, Meriden, Middlefield, Middletown, Milford, New Haven, North Haven, Norwalk, Orange, Stratford, Trumbull, Wallingford, West Haven, Weston, Westport, Wilton, and Woodbridge on May 1 2003. *Companies' Ex. 4* (Municipal Consultation Filing).

23. The Companies submitted a Municipal Consultation Filing to the 18 municipalities that would be crossed by the Project and the six municipalities within 2,500 feet of the Project or potentially viable Project alternatives (identified by the Companies). Additionally, the Companies conducted 16 informational open houses, answered questions at 14 public meetings and had six meetings with Planning & Zoning Commissions or Conservation Commissions. Other meetings were held prior to the municipal consultation period. *Companies' Ex. 1* (Application, Vol. 1, p. F-15 and ES-7); *Companies' Ex. 4* (Municipal Consultation Filing).

24. Pursuant to CGS § 16-50l(b), notice of the application was published in the *Connecticut Post*, *The Hartford Courant*, *The Hour* (Norwalk), *The Middletown Press*, *New Haven Register*, *Record Journal* (Meriden) on September 17 and 23, 2003 and October 8, 2003, *The Advisor* on September 16 and 23, 2003, *The Amity Observer*, *The Bridgeport News*, *The Cheshire Herald*, *The Courier* (Monroe/Easton), *The Milford Mirror*, *Minuteman Newspapers* (Fairfield/Westport), *The Stratford Star*, *The Trumbull Times*, *Weston Forum*, *Wilton Bulletin* and *Wilton Villager* on September 18 and 25, 2003 and October 9, 2003, the *Fairfield Citizen-News* and *The Hamden Journal* on September 17 and 24, 2003 and October 9, 2003, *Milford Weekly*, *Norwalk Citizen-News*, *North Haven Post*, *The Stratford Bard*, and *West Haven News* on September 19 and 26, 2003 and *Westport News* on September 17 and 24, 2003. *Companies' Ex. 1* (Application, Vol. 1, Section VII); *Companies' Ex. 2* (Application Cover Letter dated October 9, 2003 with attachments).

25. Pursuant to CGS § 16-50l(b), notice of the proposed construction of a high voltage electric transmission line was distributed in one or more of the utility bills of CL&P's customers in the municipalities of Middletown, Haddam, Durham, Middlefield, Meriden, Cheshire, Bethany, Westport, Norwalk, Weston, Wilton, Easton, Fairfield, Hamden, Milford, Wallingford and Woodbridge within 60 days prior to October 9, 2003; such notice was distributed within such time in the utility bills of UI's customers in the municipalities of Bridgeport, Easton, Fairfield, Hamden, Milford, New Haven, North Haven, Orange, Stratford, Trumbull, West Haven and Woodbridge. In addition, such notice was provided to customers of the Town of Wallingford-Electric Division, the South Norwalk Electric Works, and the Third Taxing District Division (East Norwalk) in one or more of their utility bills within such time. *Companies' Ex. 1* (Application, Vol. 1, Section VII); *Companies' Ex. 2* (Application Cover Letter dated October 9, 2003 with attachments).

26. Pursuant to CGS § 16-50l(b), notice of the intent of CL&P and UI to file an application for a Certificate with the Council was served by certified mail on the property owners abutting Scovill Rock Switching Station, the proposed Beseck Switching Station in Wallingford, the proposed East Devon Substation in Milford and the proposed Singer Substation in Bridgeport (including owners of property

abutting both the proposed and alternative sites) and Norwalk Substation in Norwalk. *Companies' Ex. 2* (Application Cover Letter dated October 9, 2003 with attachments).

2.2 The Application and Post-Application Procedures

27. The Application to the Council was accompanied by proof of service pursuant to Connecticut General Statutes ("Conn. Gen. Stat.") § 16-50l. *Companies' Ex. 1.*

28. The Application to the Council was accompanied by proof of service verifying that copies of the Application were served in accordance with the provisions of Conn. Gen. Stat.§ 16-50l(b), specifically including (1) each chief executive officer, the zoning commissions, planning commissions, planning and zoning commissions, conservation commissions and inland wetlands agencies of each such municipality in which the Project is to be located (both as primarily proposed and in the alternative locations listed in the Application), the regional planning agencies which encompass each such municipality, and each adjoining municipality having a boundary not more than 2500 feet from the Project; (2) the Attorney General; (3) each member of the legislature in whose assembly or senate district the facility or any alternative location listed in the application is to be located; (4) Federal Energy Regulatory Commission, United States Army Corps of Engineers, National Marine and Fisheries Service, U.S. Fish & Wildlife Service, and Bureau of Land Management, Federal Highway Administration; and (5) the Department of Environmental Protection ("DEP"), the Department of Public Health, the Council on Environmental Quality, the Department of Agriculture ("DOA"), the Department of Public Utility Control ("DPUC"), the Office of Policy and Management, the Department of Economic and Community Development and the Connecticut Department of Transportation ("CDOT"); and (6) such other state and municipal bodies as the council may by regulation designate. *Companies' Ex. 1* (Application, Vol. 1, Section IV); *Companies' Ex. 2* (Affidavit regarding Proof of Service).

29. Pursuant to CGS § 16-50k and 16-50m, the Council, after giving due notice thereof, held public evidentiary hearings on March 23 - 25, April 20 - 22, May 12 and 13, June 1 - 3, and 15 - 17, July 27 - 29, September 28 and 29, October 14, December 14 and 15, 2004, January 5, 11, 13, 18, 19 and 20, and February 1 and 17, 2005 at the Institute of Technology and Business Development, Central Connecticut State University, New Britain, Connecticut. *Council's Hearing Notices*, February 23, March 21, May 13, September 20, October 6, October 29, and December 16, 2004, January 12, January 25 and February 1, 2005.

30. The Council and its staff conducted formal public field review of the sections of the proposed route in Bridgeport, Fairfield and Trumbull on December 17, 2003, in Westport and Norwalk on January 5, 2004, in Milford and Stratford on January 15, 2004, in Weston, Easton, Norwalk and Wilton on January 21, 2004, in Meriden, Wallingford and Cheshire on February 5, 2004, in Hamden, Bethany,

Woodbridge and Orange on February 9, 2004 and in Middletown, Middlefield, Haddam and Durham on February 24, 2004. *Council Notices*, December 15 and 30, 2003, January 12 and 20, February 2, 5 and 17, 2004.

31. The Council and its staff conducted a public inspection of a demonstration of the presentation provided to all towns affected by the Project during the municipal review process on December 22, 2003 at New Britain City Hall, New Britain, Connecticut. *Council Memorandum*, December 17, 2003.

32. The Council held a pre-hearing conference on procedural matters on January 8, 2004 at the Council's office, Ten Franklin Square, New Britain, Connecticut. *Council Notice*, January 6, 2004.

33. The Council held a process meeting on June 23, 2004 at the Institute of Technology and Business Development, Central Connecticut State University, New Britain, Connecticut to discuss how to expedite the hearing schedule. *Council Notice*, June 21, 2004.

34. The Council held a technical session on September 8, 2004 at the Institute of Technology and Business Development, Central Connecticut State University, New Britain, Connecticut regarding various procedural motions and to receive public comment on "buffer zone" as used in Public Act 04-246. 9/8/04 Tr.

35. The Council held a technical meeting on February 14, 2005 at the Institute of Technology and Business Development, Central Connecticut State University, New Britain, Connecticut to discuss technologies for the placement, location and extent of the underground section of the Project. *Council Notice*, February 3, 2005.

36. Parties to these proceedings are CL&P, UI, Rep. Robert W. Megna, Town of Middlefield, Town of Milford, Town of Wallingford, Town of Durham, City of Norwalk, Town of Westport, Town of Woodbridge, City of Meriden, Attorney General Richard Blumenthal, City of Bridgeport, Communities of Responsible Energy, Office of Consumer Counsel ("OCC"), The Woodlands Coalition for Responsible Energy, CDOT, Town of Fairfield, PSEG Power Connecticut LLC, Town of Wilton, Town of Weston, South Central Connecticut Water Authority, Town of Orange, Town of Cheshire, Town of Hamden, City of Middletown, Town of Bethany, Town of Easton, Town of North Haven, Woodbridge Organizations (Ezra Academy, Congregation B'nai Jacob, the Jewish Community Center of Greater New Haven, the Jewish Federation of Greater New Haven and the Department of Jewish Education), City of New Haven, and Town of Branford. The Intervenors to these proceedings are Rep. Al Adinolfi, Rep. Mary G. Fritz,

37. Rep. Raymond Kalinowski, Rep. Themis Klarides, ISO-NE, Connecticut Business Industry Association, Sen. William A. Aniskovich, Sen. Joseph J. Crisco, Jr., First District Water Department, Sen. Leonard Fasano, City of New Haven, Branford Conservation and Environmental Commission, Town of Branford, Linda Wilson and Rep. Kevin M. DelGobbo.

2.3 State Agency Comments

38. Pursuant to CGS § 16-50j(h), state agencies were asked to submit written comments. The Departments of Public Health, Transportation, Agriculture and Environmental Protection submitted comments on the Project. *Council Hearing Program Ex. C.*

39. In its initial comments, CDOT responded to a suggestion that a new parallel road in Westport be built in connection with the underground transmission lines, noting that additional evaluation needed to be performed. *Council Hearing Program Ex. C* (CDOT submission to the Council, dated April 27, 2004). The CDOT has since raised additional concerns. *See Companies' Ex. 54* (Testimony of Zaklukiewicz, April 8, 2004 and supplemental testimony dated April 19, 2004, p. 39).

40. The Connecticut Department of Public Health ("DPH") focused on the portion of the Application related to electric and magnetic field ("EMF") health studies. In its submission to the Council, the agency stated that the Application presented a "thorough review of recent scientific research regarding the potential for health effects from EMF exposure" and that DPH's conclusions about EMF and health effects were generally consistent with those presented in the Application. *Council Hearing Program Ex. C* (DPH submission to the Council, dated March 15, 2004).

41. DOA expressed its opposition to a proposed alternate route that would have utilized New Haven Harbor and the Housatonic River coastline. *Council Hearing Program Ex. C* (DOA submission to the Council, dated May 24, 2004).

