STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

The Connecticut Light & Power Company Application for a Certificate of Environmental Compatibility and Public Need for the Connecticut Portion of the Interstate Reliability Project that traverses the municipalities of Lebanon, Columbia, Coventry, Mansfield, Chaplin, Hampton, Brooklyn, Pomfret, Killingly, Putnam, Thompson, and Windham, which consists of (a) new overhead 345-kV electric transmission lines and associated facilities extending between CL&P's Card Street Substation in the Town of Lebanon, Lake Road Switching Station in the Town of Killingly, and the Connecticut/Rhode Island border in the Town of Thompson; and (b) related additions at CL&P's existing Card Street Substation, Lake Road Switching Station, and Killingly Substation.	**Docket No. 424** **October 1, 2012**

Applicant's Proposed Findings of Fact

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I. INTRODUCTION

1. Pursuant to Connecticut General Statutes (CGS) § 16-50g et seq., on December 23, 2011, The Connecticut Light and Power Company (CL&P) applied to the Connecticut Siting Council (Council) for a Certificate of Environmental Compatibility and Public Need (Certificate) for the construction, operation and maintenance of the Connecticut portion of the Interstate Reliability Project (the Project) (CL&P 1, Vol. 1, p. ES-1)

2. The proposed Interstate Reliability Project (Interstate) involves the siting of facilities in Connecticut, Rhode Island and Massachusetts, which requires a decision by all three state siting authorities. The New England Power Company has proposed the Massachusetts component of Interstate to the Massachusetts Energy Facilities Siting Board (MA EFSB), which has jurisdiction over siting of the Massachusetts portion of Interstate. The Narragansett Electric Company has proposed the Rhode Island component of Interstate to the Rhode Island Energy Facility Siting Board, which has jurisdiction over the Rhode Island portion of Interstate. (CL&P 1, Vol. 1, p. ES-1)

3. CL&P is a wholly-owned subsidiary of Northeast Utilities (NU). (CL&P 1, Vol. 1, p. 1-1)

4. The Narragansett Electric Company and New England Power Company are wholly-owned subsidiaries of National Grid USA (collectively, National Grid). (CL&P 1, Vol. 1, p. 1-1)

5. Parties and Intervenors to these proceedings include CL&P (the Applicant); NRG Energy, Inc., NRG Power Marketing, Inc., Connecticut Jet Power LLC, Devon Power LLC, Middletown Power LLC, Montville Power LLC, Norwalk Power LLC, and Meriden Gas Turbines, LLC (collectively, NRG); Victor Civie and Richard Civie; Equipower Resources Corp., Lake Road Generating Company LP, and Milford Power Company, LLP (collectively, Equipower); The United Illuminating Company (UI); Edward Hill Bullard; Office of Consumer Counsel; Richard Cheney and The Highland Ridge Golf Range, LLC (Highland Ridge); Mount Hope Montessori School, Incorporated and The Independent System Operator-New England, Inc. (ISO-NE). (Record)

6. Pursuant to CGS § 16-50*l*(b), CL&P provided service and legal notice of the Application. This included notice to municipalities along the route of the proposed Project and alternative; municipalities within 2,500 feet of the proposed lines; federal, state, local and regional agencies, and elected officials; published notice in The Willimantic Chronicle and The Norwich Bulletin on December 9, 2011 and December 16, 2011; and a separate "Notice of Proposed Construction of a High-Voltage Electric Transmission Line" included in one or more monthly bills to CL&P customers within Lebanon, Columbia, Coventry, Mansfield, Chaplin, Hampton, Brooklyn, Pomfret, Killingly, Putnam, and Thompson and to each customer of The Bozrah Light and Power Company within Lebanon. (CL&P 2, CL&P 4)