42. The DEP commented that, from the agency's perspective: (1) Alternatives A and B offered no advantages over the Proposed Route; (2) along the overhead portion, no direct construction-related impacts to water courses were envisioned; (3) efforts were being made to avoid work directly in watercourses for the underground portion; (4) there would be few impacts to DEP-owned properties; and (5) the fluid in the originally proposed HPFF cables was generally considered non-toxic and non-hazardous, but that a leak into a watercourse would still be considered a pollutant. The DEP also recommended certain measures to protect the environment during construction, asked about the use of XLPE cable and commented on the DEP permitting proceedings that were ongoing at the time. *Council Hearing Program Ex. C* (DEP submission to the Council, dated May 4, 2004).

43. The Connecticut Historical Commission ("CHC") commented on the cultural resource assessment prepared for the Project by Raber Associates. The CHC noted that the historic, architectural, and archaeological investigations undertaken appear consistent with the Connecticut Environmental Policy Act, the National Historic Preservation Act, and the CHC's primer for Connecticut archaeological resources. Further, the CHC anticipated further consultations with the Companies regarding the management of cultural resources during the preparation of the Development and Management Plan(s) ("D & M Plan") for the Project. *Companies' Ex. 83*, Response to W-M-01, Q-W-M-009.

2.4 Supplemental Filings

44. Section VIII (Q) of the Council's Application Guides for Terrestrial Electric Transmission Line Facilities provides that "the Applicant[s] shall provide supplemental information for the Council to make a reasonable comparison between the Applicant[s'] proposed route and any reasonable alternative route recommended by the site municipalities pursuant to C.G.S. section 16-50l." During the siting proceedings, the Companies received numerous comments regarding routing from the municipalities traversed by the Companies' proposed or alternative routes for the Project relating to five routing alternatives: (1) utilization of existing highway corridors; (2) a change of the underground transmission line route location in Westport; (3) additional undergrounding of the transmission line; (4) connecting Oxbow Junction – Chestnut Junction – Black Pond Junction, rather than Oxbow Junction – Beseck Switching Station; and (5) utilizing the existing East Shore Substation and 345-kV lines. *Companies' Ex. 7* (Supplemental filing, dated December 16, 2003[1], pp. 1-2).

45. The Town of Bethany Planning and Zoning Commission recommended that the Companies consider constructing the Project's new 345-kV transmission line along Interstate Highways 91 and 95, either overhead or underground. The Companies investigated the feasibility of routing the transmission line along Interstate Highways 91 and 95 and Route 15 (Merritt/Wilbur Cross Parkway) and submitted the Middletown to Norwalk 345-kV Transmission Line Project Highway Corridor Study with their municipal consultation materials. Only limited areas along these highways meet the requirements for either an underground or overhead transmission ROW. Because there are areas that do not have sufficient ROW potentially available, utilizing existing highway corridors was not a viable alternative. *Companies' Ex. 7* (Supplemental filing, dated December 16, 2003, p. 2-3); *Companies' Ex. 4* (Bulk Filing 2, Letter to Chief Elected Officials, dated September 5, 2003, with Attachment "Report on Route Options Considered but Eliminated" including "Middletown to Norwalk 345-kV Transmission Line Project Highway Corridor Study); *Companies' Ex. 1* (Application, Vol. 1, pp. H-14 and H-15).

[1] Exhibit 7 was erroneously dated 12/16/04 when it was actually filed on 12/16/03. Subsequent references to this exhibit herein use the correct 12/16/03 date.

46. The Town of Westport requested that the Companies not use the portion of Kings Highway located in the Westport historic district and downtown business district, and a route change suggested by a Westport resident suggested a route that avoids this portion of Kings Highway. *Companies' Ex. 7* (Supplemental filing, dated December 16, 2003, p. 3). The Companies supported this route variation, which reduces impacts to communities. *Companies' Ex. 1* (Application, Vol. 1, pp. I-3 and I-4); *Companies' Ex. 7* (Supplemental filing, dated December 16, 2003, p. 3).

47. Numerous municipalities have urged the Companies to incorporate as much undergrounding as possible in their route considerations. *Companies' Ex. 7* (Supplemental filing, dated December 16, 2003, p. 3). The Companies have considered and submitted to the Council information about various methods of increasing the amount of underground cable in the Project, and the Council's consultant, KEMA Inc., has determined that 24 linear miles is the maximum technologically feasible for this Project.

48. The Town of Durham suggested that "a new 345kV line in the existing ROW from Oxbow Jct. to Chestnut Jct. and then from Chestnut Jct. to Black Pond" would be a "preferable alternative to building a new overhead 345 kV line through Durham from Oxbow Jct. to Beseck SS." *Companies' Ex. 7* (Supplemental filing, dated December 16, 2003, p. 8). The Companies' proposed route already includes construction of two new 345-kV lines from Black Pond Junction in Meriden to Beseck Switching Station, which the Companies have identified as the "best strong source" for the termination of the loop. *See Companies' Ex. 1* (Application, Vol. 1, pp. G-11 and G-12). The alternative suggested by the Town of Durham would provide less reliability than the Companies' proposed route with greater environmental, visual and social impacts than the proposed route, and at a greater cost than the proposed route. *Companies' Ex. 7* (Supplemental filing, dated December 16, 2003, pp. 8-10).

49. The Mayor of Wallingford suggested that the Companies consider a route from East Wallingford Junction in Wallingford to UI's East Shore Substation in New Haven, and from there underwater in the Long Island Sound from New Haven to the proposed East Devon Substation in Milford. *Companies' Ex. 7* (Supplemental filing, dated December 16, 2003, pp. 10-11). The Companies considered the suggestion and concluded that construction of a 345-kV transmission line in Long Island Sound, when a land alternative is available, is not environmentally practical. *Companies' Ex. 7* (Supplemental filing, dated December 16, 2003, p. 11). In response to the Mayor of Wallingford's suggestion, the Companies also considered the feasibility of a connection to the East Shore Substation using a land route from the East Shore Substation to the East Devon Substation. *Companies' Ex. 7* (Supplemental filing, dated December 16, 2003, pp. 11-14); *Companies' Ex. 14* (Addendum #1 to December 16, 2003 Supplemental Filing, dated January 8, 2004); *Companies' Ex. 18* (Addendum #2 to December 16, 2003 Supplemental Filing, dated January 30, 2004); *Companies' Ex. 23* (Addendum #3 to December 16, 2003 Supplemental Filing, dated February 23, 2004). On the

basis of information provided by ISO-NE, the Companies have concluded that the East Shore land route studied is unacceptable because it does not meet The North American Electric Reliability Council ("NERC"), The Northeast Power Coordinating Council ("NPCC") and the New England Power Pool ("NEPOOL") criteria. *Companies' Ex. 23* (Addendum #3 to December 16, 2003 Supplemental Filing, dated February 27, 2004, at pp. 2-3).

50. Following the enactment of P.A. 04-246, the Companies filed aerial maps identifying residential areas, private or public schools, licensed day care facilities, licensed youth camps, and public playgrounds in the vicinity of the proposed route to satisfy the mapping requirements of Conn. Gen. Stat. § 16-50l(a)(1), as amended by section 1 of P.A. 04-246. *Companies' Ex. 132* (Map satisfying requirement C.G.S. 16-50l(a)(1), dated July 26, 2004); *Companies' Ex. 173* (Maps showing facilities and areas along segments 3 and 4, dated December 28, 2004). *Companies' Ex. 1* (Application, Vol. 1, p. D-2).

51. The Application was jointly filed by CL&P and UI. CL&P will own approximately 80% of the completed Project and UI will own approximately 20% of the completed Project. The final ownership of the Project facilities will be determined upon issuance of a Certificate by the Council and each company will construct and own its own portion of the Project. *Companies' Ex. 1* (Application, Vol. 1, pp. C-1, D-2); *Companies' Ex. 54* (Testimony of Zaklukiewicz, April 8, 2004, p. 6).

3.0 Detailed Technical Description of the Proposed Transmission Line Route and Facilities Proposed in the Application

3.1 Introduction

52. The Project will consist of approximately 45 linear miles of overhead 345-kV transmission line and 24 linear miles (48 circuit miles) of underground 345-kV transmission cable. In conjunction with the installation of the overhead portion of the Project, certain of CL&P's existing 345-kV and 115-kV lines will be removed and reconstructed, and certain interconnections will be reconfigured. In addition, the Project will include modifications to the existing Scovill Rock Switching Station (Middletown) and Norwalk Substation (Norwalk), as well as the development of three new stations: Beseck Switching Station (Wallingford), East Devon Substation (Milford), and Singer Substation (Bridgeport). *Companies' Ex. 1* (Application, Vol. 1, pp. ES-2 to ES-3, E-1, I-12 to I-13, I-20); *Companies' Ex. 188* (Singer Substation Relocation from Site 1 as Proposed to Site 8 to Accommodate PSEG Power).

53. The proposed route will be installed primarily within existing transmission line ROWs or state roads. *Companies' Ex. 1* (Application, Vol. 1, pp. I-1 to I-2; Vol. 9 Aerial Photographs – 400 Scale); *Companies' Ex. 53* (Testimony of Mango, April 8, 2004, pp. 3-4); *Companies' Ex. 90* (Testimony of Zaklukiewicz et al., May 25, 2004, p. 4).

54. The alignment of the proposed Project along existing ROWs will minimize potential impacts and costs and will be consistent with the Federal Energy Regulatory Commission's "Guidelines for the Protection of Natural, Historic, Scenic, and Recreational Values in the Design and Location of Rights-of-Way and Transmission Facilities," which call for the siting of linear facilities (such as transmission lines) within or along existing linear corridors. *Council's Administrative Notice Item 9* (FERC Guidelines, paragraph1); *Companies' Ex. 1* (Application, Vol. 1, pp. H-2 to H-6); *Companies' Ex. 90* (Testimony of Zaklukiewicz et al., May 25, 2004, pp. 11 -12).

3.2 Transmission Line Route Description Proposed in Application

55. The 345-kV transmission line will extend from the Scovill Rock Switching Station to the Norwalk Substation, crossing portions of 18 municipalities in Middlesex, New Haven, and Fairfield counties. *Companies' Ex. 1* (Application, Vol. 1, p. ES-2; Vol. 9, *Aerial Photographs – 400 Scale*); *Companies' Ex. 98* (Visual Presentation on Segments 1 and 2, June 1, 2004); *Companies' Ex. 173* (Maps Showing Facilities along Segments 3 and 4, December 28, 2004).

56. The municipalities along the route, and the approximate length of the proposed transmission line route in each, are:

Municipality	Route Length (Approx. Miles)* (incorporates Companies' supported changes)
Overhead Portion	
Middletown	3.1
Haddam	0.2
Durham	5.0
Middlefield	0.7
Wallingford	11.5
Meriden	2.3
Cheshire	0.9
Hamden	3.7
Bethany	2.6
Woodbridge	6.2
Orange	5.9
West Haven	0.1
Milford	3.4

Underground Portion	
Milford	2.1
Stratford	2.8
Bridgeport	6.3
Fairfield	3.6
Westport	5.0
Norwalk	3.1

*Note: Because of rounding, mileages (by municipality) are not exact and do not equate to total estimated Project mileage.

Companies' Ex. 1 (Application, Vol. 1, p. I-20, Vol. 9, *Aerial Photographs – 400 Scale*); *Companies' Ex. 90* (Testimony of Zaklukiewicz et al., May 25, 2004, p. 5).

3.2.1 Overhead Portion of the Transmission Line

57. The overhead portion of the Project, as proposed in the Application, will be installed primarily within existing CL&P transmission line ROWs, all of which were established 40 – 80 years ago. Individual easements comprising these ROWs vary in width from 125 to 320 feet, as depicted in the following table. *Companies' Ex. 1* (Application, Vol. 1, pp. I-2, Table I-1 pp. I-8 to I-10, I-21); *Companies' Ex. 90* (Testimony of Zaklukiewicz et al., May 25, 2004, pp. 4 -5).

Summary of Overhead Transmission Line Sections: Existing
and Proposed ROW Easement Widths – Proposed in Application

Transmission Line Section (Municipality)	Segment	Approx. Miles	Existing ROW Width (feet)	Proposed ROW Width (feet)	Additional ROW Required (feet)
Scovill Rock Switching Station –Chestnut Junction (Middletown)	1	2.5	250	335	85 feet
Oxbow Junction to Beseck Switching Station (Middletown, Haddam, Durham, Middlefield, Wallingford)	2	7.0	125	125	0
Black Pond Junction to East Meriden Substation (Meriden)	3	1.4	275	275	0
East Meriden Substation to Beseck Switching Station (Meriden, Wallingford)	4	1.4	320	320	0
Beseck Switching Station to E. Wallingford Junction (Wallingford)	5	5.9	275	275	0
E. Wallingford Junction to Wallingford Junction (Wallingford)	6	2.1	200	200	0
Wallingford Junction to Cook Hill Junction (Wallingford and Cheshire)	7	2.9	200	200	0
Cook Hill Junction to East Devon Substation (Cheshire, Hamden, Bethany, Woodbridge, Orange, West Haven, Milford)	8	22.5	165	165	0

Companies' Ex. 1 (Application, Vol. 1, pp. I-8 to I-10).

58. The Companies do not have underground easement rights along the overhead ROW. Accordingly, anywhere a 115-kV or 345-kV transmission line is place underground along the overhead ROW, additional easement rights will be needed. 10/14/04 Tr. at 232-33 (Bartosewicz). With the following exceptions, the overhead portion of the transmission line route proposed in the Application will not require the acquisition of new ROW or deviations from existing transmission line ROWs:

- For the overhead portion of the Project, the only area where additional easements will be acquired is between Scovill Rock Switching Station and Chestnut Junction. Along this 2.5-mile section, CL&P's existing 250-foot-wide ROW will be expanded by 85 feet, requiring the acquisition of approximately 9.5 acres of new easement from private landowners in Middletown. The remainder of the ROW expansion will be located on property owned by CL&P. *Companies Ex. 15*, Response to D-W-01, Q-D-W-031, Attachment 2; *Companies' Ex. 1* (Application, Vol. 1, pp. I-2 to I-3, I-21; Vol. 10, Typical Cross Section, Figure 1, XS-001); *Companies' Ex. 90* (Testimony of Zaklukiewicz et al., May 25, 2004, p. 8).

- For 4,900 feet in the vicinity of a residential subdivision along Old Farms Road in Cheshire near the Cheshire / Hamden town line (Wallingford Junction to Cook Hill Junction section of the Project, between existing structure Nos. 4663 and 4020), the proposed overhead 345-kV line will be accommodated within CL&P's existing ROW by removing one of the existing 115-kV circuits (Circuit 1640) and rebuilding it underground, using XLPE cable. The underground cable will be located primarily within two local roads, with the beginning and end of the cable segments buried for short distances within the transmission ROW. One existing 115-kV line (Circuit 1208) will be rebuilt and will be co-located with the proposed 345-kV line on a single structure within the ROW up to Cook Hill Junction. The other 115-kV line (Circuit 1610) will be co-located with the proposed 345-kV line on a single structure within the ROW from Cook Hill Junction to the Hamden town line. This minor variation, referred to as Supported Change 1, was recommended by a local resident during the Municipal Consultation Process; it was subsequently accepted by the Companies and is reflected in the proposed route proposed in the Application. *Companies' Ex. 1* (Application, Vol. 1, pp. I-2 to I-3; Vol. 10, Typical Cross Section, Figures 7A and 7B; Vol. 9, *Aerial Photographs – 400 Scale*, Map Segments 23 and 24); *Companies' Ex. 90* (Testimony of Zaklukiewicz et al., May 25, 2004, pp. 8-9).

3.2.2 Underground Portion of the Transmission Line

59. The underground portion of the route will be aligned predominantly within U.S. Route 1 or other urban roadways (refer to the table below). The Companies will not need to acquire easements to install the transmission cable system within such public roads. However, underground easement rights will be required at certain locations (e.g., crossings of rivers such as the Housatonic, Pequonnock, Saugatuck, and Norwalk (second crossing)) where the route will deviate from public roadways and where the route is not located in the CDOT ROW. *Companies' Ex. 1* (Application, Vol. 1 pp. I-21 to I-22; Vol. 9, *Aerial Photographs – 400 Scale*; Vol. 12, Aerial Photographs Underground Portion – 100 Scale); *Companies' Ex. 53* (Testimony of Mango, April 8, 2004, pp. 6, 16).

Summary of Underground Transmission Cable Sections: ROW Proposed in Application

Transmission Line Section (Municipality)	Segment Number (Cross Section Drawing)*	Approx. Miles	Proposed ROW Location	Principal River Crossings	Permanent Easements Required
East Devon Substation to Singer Substation (Milford, Stratford, Bridgeport)	3 (XS-001, Figure 9A)	8.1	Primarily within municipal streets and U.S. Route 1	Housatonic River Yellow Mill Creek Pequonnock River	Easements required for alignment of cable outside of roadways at Housatonic, Yellow Mill, and Pequonnock crossings
Singer Substation to Norwalk Substation (Bridgeport, Fairfield, Westport, Norwalk)	4 (XS-001, Figure 9A)	15.5	Primarily within municipal streets and U.S. Route 1	Ash Creek Southport Harbor Sasco Creek Saugatuck River Norwalk River (two crossings)	Easements required for alignment of cable outside of roadways at Saugatuck River and second Norwalk River crossings

*Note: Cross Section Drawings refer to figures in *Companies' Ex. 1* (Application, Vol. 10).

60. At locations where the transmission cable will be installed outside of public roadways (e.g., at certain river crossings), the Companies will need to acquire permanent easements, as well as temporary construction work room. *Companies' Ex. 1* (Application, Vol. 1, pp. I-22, J-17 to J-21); *Companies' Ex. 171* (Revised Table J-2, December 22, 2004).

61. The underground portion of the proposed route reflects the Companies incorporation of Supported Change Nos. 2 (Pequonnock River Crossing Variation) and 3 (Saugatuck River Crossing Variation), both of which were identified during the Municipal Consultation Process. These two variations

reduce the length of the route by a total of approximately 0.9 miles. Neither route variation will result in adverse environmental effects because the cable will be installed beneath both rivers using horizontal directional drilling. These supported changes are summarized below. *Companies' Ex. 1* (Application, Vol. 1, pp. I-3 to I-4); *Companies' Ex. 53* (Testimony of Mango, April 8, 2004, p. 25):

- Pequonnock River. Whereas the route initially advanced by the Companies would follow Noble Street, Washington Avenue, and Housatonic Avenue, Supported Change No. 2 will align the underground cable for a longer distance along Noble Street, crossing beneath the Amtrak / Metro-North Railroad and then crossing underneath the Pequonnock River onto waterfront property owned by the City of Bridgeport. The route will then proceed under the railroad and turn south onto Housatonic Avenue / Water Street. This alignment, which the Companies have incorporated into the Project, reduces the length of proposed route by approximately 1,850 feet and minimizes the use of private property. Bore pits for the horizontal directional drill of this crossing would be placed within undeveloped properties on either side of the river. The City of Bridgeport endorses this alignment. *Companies' Ex. 1* (Application, Vol. 1, pp. I-3, J-21; Vol. 9, *Aerial Photographs – 400 Scale*, Segment No. 52); 6/3/04 Tr. at 114 (Nidoh).

- Saugatuck River. This route variation was suggested by a Westport resident to reduce the overall length of the route, as well as to avoid the Westport historic district and business district along U.S. Route 1. Thus, along Supported Change No. 3, the cable will diverge from the Post Road (U.S. Route 1) and follow Imperial Avenue for approximately 0.25 mile before turning west into the Westport Commuter Metro North parking lot and then traversing beneath the Saugatuck River. On the west side of the river, the route will cross Riverside Avenue and continue west along Lincoln Avenue before rejoining U.S. Route 1. This alignment, which has been incorporated into the Project, reduces the length of the proposed route by approximately 2,750 feet. *Companies' Ex. 1* (Application, Vol. 1, pp. I-3 to I-4, J-21; Vol. 9, *Aerial Photographs – 400 Scale*, Segment Nos. 61, 61A, and 62).