7. Pursuant to CGS § 16-50*l*(e), in August 2008, CL&P provided municipal consultation documents to the Chief Elected Official of each of the eleven towns that would be

affected by the proposed route for the new 345-kV facilities, as well as the additional town affected by route variations. The Project route would traverse Lebanon, Columbia, Coventry, Mansfield, Chaplin, Hampton, Brooklyn, Pomfret, Killingly, Putnam, and Thompson. Some identified route variations would traverse Windham. (CL&P 1, Vol. 1, pp. ES-30, ES-40, ES-42; CL&P 2, CL&P 3)

8. Pursuant to CGS § 16-50*l*(e), in July, 2011, CL&P provided supplemental municipal consultation documents to all of the 11 towns along the Project route and the Town of Windham. (CL&P 1, Vol. 1, p. ES-42; CL&P 2, CL&P 3)

9. During the 2008 municipal consultation process, CL&P held three "open houses" in Connecticut:

- Wednesday, September 24, 2008 in Brooklyn
- Tuesday, September 30, 2008 in Willimantic
- Wednesday, October 22, 2008 in Mansfield.

(CL&P 1, p. ES-42, pp. 9-6, 9-9)

10. Each 2008 open house consisted of four clusters of information stations staffed by CL&P and its consultants. The first station provided visitors with Project information, including an explanation of how to participate in the siting process, and a route locator. The second station included information on the need for the Project, electric industry information and other collateral material. The third station included photosimulations, structure design drawings and samples of conductors and insulators. The fourth station included information on environmental management of the transmission line right-of-way (ROW), electric and magnetic fields (EMF) and the proposed ROW. (CL&P 17, p. 22)

11. During the 2011 municipal consultation process, two "open houses" were held in Connecticut:

- Tuesday, August 23, 2011 in Killingly (Danielson area)
- Thursday, December 8, 2011 in Mansfield.

(CL&P 1, p. ES-42; pp. 9-6, 9-9)

12. Each 2011 open house was staffed by CL&P and its consultants and focused on topics of interest, organized into the following information stations: Needs and Benefits; Proposed Upgrade; Transmission Construction; Mansfield Hollow; EMF; Understanding ROWs; and Public Participation in the siting process. In addition, several Route Locators (using a Google Earth interface) were available so that residents could learn more about proposed construction on or near their particular property. (CL&P 17, p. 23)

13. Pursuant to CGS § 16-50*l*(b), CL&P provided notice to landowners abutting the Card Street Substation in Lebanon, Connecticut, the Killingly Substation in Killingly, Connecticut and the Lake Road Switching Station in Killingly, Connecticut. Community organizations and water companies were also provided notice consistent with the

Council's Application Guide for Electric and Fuel Transmission Line Facility (Application Guide). (CL&P 2, filing of notice)

14. Pursuant to CGS § 16-50j(h), on February 27, 2012, the following state agencies were requested to submit written comments regarding the proposed Project: Department of Energy and Environmental Protection (DEEP); Department of Agriculture (DOA); Department of Public Health (DPH); Council on Environmental Quality (CEQ); Public Utilities Regulatory Authority (PURA); Office of Policy and Management (OPM); Department of Economic and Community Development (DECD); Department of Transportation (CDOT); and Department of Emergency Management and Homeland Security (DEMHS). (Record)

15. The Connecticut Energy Advisory Board did not issue a request for proposals for alternative solutions to the need that would be addressed by CL&P's Application. (Record, Council's Request for Comments on CL&P's Request for Continuance dated 3/26/12; Revised schedule dated 4/16/12; CEAB Correspondence dated 4/23/12 distributed to service list 4/30/12)

16. CDOT submitted comments concerning CL&P's Application on February 23, 2012. DEEP submitted comments on June 21, 2012. (CDOT comments dated February 23, 2012; DEEP Comments dated June 21, 2012)

17. The Town of Windham provided comments dated February 22, 2012. The Windham Region Council of Governments filed comments dated March 13, 2012. The Towns of Brooklyn, Killingly and Putnam submitted comments at the public hearing on April 19, 2012. The Town of Mansfield provided comments at the public hearing on April 24, 2012. The Town of Thompson Inland Wetlands Commission filed comments with photographs dated May 29, 2012 and comments dated June 19, 2012, with an attached soil report. (Record)