62. More specific design information about the underground cable installation and locations will be provided in the D & M Plan(s). For the underground portion of the Project, the D & M Plan(s) can be expected to include (among other data) information concerning detailed engineering design, land requirements, locations of staging areas at river crossings, and off-ROW material storage and staging areas. *Companies' Ex. 53* (Testimony of Mango, April 8, 2004, pp. 23 to 24).

3.3 The Companies' Transmission Facilities Proposed in the Application

3.3.1 Technical Description of Transmission Facilities Proposed in the Application

63. The following table from the Application summarizes the Project components, as proposed in the Application:

Technical Description of Project Components

Terminal Point 1 - Expand Scovill Rock 22P 345-kV Switching Station Install 345-kV breakers and switches
Segment 1 (Scovill Rock Switching Station to Beseck Switching Station)
• Build an OH 345-kV line (2-1590 kcmil ACSR) from Scovill Rock Switching Station to Chestnut Jct and connect it to the 348 Line (western section)
• Build an OH 345-kV line (2-1590 kcmil ACSR) from Beseck Switching Station to Oxbow Jct and connect it to the 348 Line (eastern section)
• De-energize the 348 Line between Chestnut Jct and Oxbow Jct
• Split the existing 362 Line at Black Pond Jct and loop it through Beseck Switching Station
• Rebuild the 1975 Line (1-1590 kcmil ACSR) between Oxbow Jct and East Meriden Substation
• Rebuild the 1466 Line (1-1590 kcmil ACSR) between East Meriden Substation and Beseck Switching Station
Terminal Point 2 - Build Beseck 345-kV Switching Station at Carpenter Lane Junction Install 345-kV breakers and switches
Segment 2 (Beseck Switching Station to East Devon Substation)
• Build an OH 345-kV line (2-1590 kcmil ACSR) from Beseck Switching Station to East Devon Substation
• Rebuild the 1655 Line (1-1590 kcmil ACSR) between East Wallingford Jct and New Haven Jct.
• Rebuild the 1630 Line (1-1590 kcmil ACSR) between New Haven Jct and Pent Road Jct (does not include the taps to WALREC and to Wallingford)
• Rebuild the 1640 Line (UG 3000 kcmil XLPE) for approximately 2100' easterly and approximately 2800' southerly from Cook Hill Jct

• Reconductor the 1208 Line for approximately 2,100' easterly from Cook Hill Junction
• Rebuild the 1640, 1610 and 1685 Lines (1-1590 kcmil ACSR) between Cook Hill Jct and Devon 7R Substation (does not include the tap to June Street Substation and Mix Avenue Substation)
• De-energize and remove from service the 1690 Line from Cook Hill Jct to Devon 7R
Terminal Point 3 - Build East Devon 115/345-kV Substation near East Devon Junction in Milford (East Devon) Install 345-kV breakers, one 345/115-kV auto transformer, two variable 345-kV shunt reactors, one 345-kV series reactor, and other equipment
Segment 3 (East Devon Substation to Singer Substation)
• Build an UG 345-kV line (2-2500 kcmil HPFF) from East Devon Substation to Singer Substation
• Re-terminate the Milford Power generator lead to the new 115-kV substation near Devon 7R (East Devon Junction) by re-using the existing generator lead from Devon 7R
• Build an OH 115-kV line (4-954 kcmil ACSR) from Devon 7R to the new 115-kV substation near Devon 7R (East Devon Junction)
• Reconductor existing 1780 and 1790 115-kV lines (2-1590 kcmil ACSR between Devon Substation and Devon Switching Station)
• Install 1% series reactors on each of the 115-kV lines between Devon 7R and the new 115-kV substation near Devon 7R (East Devon Junction)
• Open the bus tie (1480) at Devon 7R
• Disconnect Milford Power from Devon 7R and re-connect to the new 115-kV substation near Devon 7R (East Devon Junction)
Terminal Point 4 - Build Singer Substation (GIS) Install 345-kV breakers, two 345/115-kV auto transformers, four variable 345-kV shunt reactors, and other equipment
Segment 4 (Singer Substation to Norwalk Substation)
• Build an UG 345-kV line (2-2500 kcmil HPFF) from Singer Substation to Norwalk Substation
• Modify existing Bridgeport Energy connection to Pequonnock 8J by adding a disconnect, a series reactor and a bypass switch
• Re-connect Bridgeport Energy to the new 345-kV Singer Substation
• Build 115-kV connection from Pequonnock (modified) to Singer Substation
Terminal Point 5 - Modify Norwalk Substation

Expand Norwalk 9S 115/345-kV Substation Install 345-kV breakers, two variable 345-kV shunt reactors, and other equipment

Companies' Ex. 1 (Application, Vol. 1, pp. I-12 to I-19).

64. The new 345-kV overhead circuit will consist of three phases and will be designed for nominal 345-kV operation. Each phase will consist of two 1,590,000 circular mil (1590 kcmil) aluminum conductors with steel reinforcement ("ACSR"). The bundled 1590 kcmil ACSR conductor will have a 2040 MVA summer normal capacity. *Companies' Ex. 1* (Application, Vol. 1, pp. I-6, I-21).

3.3.2 Design and Appearance of Structures Proposed in Application

65. The Companies propose to use various configurations and heights of 345-kV and 115-kV structures (based on ROW widths, terrain, and other landscape characteristics) and to place new structures to match existing structure spacing, where possible. *Companies' Ex. 1* (Application, Vol. 1, p. I-2); *Companies' Ex. 90* (Testimony of Zaklukiewicz et al., May 25, 2004, pp. 33 -34).

66. The Companies used transmission line design software (Power Line System's "PLS-CADD"™) to identify preliminary structure locations. However, these locations may change based on additional information obtained from subsurface investigations, final surveys, constructability reviews, and/or based on the Council's decision. After these additional data are analyzed, final detailed engineering will determine the exact location of structures. The Companies anticipate that the final structure locations should typically be within about 100 feet of the preliminary location. *Companies' Ex. 1* (Application, Vol. 1, p. I-22; Vol. 10, Plan & Profile Drawings; Vol. 11, *Aerial Photographs – 100 Scale*).

67. Structures will consist of wood or steel pole H-frames or self-supporting tubular steel monopoles in vertical or delta configurations. Steel pole H-frames will be direct embedded, while reinforced concrete foundations will be used to support steel monopole structures. The unique characteristics of the various ROWs determined the proposed configuration of the structures. *Companies' Ex. 1* (Application, Vol. 1, p. I-7; Figures I-1 to I-4; Vol. 10, Route Illustration).

68. The structures proposed for the overhead portion of the route are summarized in Table I-1 of the Application. *Companies' Ex. 1* (Application, Table I-1, pp. I-8 to I-10, pp. I-13 to I-17; Vol. 10, Typical Cross Sections, Figure Nos. 1 to 8).

3.3.3 Underground Cable System Design and Appearance Proposed in Application

69. As set forth in the Application, the Companies initially proposed that from East Devon Substation to Singer Substation and from Singer Substation to Norwalk Substation, the 345-kV facilities would consist of HPFF pipe-type underground cable technology and would be installed principally within public roadway ROWs. Two sets of three 2,500-kcmil cables would be installed in two steel pipes. *Companies' Ex. 1* (Application, Vol. 1, pp. I-18 to I-19).

3.3.4 Substation and Switching Station Facilities as Initially Proposed in The Application

70. The Companies have developed preliminary plans for modifications to two existing CL&P stations (Scovill Rock Switching Station and Norwalk Substation) and for the development of three new stations (Beseck Switching Station, East Devon Substation, and Singer Substation). Final designs for these facilities will be developed after further consultations with equipment suppliers; such designs will be provided in the D&M Plan. *Companies' Ex. 1* (Application, Vol. 1, pp. I-23 to 27; Vol. 7, Proposed Substation and Switching Station Drawings); *Companies' Ex. 53* (Testimony of Mango, April 8, 2004, p. 23); *Companies' Ex.* 188 (Singer Substation Relocation from Site 1 as Proposed to Site 8 to Accommodate PSEG Power).

71. At Scovill Rock, Beseck and East Devon, the terminations for the 345-kV overhead line will be approximately 90-foot-tall steel A-frame structures, with 22-foot phase spacing at the attachments. The terminal structure for the underground cable at the East Devon and Norwalk substations will be a pothead (or terminator) about 25 feet tall. At the Singer Substation, the termination will be within the gas insulated switchgear (GIS) building. *Companies' Ex. 1* (Application, Vol. 1, p. I-20).

3.3.4.1 Scovill Rock Switching Station

72. At the existing Scovill Rock Switching Station, switching facilities for the new 345-kV line will be installed within the existing fenced station area. A new 345-kV line position with associated equipment for the 345-kV line to Southington Substation will be constructed. The equipment will include two 345-kV circuit breakers, four 345-kV disconnect switches, bus supports and other equipment. The new 345-kV line termination structure will be approximately 90 feet tall, similar to the existing line termination structures at the station. *Companies' Ex. 1* (Application, Vol. 1, p. I-23; Vol. 7, Drawings for Scovill Rock Switching Station).

3.3.4.2 Beseck Switching Station

73. The proposed Beseck Switching Station will be developed on 5.4 acres of a 52-acre property owned by CL&P. *Companies' Ex. 1* (Application, Vol. 1, pp. I-23 to I-24); *Companies' Ex. 90* (Testimony of Zaklukiewicz et al., May 25 2004, p. 35).

74. At Beseck, four new 345-kV line positions with associated equipment will be installed to allow termination lines from Southington, Haddam Neck, East Devon and Millstone; the switching station yard also will include space for four additional 345-kV line positions. The station will include a 345-kV air-insulated outdoor breaker-and-one-half bus arrangement consisting of steel structures, porcelain insulators, aluminum tubular bus conductor, seven circuit breakers, 20 disconnect switches and other equipment. In addition, an enclosure (approximately 32-foot x 56-foot x 10-foot high) for protective relay, control and communications equipment will be built, and an emergency generator (which will use diesel or propane fuel) will be installed. *Companies' Ex. 1* (Application, Vol. 1, pp. I-23 to I-24; Vol. 7, Drawings for Beseck Switching Station).

3.3.4.3 East Devon Substation

75. The East Devon Substation is proposed for a 15-acre undeveloped, privately-owned site in an industrially zoned area of Milford. CL&P will have to acquire this site from the private landowner. *Companies' Ex. 1* (Application, Vol. 1, p. I-24; Vol. 7, Drawings for East Devon Substation); *Companies' Ex. 54* (Testimony of Zaklukiewicz, April 8, 2004, p. 31); *Companies' Ex. 53* (Testimony of Mango, April 8, 2004, p. 27).

76. The East Devon Substation will include three new 345-kV line positions and associated equipment to allow the termination of lines to Beseck Switching Station and Singer Substation, as well as four new 115-kV line positions and associated equipment to allow termination of lines to the Milford Power generating facility and the Devon Power Plant Substation. *Companies' Ex. 1* (Application, Vol. 1, p. I-24).

77. As proposed in the Application, the other equipment at East Devon if HPFF cable is used would include: a 345-kV air-insulated outdoor breaker-and-one-half bus arrangement (consisting of steel structures, porcelain insulators, aluminum tubular bus conductor, seven circuit breakers, two circuit switchers, 21 disconnect switches and other associated equipment); a 115-kV air-insulated outdoor breaker-and-one-half bus arrangement (consisting of steel structures, porcelain insulators, aluminum tubular bus conductor, eight circuit breakers, 26 disconnect switches, two circuit switchers, two current limiting reactors and other associated equipment); two 345-kV, 75-150 MVAR variable shunt reactors, one 3-phase 600-MVA autotransformer, one series reactor, and one pressurization plant.

Companies' Ex. 1 (Application, Vol. 1, pp. I-24 to I-25; Vol. 7, Drawings for East Devon Substation); *Companies' Ex. 54* (Testimony of Zaklukiewicz, April 8, 2004, p. 32).

78. A new 32-foot x 110-foot x 10-foot high enclosure will be built to house protective relay, control and communications equipment. Sound barrier walls will be installed around the single phase transformers. In addition, an emergency generator (which will operate with diesel or propane fuel) will be installed. If diesel fuel is used, a fuel tank with appropriate spill prevention or leak detection measures will be installed. *Companies' Ex. 1* (Application, Vol. 1, I-25; Vol. 7, Drawings for East Devon Substation); *Companies' Ex. 53* (Testimony of Mango, April 8, 2004, p. 28); 4/20/04 Tr. at 273 (Zaklukiewicz); 4/20/04 Tr. at 272-273 (Bartosewicz).

3.3.4.4 Singer Substation

79. At the time of the filing of the Application, the Companies proposed to locate the Singer Substation on Site 1. Facilities at Singer Substation will include four 345-kV underground line terminations with associated equipment to allow termination of lines from the East Devon and Norwalk substations; two 115-kV underground line termination positions with associated equipment to allow termination of 115-kV lines from Pequonnock Substation and Bridgeport Energy Generating Plant; GIS, including 345-kV class gas insulated indoor breaker and a half bus arrangement (consisting of 16 circuit breakers, 38 gas insulated disconnect switches, and other associated equipment); two 3-phase 600 MVA, 345/115-kV autotransformers; and four 345-kV, 75-150 MVAR variable shunt reactors. The GIS will be housed in a building approximately 309 feet long x 75 feet wide x 40 feet high, which also will contain relay and control enclosures. *Companies' Ex. 1* (Application, Vol. 1, p. I-26).

80. An architectural wall, approximately 35-40 feet high, will be installed on the north, west, and south sides of the substation. This wall will provide a visual and sound barrier, as well as added site security. *Companies' Ex. 1* (Application, Vol. 1, p. I-27; *Companies' Ex. 53* (Testimony of Mango, April 8, 2004, pp. 26-27); 4/20/04 Tr. at 263-264 (Prete).

3.3.4.5 Norwalk Substation

81. At the existing Norwalk Substation, all facilities associated with the Project will be located within the existing station fence line. As initially proposed in the Companies' Application, the substation would be modified to include a pressurizing plant and two underground HPFF terminations for the additional lines from Singer Substation, along with four gas insulated 500-kV class circuit breakers and switches, and two 345-kV, 75-150 MVAR variable shunt reactors isolated by circuit switchers. *Companies' Ex. 1* (Application, Vol. 1, p. I-27, Vol. 7, Substation and Switching Station Drawings).

4.0 Detailed Technical Description of the Proposed Transmission Line Route and Facilities Including Changes Developed During the Docket

4.1 Introduction

82. The following revision of Table I-3 in the Application reflects the changes in the Project components due to the substitution of XPLE underground cable for HPFF underground cable in Segments 3 and 4. The installation requirements for the XLPE cable will be the same as described in the Application for the XLPE cable. *Companies' Ex. 201* (Revision of Table I-3 in Vol. 1 of the Application substituting description of HPFF with XLPE dated February 16, 2005); *Companies' Ex. 1* (Application, Vol. 1, pp.I-35 to I-37, Vol. 10, Drawing XS-001, Figure 10).

Technical Description of Project Components

Terminal Point 1 - Expand Scovill Rock 22P 345-kV Switching Station Install 345-kV breakers and *associated equipment*
Segment 1 (Scovill Rock Switching Station to Beseck Switching Station)
• Build an OH 345-kV line (2-1590 kcmil ACSR) from Scovill Rock Switching Station to Chestnut Jct and connect it to the 348 Line (western section)
• Build an OH 345-kV line (2-1590 kcmil ACSR) from Beseck Switching Station to Oxbow Jct and connect it to the 348 Line (eastern section)
• De-energize the 348 Line between Chestnut Jct and Oxbow Jct
• Split the existing 362 Line at Black Pond Jct and loop it through Beseck Switching Station
• Rebuild the 1975 Line (1-1590 kcmil ACSR) between Oxbow Jct and East Meriden Substation
• Rebuild the 1466 Line (1-1590 kcmil ACSR) between East Meriden Substation and Beseck Switching Station
Terminal Point 2 - Build Beseck 345-kV Switching Station at Carpenter Lane Junction Install 345-kV breakers and *associated equipment*
Segment 2 (Beseck Switching Station to East Devon Substation)
• Build an OH 345-kV line (2-1590 kcmil ACSR) from Beseck Switching Station to East Devon Substation
• Rebuild the 1655 Line (1-1590 kcmil ACSR) between East

Wallingford Jct and *North* Haven Jct.
• Rebuild the 1630 Line (1-1590 kcmil ACSR) between *North* Haven Jct and Pent Road Jct (does not include the taps to WALREC and to Wallingford)
• Rebuild the 1640 Line (UG 3000 kcmil XLPE) for approximately 2100' easterly and approximately 2800' southerly from Cook Hill Jct
• Reconductor the 1208 Line for approximately 2,100' easterly from Cook Hill Junction
• Rebuild the 1640, 1610 and 1685 Lines (1-1590 kcmil ACSR) between Cook Hill Jct and Devon 7R Substation (does not include the tap to June Street Substation and Mix Avenue Substation)
• De-energize and remove from service the 1690 Line from Cook Hill Jct to Devon 7R
Terminal Point 3 - Build East Devon 115/345-kV Substation near East Devon Junction in Milford (East Devon) Install 345-kV breakers, one 345/115-kV auto transformer and *associated* equipment
Segment 3 (East Devon Substation to Singer Substation)
• Build an UG 345-kV line (2-*3000* kcmil *XLPE*) from East Devon Substation to Singer Substation
• Reterminate the Milford Power generator lead to the new 115-kV substation near Devon 7R (East Devon Junction) by reusing the existing generator lead from Devon 7R
• Build an OH 115-kV line (4-954 kcmil ACSR) from Devon 7R to the new 115-kV substation near Devon 7R (East Devon Junction)
• Reconductor existing 1780 and 1790 115-kV lines (*1*-1590 kcmil ACSR between Devon Substation *(7R)* and Devon *Tie* Switching Station *(16P)*)
• Install 1% series reactors on each of the 115-kV lines between Devon 7R and the new 115-kV substation near Devon 7R (East Devon Junction)
• Open the bus tie (1480) at Devon 7R
• Disconnect Milford Power from Devon 7R and reconnect to the new 115-kV substation near Devon 7R (East Devon Junction)
Terminal Point 4 - Build Singer Substation (GIS) Install *500-kV class* breakers, two 345/115-kV auto transformers, four variable *50-100 MVAR* 345-kV shunt reactors, and *associated* equipment
Segment 4 (Singer Substation to Norwalk Substation)
• Build an UG 345-kV line (2-*3000* kcmil *XLPE*) from Singer Substation to Norwalk Substation

• Modify existing Bridgeport Energy connection to Pequonnock 8J by adding a disconnect, a series reactor and a bypass switch
• Reconnect Bridgeport Energy to the new 345-kV Singer Substation
• Build 115-kV connection from Pequonnock (modified) to Singer Substation
Terminal Point 5 - Modify Norwalk Substation Expand Norwalk 9S 115/345-kV Substation Install *500-kV class* breakers, two variable *50-100 MVAR* 345-kV shunt reactors, and *associated* equipment

83. The proposed overhead and underground routes remain the same as in the Application; however, there have been a number of changes in the construction type and facilities that will be identified below.

4.2 Minor Route Variations Discussed During the Docket

84. The route for the overhead and underground transmission line is essentially as initially described in the Companies' Application. However, during the course of the Docket, three overhead route variations were identified and evaluated (see Section 11.4.1 (Royal Oak Bypass); Section 11.4.2 (Jewish Community Center); Section 11.4.3 (Congregation B'nai Jacob/Ezra Academy)) and one underground route variation was identified (see Section 11.4.4. (CDOT Routing Alternatives)).

85. The underground portion of the transmission line route (Segments 3 and 4), remains the same as proposed in the Application although the Companies have modified various technical aspects of the Project.

4.3 The Companies' Proposed Transmission Facilities as Revised During the Docket

4.3.1 Conductor Sizes, Specifications and Initial Design Voltages and Capacities

86. The conductor sizes, specifications and initial design voltages and capacities remain the same as presented in Section 3.3.1 with the exception that the use of split-phasing of circuits was explored during the Docket as a low magnetic field design option. See Section 14.

4.3.2 Overhead Structure Design and Appearance

87. During the proceeding, the Companies determined that utilization of a delta structure instead of an H-frame structure in the segment between Scovill Rock Switching Station and Chestnut Junction will reduce the needed expansion of the ROW from 85 to 60 feet. 2/1/05 Tr. at 141-42 (Bartosewicz). Accordingly, the only change to the table in Section 3.2.1 is as follows:

Transmission Line Section (Municipality)	Approx. Miles	Existing ROW Width (feet)	Proposed ROW Width (feet)	Additional ROW Required (feet)
Scovill Rock Switching Station –Chestnut Junction (Middletown) – Segment 1	2.5	250	310	60 feet

88. During the course of the Docket evidence was presented with respect to low magnetic field design of overhead structures. If utilized, these designs would increase the number of conductors per phase, the number of structures and the overall height of structures. See Section 14.

4.3.3 Underground Cable System Design and Appearance Changes Developed During the Docket

89. Because of the need to maximize the linear length of underground cable, the Companies now propose to replace the HPFF cable originally proposed in the Application with XLPE because the difference in capacitance between HPFF cable and XLPE cable (approximately 21 MVARs/mile for HPFF and approximately 12 MVARs/mile for XLPE) will aid in reducing the capacitance on the system. The new 345-kV underground circuits between East Devon and Singer Substations, and between Singer and Norwalk Substations, will consist of two rows of three 3000-kcmil XLPE cables in six 8-inch PVC conduits installed primarily within public roadways. Each conduit would contain one phase of the new underground XLPE 345-kV lines, encased in concrete and placed in a trench approximately 3.5 feet wide and 5 feet deep, backfilled with an appropriate fill. The duct bank includes up to three PVC conduits for the installation of fiber optic cable and ground continuity conductors. Pairs of splicing vaults approximately 8 feet high, 8 feet wide, and up to 28 feet long would be buried approximately 1,800 feet apart along the route. *Companies' Ex. 147* (Reliability and Operability Committee Report, dated August 16, 2004, p. 14); *Companies' Ex. 201* (Revision of Table I-3 in Vol. I of the Application substituting description of HPFF with XLPE, dated February 16, 2005); *Companies' Ex. 1* (Application, Vol. 1, pp. I-44, 47; Vol. 10, Drawing XS-001, Figure 10); *Companies' Ex. 162* (PDC document titled Magnetic field calculations for Middletown-Norwalk 345-kV XLPE transmission cables, dated September 27, 2004. p. 1).

4.4 Substation and Switching Station Facilities as Changed

90. As a result of discussions between UI and PSEG, the Companies propose that Singer Substation be constructed on an adjacent site currently owned by PSEG. This site is identified as Site 8 in the Singer Substation Site Selection Study. *Companies' Ex. 1* (Application, Vol. 6). The change to Site 8 does not change the underground route of the 345-kV line, but will extend the route one more block in Bridgeport. The change to Site 8 will have little effect on the substation layout or construction. *Companies' Ex. 54* (Testimony of Zaklukiewicz et al., April 8, 2004, p. 34); *Companies' Ex. 188* (Singer Substation Relocation from Site 1 as Proposed to Site 8 to Accommodate PSEG Power, dated January 27, 2005).

91. Substations made since the filing of the Application are related to the substitution of XLPE cable for HPFF cable: (i) removal of pumping plants from all three substations; (ii) the installation of 500-kV class circuit breakers at Singer and Norwalk substations (no change in physical appearance); and (iii) the replacement of surge arrestors. Neither the installation of the 500-kV class circuit breakers nor the replacement of surge arrestors will result in a change in the physical appearance of the substations from that originally proposed in the Application. Additionally, the two 345-kV shunt reactors and the 345-kV series reactors initially proposed at East Devon Substation when the Project included the use of HPFF cable are no longer needed. *Compare Companies' Ex. 1* (Application, Vol. 1, Table I-3) to *Companies' Ex. 201* (Revision of Table I-3 in Vol. 1 of the Application substituting description of HPFF with XLPE, dated February 16, 2005).

5.0 The Proposed Line Conforms To A Long-Range Plan for Expansion Of The Electric Power Grid Serving Southwest Connecticut, Connecticut and Interconnected Utility Systems in the Northeast U.S.

92. Connecticut's electric system is part of the New England bulk power transmission system and there are approximately 1,800 miles of electric transmission lines in Connecticut (approximately 400 miles of which are 345-kV lines). New England has transmission interconnections with the neighboring electric regions of New York, and Quebec and New Brunswick, Canada. These interconnections allow access to low cost energy and help to maintain grid reliability and voltage stability by connecting generation in Connecticut, New York and Canada to New England load centers. *Companies' Ex. 1* (Application, Vol. 1, pp. F-7 to F-9); *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 10).

93. The 345-kV system in Connecticut is used to transmit electricity from generating plants in New England, New York State and Canada to substations near regional load centers. At the regional load centers, voltage is reduced to 115-kV for local area transmission. *Companies' Ex. 1* (Application, Vol. 1, pp. F-7 to F-8); *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 10).

94. In SWCT, the 115-kV transmission system has to transmit power into the area and distribute the power to the distribution substations that serve the local load since there is no 345-kV supply into SWCT. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p.10).

95. The existing 345-kV line from Long Mountain switching station in New Milford to Plumtree substation was the first segment of a planned expansion of the 345-kV transmission line south from Plumtree substation to Norwalk substation then northeasterly to Beseck substation in Wallingford, where it would be connected to the 345-kV system. Council's Administrative Notice Item 10, Docket No. 5, Findings of Fact Nos. 69 and 71; Administrative Notice 1, p. 4.

96. CL&P identified its "long range plan for system expansion in Southwestern Connecticut" to the Council in 1974, when CL&P applied for a certificate for the first part of the contemplated loop - the Long Mountain to Plumtree 345-kV line. At that time, CL&P pointed out that SWCT was "the only major load area in the state that (was) not already supplied from (the) 345-kV system." *Council's Administrative Notice Item 15* (Docket No. 217, Finding of Fact No. 25). However, lower load growth experienced during the 1970's and 1980's, coupled with multiple upgrades of the 115-kV supply to SWCT allowed the deferral of the completion of the loop. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 7).

97. In July 2000, the DPUC rendered a decision in Docket No. 99-08-01, DPUC Investigation into Electric Capacity and Distribution identifying SWCT as having operational difficulties and a near term need to reinforce the transmission and distribution system. Since that time several electric events have threatened system reliability. Therefore, in March of 2002, the Connecticut General Assembly's Energy & Technology Committee directed the DPUC to conduct an investigation into possible shortages of electricity in SWCT during summer periods of peak demand. The DPUC determined that the reliability of SWCT is vulnerable because of inadequate local generation and transmission capability. To reduce the possibility of outages, both the ISO-NE and local transmission and distribution companies must maximize, in the short term, conservation and load management and load response programs, implement emergency generation, and increase capacity to local transmission and distribution system. *Council's Administrative Notice Item 15* (Docket No. 217, Finding of Fact No. 28).

98. The 345-kV system is considered the "backbone" of the electric utility system grid of New England. The 345-kV system is used to efficiently transmit large amounts of electricity over long distances from major generating plants in New England, New York State, and Canada to 345/115-kV step down substations near load centers. *Council's Administrative Notice Item 15* (Docket No. 217, Finding of Fact No. 30).

99. Electric energy on Extra High Voltage ("EHV") lines, such as 345-kV, moves much more freely at high voltages and low currents than at lower voltages and higher currents. EHV lines are used to transport power efficiently for long distances, and to deliver that power to lower voltage lines, such as 115-kV, for local transmission. *Council's Administrative Notice Item 15* (Docket No. 217, Findings of Fact No. 31).

100. In other regions of the United States, higher EHV voltages, such as 500-kV and 765-kV, are used as the regional "backbone." *Council's Administrative Notice Item 15* (Docket No. 217, Finding of Fact No. 32).

101. CL&P's existing 345-kV facilities include three transmission lines that connect to other utilities serving New England and New York State. The three transmission ties are the 347 line between Lake Road Generating substation in Killingly and the Sherman Road substation in Rhode Island connecting with the New England Power Company grid; the 395 line between the Manchester substation in Manchester and the Ludlow substation in Massachusetts connecting with the Western Massachusetts Electric Company grid (a subsidiary of NU), and the 398 line between Long Mountain switching station and Pleasant Valley substation in New York connecting to the Con Edison company grid. *Council's Administrative Notice Item 15* (Docket No. 217, Finding of Fact No. 33).

102. The Companies determined that completion of the loop is the best long-term solution for SWCT. Accordingly, CL&P proposed, and the Council approved in Docket 217, the construction of a new 345-kV transmission line that will provide bulk power transmission from Plumtree Substation in Bethel to Norwalk Substation in Norwalk. The Project completes the loop by providing 345-kV service to Norwalk from central Connecticut and from Milford and Bridgeport. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 7 to 8).

103. The Project is the next phase in the extension of the 345-kV bulk transmission system into SWCT. SWCT is the only part of the state not served by 345-kV transmission lines. The Project completes a 345-kV loop capable of transferring power to and within SWCT from both the north and east. As such, power transfers can continue even if service is disrupted on underlying 115-kV transmission lines or one "leg" of the loop is interrupted by an unplanned outage. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 6 to 7).

104. A transmission loop enhances the reliability of the transmission system. New England's bulk power system is constructed in a series of loops so that 345-kV transmission service can be maintained to an area following the interruption of one leg of the loop. CL&P's existing 345-kV transmission systems include interconnected loops with Connecticut and extend beyond Connecticut and connect with 345-kV transmission systems in Massachusetts, New York and Rhode Island. The majority of load centers in central and eastern Connecticut are

connected to one of these 345-kV loops. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 7).

105. Additional improvements to the 115-kV transmission system are contemplated as part of the long range plan for SWCT. These improvements will allow full benefit from the 345-kV source at Norwalk Substation that will be completed as part of this Project. Accordingly, CL&P is proposing the addition of two underground 115-kV circuits between Norwalk Substation and Glenbrook Substation in Stamford. An additional underground line from Norwalk Harbor Substation to Glenbrook Substation and associated equipment upgrades may be required at a later date depending on future system developments. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 8 to 9).

106. CL&P's long range plan for expansion of the 345-kV system includes upgrading the interconnection between Card Substation in Lebanon, Connecticut and the National Grid's Millbury Substation in Massachusetts and possibly the National Grid's Sherman Road Substation in Rhode Island. Upgrading the transmission corridor between Connecticut and Rhode Island will provide Connecticut with access to abundant and less expensive generation from Canada, eastern Massachusetts, Rhode Island and other sources of new generation in New England. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 8).

The Project has been identified in RTEP by ISO-NE's long term expansion plans. *ISO-NE's Administrative Notice Items 9 and 10.*

6.0 The Proposed Line Is Needed to Complete the 345-kV Loop to Southwest Connecticut, Thereby Ensuring Reliable Electric Service to the Region and within the New England Electric System

107. Consumption of electricity in the 54 municipality region known as SWCT has grown significantly in the past few decades. SWCT accounts for approximately half of the total electrical load in Connecticut while it represents only approximately 25% of the state in geographic terms. Population growth, continued construction of larger homes, economic development and continuing increases in the use of air conditioners and electronic devices such as computers has increased consumption in SWCT. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 5).

108. New England's load will continue to grow in the future. Summer and winter peak demands are expected to increase at a 1.5% compound rate annually for the next ten years according to ISO-NE's RTEP03 issued on November 13, 2003. Additionally, the forecast for summer peak load in New England is 27,820 MW in the year 2010 according to the NEPOOL 2003 CELT Report, issued in April 2003. *Companies' Ex. 32* (Testimony of Coretto, March 9, 2004, p. 4).

109. Growth in electricity usage in SWCT has strained the existing 115-kV transmission system and made the region vulnerable to customer outages and dependent on the availability of local generation. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 4).

110. SWCT's electrical transmission system is inadequate to serve the needs of Connecticut residents and businesses. The FERC designated SWCT as a severe reliability risk. Similarly, ISO-NE indicated that the need to upgrade the transmission system in SWCT is most urgent in New England. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 3 to 4); 3/23/04 Tr. at 109 (Whitley).

111. The Project is needed immediately to prevent forecasted overloads during peak periods because the existing 115-kV transmission system in SWCT does not meet national and regional transmission reliability standards. 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, p. 4).

112. The most urgent system reliability need exists in SWCT and Norwalk / Stamford area despite recent local improvements. The transmission system in SWCT cannot provide for significant generation expansion or utilize fully the area's generation resources during times of need. Moreover, there have been no new developments that would significantly alleviate long term reliability concerns in this area. As such, the Project is needed as soon as is practicable. *ISO-NE's Ex. 1* (Testimony of Whitley, March 9, 2004, pp. 11 to 13).

113. The Project needs to be constructed as soon as possible to address serious problems with the transmission system in SWCT. Even under normal conditions, significant problems exist in SWCT. There is uncertainty concerning the availability of power supplies from local generating facilities and continuing development and economic expansion in the area. *Companies' Ex. 1* (Application, Vol. 1, p. F-31).

114. Delaying the construction of the Project could cause the 115-kV transmission line serving SWCT to become overloaded due to certain contingencies. If this happens customers could experience interruptions in service. *Companies' Ex. 1* (Application, Vol. 1, p. F-31).

115. ISO-NE expects that operators will have to implement pre-contingency or precautionary load shedding to reduce load on the transmission system. Reducing load protects the grid when ISO-NE is unable to meet operating criteria. SWCT's economy could suffer a devastating impact if operators are forced to introduce rotating blackouts as was the case in California a few years ago. Accordingly, the Project is critical to ensuring reliability in SWCT. 1/11/05 Tr. at 23-24 (Whitley).

116. Transmission is needed to address the interdependency from the generation that needs to be at the correct locations to move power from bus to bus in SWCT. All the generation in SWCT cannot be operated at the same time as the generation is interconnected to the 115-kV transmission system, which is inadequate to move power from the generating sources to the load centers. There have been several occasions, during light to heavy load periods in which the overall grid could have been lost. Additionally, transmission is needed in SWCT to resolve thermal, voltage and short-circuit issues. 3/23/04 Tr. at 31-32 (Brandien and Zaklukiewicz).

117. ISO-NE pointed out that flexibility of operation is critical to an operator. The situation in SWCT is complex and requires monitoring constantly. Transmission operators confront heavy load conditions that are dependent on generation being accessible. The generation has to be dispatched in a particular manner so that overloads are avoided. Additionally, short circuit, voltage and system reliability issues impact ISO-NE's flexibility. 3/23/04 Tr. at 119-120 (Whitley).

118. 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 that 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).

119. ISO-NE acknowledged that major infrastructure is required to solve the need for resources as the Gap RFP will not remedy the problem. The existing 115-kV system is inadequate to support even a small generator. Load response would have to be well balanced as it would have the same net effect on the transmission system as a small generator. 3/23/04 Tr. at 155-56 (Whitley and Kowalski).

120. ISO-NE explained that the Gap RFP has been a difficult process because of the limited number of sites in SWCT. Additionally, short circuit duty problems and other problems make it difficult to connect even emergency generation to SWCT's weak transmission system. Accordingly, the Gap RFP is not a long term solution to the problems in SWCT. ISO-NE hopes that the Project will provide the reliability needed to keep the lights on in SWCT. 3/23/04 Tr. at 116-17 (Whitley).

121. Reliance on conservation and load management, demand side management programs and ISO-NE initiatives alone will not resolve the situation in SWCT. The Companies endorse these efforts and will have to rely on these efforts during the construction period of the Project, if it is approved. Rebuilding the transmission infrastructure is critical to having a reliable electric system in SWCT. 3/23/04 Tr. at 33-35 (Brandien and Zaklukiewicz).

122. The transmission system needs reinforcement to ensure reliability to serve customers in SWCT. The Project would provide needed improvement to the reliability of the electric transmission system. City of Milford Ex. 8 (Testimony of Schlissel et al., p. 4-5); 6/3/04 Tr. at 29 (Lanzalotta and Schissel).

123. CL&P and UI must comply with the reliability standards developed by NERC, NPCC and NEPOOL for transmission planning because CL&P and UI's bulk power delivery systems are part of ISO-NE's bulk power grid. CL&P and UI plan for design contingencies by using simulations on computer models. The output of each generating unit is adjustable and each transmission line or transformer can be removed from service so as to represent its loss. This allows the planner to model numerous combinations of generation dispatches and transmission system conditions. Transmission capacity for an area must be designed to transmit power in the event generation deficits exist and transmission facilities are unavailable. Reliability standards require that the bulk power delivery system withstand certain transmission and generation facility contingencies and still reliably serve customer demands. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 23).

124. No party or intervenor presented evidence disputing the need for the project. Docket *272 Record.*

125. Reliability standards are deterministic criteria based on the collective judgment of experienced planning and operating engineers throughout the country over many years. Deterministic criteria are the foundation of the planning criteria used by the reliability councils. The principle behind deterministic criteria is to ensure that a widespread blackout will not occur. The Council has recognized these criteria as the basis for determining public need. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 23-24).

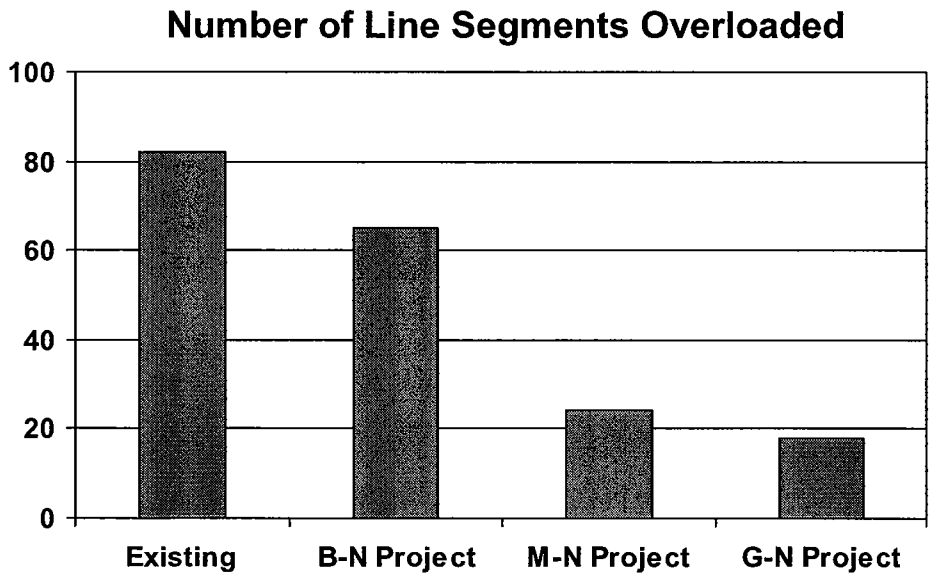
126. The reliability of the transmission system in SWCT will continue to deteriorate without remediation of the problems in SWCT. The Project addresses the majority of needs in SWCT. *OCC's Ex. 1* (Testimony of Montalvo, March 9, 2004, p. 4).

127. Because of insufficient power generation resources and inadequate electric transmission facilities, SWCT fails to meet regional and national reliability standards. 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).

128. "Must run" generation conditions and transmission congestion undermine system reliability because the system operator may not be able to import sufficient power to deal with unplanned outages. Load shedding is the only option in these situations. Further, "must run" generation results in higher costs to consumers because it limits the system operator's ability to dispatch generation from the lowest price sources. Additionally, "must run" generation results in higher costs because "must run" generators are insulated from competition. *Companies' Ex. 1* (Application, Vol. 1, p. F-7).

129. The transmission system in SWCT does not meet reliability standards. The performance of the transmission system was modeled using different combinations of system conditions and varying New England generation dispatches. The modeling demonstrates that a number of line segments overloaded for the following four configurations of the SWCT transmission system: (1) the existing 115-kV transmission system as it exists; (2) the SWCT system after the Bethel to Norwalk 345-kV line is completed; (3) the SWCT system after the completion of the Bethel to Norwalk and Middletown to Norwalk Projects; and (4) the SWCT system after the completion of the 345-kV loop and the Glenbrook to Norwalk Project. There are 82 line segments that would thermally overload under various contingencies. The completion of the Bethel to Norwalk and Middletown to Norwalk Projects would reduce the number of overloaded line segments to 24. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 24 to 25).

Number of SWCT Transmission Lines Segments Affected by Contingencies Under Existing Conditions and After the Installation of Various Projects



130. The Project will provide benefits regarding voltage stability by resolving critical violations of thermal criteria. Additionally, the Project will protect against cascading outages from thermal overloads that could result in voltage violations. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 25-26).

131. Short circuit current levels are high 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 when the current's magnitude surpasses the rating of substation equipment. The addition of new generators to a system operating at a single voltage also increases short circuit currents. Transmission systems consisting of more than one voltage are less likely to be at risk for short circuit problems when larger generators are connected to the higher voltage system. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, pp. 26-27).

132. ISO-NE acknowledged that short circuit levels are a significant problem in SWCT because the circuit breaker capabilities on the 115-kV system are near full capacity. The Project is needed so that transmission owners can reconnect generation to the 345-kV loop thereby dispatching power more efficiently and reliably. 3/23/04 Tr. at 118-19 (Whitley).

133. The Project will reduce high levels of short circuit current by connecting the Bridgeport Energy generating station to the 345-kV system and removing the Milford Generating Station from the Devon 115-kV Substation to the new East Devon 115-kV Substation including series reactors. At Pequonnock Station in Bridgeport, available currents can reach 63,000 amperes, which is the 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).

134. The Project will increase transfer limits into SWCT. The SWCT interface transfer limits are calculated using computer simulations that determine maximum power transfer levels across a set of defined transmission facilities without violating voltage, thermal or stability criteria. Construction of the Project and related 115-kV transmission additions and modifications will increase transfer from 3,200 to 3,400 MW. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 20); 3/23/04 Tr. at 56, 58-59 (Brandien & Zaklukiewicz).

135. The increase in transfer limits will provide reliability benefits. Peak load in SWCT was approximately 3,465 MW in 2002 and is expected to grow in the future. The peak load for 2002 significantly exceeded the approximately 2,200 MW of total generation in the region. As such, SWCT businesses and residents rely on power imported from generating stations outside of SWCT. SWCT's

reliance on imported power is likely to increase as the continued availability of the existing generation and the siting of new generation remains uncertain. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 20).

136. The Project will relieve the problems associated with moving power across the 115-kV system and allow power to move from the eastern part of the state, which is the strong source of the transmission system, to SWCT. The installation of autotransformers at East Devon Substation in Milford and the proposed Singer Substation in Bridgeport and Norwalk Substation as part of the Bethel to Norwalk Project, along with the existing autotransformers at Plumtree Substation in Bethel, Frost Bridge Substation in Watertown, Southington Substation in Southington and East Shore Substation in New Haven, will allow power to be accessed off the 345-kV system at various points. 3/23/04 Tr. at 41-45 (Brandien).

137. The Project will allow newer and more efficient generation to be added to the transmission system in Connecticut. The 115-kV system is unable to connect to today's economic generation that is mainly in the 550 MW class. 3/23/04 Tr. at 91 (Zaklukiewicz).

138. ISO-NE recognized that the Project will greatly reduce conditional dependency of generation in SWCT. This will be a significant improvement as SWCT will meet reliability criteria. 3/23/04 Tr. at 119 (Whitley).

139. The Project significantly decreases the reliance on generation that must run during high and peak load conditions in SWCT to reliably serve the area. Regulated utilities do not have control over generation in SWCT because regulated utilities are no longer allowed to own generation. 3/23/04 Tr. at 60 (Zaklukiewicz).

140. The Project will strengthen the entire New England system by improving interconnections between SWCT and the rest of the New England 345-kV system. *Companies' Ex. 31* (Testimony of Zaklukiewicz, March 9, 2004, p. 4).

7.0 The Proposed Line Will Serve the Interests of System Economy and the Overhead Portions of the Facility Are Cost Effective and the Most Appropriate Alternative Based Upon a Life Cycle Cost Analysis. (Conn. Gen. Stat. § 16-50p)

7.1 Cost of the Proposed Line

141. The estimated capital costs of the Proposed Route (as modified by the Final ROC Report dated December 20, 2004, in which the Proposed Route is referred to as "Case 5"), Alternative A, and Alternative B, expressed in 2004 dollars, are set forth in the table below, which provides a breakdown of cost by route segment. The table also includes cost estimates for constructing low magnetic field designs in segments 1 and 2:

Summary of Cost Estimates by Route Segment
(Millions of 2004 Dollars)

Segment	Proposed Route (24 Miles UG 45 Miles OH)	Alternative A (13 Miles UG 60 Miles OH)	Alternative B (4 Miles UG 72 Miles OH)	All Incremental Cost for Constructing Low Magnetic Field Designs
1 including Scovill Rock and Beseck Switching Stations	92 to 105	92 to 105	94 to 108	20 to 23
2 including East Devon Substation	241 to 275	244 to 278	247 to 281	48 to 57
3 including Singer Substation and Interconnections	229 to 275	222 to 266	149 to 170	not estimated
4 including Norwalk Substation	276 to 339	253 to 299	264 to 305	not estimated
TOTAL	837 to 993	811 to 947	754 to 864	68 to 80

142. The cost estimates are expressed in ranges because they are based on preliminary or conceptual engineering and an imperfect knowledge of field conditions. For example, the Companies do not precisely know how much contaminated soil or rock or ledge will be encountered during construction, and the cost ranges reflect differing assumptions for such variables. *Companies' Ex. 172* (Testimony of Bartosewicz et al., December 28, 2004, pp. 2-3 & Appendix A).

143. As described in the Final ROC Report, in order to maximize the amount of underground cable, it will be necessary to upgrade existing equipment, such as surge arresters, at nearly half of the CL&P system transmission substations and at all of the UI transmission substations, as explained in the Final ROC Report. The estimated capital cost of the Proposed Route, $837-993, million does not include the cost of such upgrades. The preliminary estimate of the direct costs of such upgrades is $7 to $10 million. *Companies' Ex. 172* (Testimony of Bartosewicz et al., December 28, 2004, pp.4-5).

144. The estimated incremental cost to incorporate low magnetic field designs into the proposed overhead portion of the route is $68 to $80 million in 2004 dollars ($20-23 million for segment 1 and $48-57 million for segment 2), if such designs were

mandated for the entire proposed overhead length of the line. This estimate includes the cost of the Royal Oak bypass, including the acquisition of a new easement, but does not include any changes to the existing 115-kV overhead line on the existing ROW through the Royal Oak subdivision. The estimate does not include additional costs to relocate existing overhead transmission facilities at the Jewish Community Center or Congregation B'nai Jacob/Ezra Academy locations. *Companies' Ex. 172* (Testimony of Bartosewicz et al., December 28, 2004, p. 6).

7.2 Life Cycle Costs

145. The life cycle costs of the Proposed Route (as modified in the Final ROC Report), Alternative A, and Alternative B are set forth in the following table:

Summary of Life Cycle Costs by Route Segment
(Millions of 2004 Dollars)

Segment	Proposed Route (24 Miles UG 45 Miles OH	Alternative A (13 Miles UG 60 Miles OH)	Alternative B (4Miles UG 72 Miles OH)	Incremental Cost for Low Magnetic Field Designs
1 including Scovill Rock and Beseck Switching Stations	133.2 to 151.5	134.3 to 152.6	137.9 to 155.9	31.8 to 36.2
2 including East Devon Substation	333.1 to 382.0	336.0 to 386.0	349.0 to 397.7	74.8 to 85.8
3 including Singer Substation and Interconnections	318.3 to 383.7	316.0 to 380.4	$188.2 to 214.5	Not Estimated
4 including Norwalk Substation	395.7 to 488.6	360.4 to 427.6	361.7 to 417.5	Not Estimated
TOTAL *	1,180.4 to 1,405.9	1,146.9 to 1,346.6	1,036.6 to 1,185.6	106.6 to 122.0

*Total may not add due to rounding

Companies' Ex. 181, Response to OCC-03, Q-OCC-015.

7.3 The Proposed Line Will Have Economic Benefits

146. When transmission facilities are inadequate to transport power from the lowest price generation source into a given area, higher priced generating units within that congested area or "load pocket" may have to be dispatched in order to meet demand and maintain a reliable power supply. ISO-NE has designated SWCT as a deficient load pocket due to transmission constraints. The additional costs to run these more expensive generators in "out of merit order" are paid by customers in the form of "congestion" charges. Under ISO-NE's SMD rules, which became effective on March 1, 2003, the congestion charges for SWCT are paid for by Connecticut customers alone, whereas in the past such costs were socialized among all New England consumers. ISO-NE concluded in RTEP02 that the most effective long-term strategy for reducing congestion costs was to improve import limits in SWCT by constructing a 345-kV loop. *Companies' Ex. 1* (Application, Vol. 1, p. F-33).

147. Construction of the Bethel to Norwalk line approved in Docket No. 217 will eliminate transmission constraints and associated congestion costs at the present Norwalk-Stamford Sub-area interface; and construction of the Middletown to Norwalk Project would then eliminate or greatly reduce remaining transmission constraints at the SWCT interface. Significant transmission constraints within Connecticut would be substantially eliminated, leaving the congestion at the Connecticut / Rhode Island interface to be addressed by construction of a Card to Sherman line. *Companies' Ex. 1* (Application, Vol. 1, p. F-33).

148. ISO-NE estimates that the annual "inefficiency cost" of the existing transmission system in Connecticut is approximately $308 million. This estimate includes the costs of RMR contracts, gap RFPs, congestion costs, and the costs of running uneconomic generators. The construction of the Project will not eliminate these costs but will assist in reducing these costs by, among other things, reducing dependence on RMR contracts. However, even after completion of the Project, Connecticut will be a net importer of power, and the planned Card to Sherman line will improve the import capability by bringing a new 345-kV line into Connecticut from Rhode Island and thereby improving access to cheaper power for the entire state. *ISO-NE's Ex. 13* (Power Point Presentation at the FERC Technical Conference, dated January 6, 2005, p. 3); 1/11/05 Tr. at 24-25 (Whitley); 2/17/05 Tr. at 84 (Whitley); *Companies' Ex. 1* (Application, Vol. 1, F-33).

149. By improving the reliability of the grid, the Project reduces the risk of cascading outages such as the blackout that occurred in August of 2003. The economic cost of such blackouts far exceeds the costs associated with the inefficiencies associated with the existing transmission system in Connecticut. 2/17/05 Tr. at 88 (Whitley).