18. In accordance with Section IX of the Application Guide, on April 4 and 5, 2012, CL&P posted twenty-two 4-foot by 6-foot signs notifying the public of the Council's three public hearing to be held in Lebanon, Brooklyn and Mansfield on April 18, 19 and 24, respectively. These signs were posted at various locations throughout the 11 towns included in the proposed Project route, predominately at ROW crossings on land owned by CL&P, except for three locations on land of private parties, for which permission was obtained. (CL&P 17, pp. 24-25)

19. Pursuant to CGS § 16-50m, the Council held public hearings for citizen comment on April 18, 2012 at the Lebanon Fire Safety Complex, Lebanon; on April 19, 2012 at the Quinebaug Valley Senior Citizens Center, Brooklyn; and on April 24, 2012 at Mansfield Middle School, Mansfield. Each hearing commenced at approximately 7:00 p.m. (Transcript 1, April 18, 2012 [Tr. 1], p. 3; Transcript 2, April 19, 2012 [Tr. 2], p. 2; Transcript 3, April 24, 2012 [Tr. 3], p. 2)

20. The Council and its staff conducted public field reviews of the proposed routing of the 345-kV lines for Interstate in Connecticut. Each of the public field reviews was held on the same day as a public hearing. (Council Hearing Notice)

21. The Council held public evidentiary hearings on June 4, 2012, June 5, 2012, June 26, 2012, July 31, 2012, and August 2, 2012, at Central Connecticut State University, Institute of Technology and Business Development, 185 Main Street, New Britain, Connecticut. (Transcript 4, June 4, 2012 [Tr. 4]; Transcript 5, June 5, 2012 [Tr. 5]; Transcript 6, June 26, 2012 [Tr. 6]); (Transcript 7, July 31, 2012 [Tr. 7]; Transcript 8, August 2, 2012 [Tr. 8])

22. The Council held public evidentiary hearings on August 28, 2012 and August 30, 2012 at the Council's office at Ten Franklin Square, New Britain, Connecticut. (Transcript 9, August 28, 2012 [Tr. 9]; Transcript 10, August 30, 2012 [Tr. 10])

23. On May 30, 2012, pursuant to CGS § 16-50o(c), CL&P filed a copy of an agreement with UI, which provides that a portion of the project assets will be sold by CL&P to UI if the project is approved, thus requiring a partial transfer of the Certificate of Environmental Compatibility and Public Need that would be issued at the conclusion of this proceeding. (CL&P 21; CL&P 33, Q42; CL&P 34, Q42-RV01; Tr. 9, pp. 132-140, Peters; Tr. 10, pp. 97-99, O'Hara)

II. NEED

<u>Background (Southern New England Region)</u>

Regional Planning and Reliability

24. The electric power system in New England became regionalized during the 1960s, when the electric utility companies in New England, including CL&P, developed a plan for a 345-kV transmission grid that would integrate the dispatch of electricity from strategically located generating stations serving loads within and between the New England States and other regions. (Council Admin. Notice No. 33, FOF # 25; CL&P 1, Vol. 1, pp. 2-2, 2-3)

25. Since the 1960s, transmission planning and reliability standards have become more closely integrated on a regional basis. Due to events such as the Northeast blackout of 1965 and extensive electric industry restructuring during the 1990s, regulators and legislators created and strengthened a clear chain of authority for both planning and reliability from the federal level down to the regional level. On February 1, 2005, the Federal Energy Regulatory Commission (FERC) designated ISO-NE as a Regional Transmission Organization, with consolidated authority to plan transmission systems and maintain system reliability. (Council Admin. Notice No. 33, FOF # 27; CL&P 1, Vol. 1, pp. 2-2, 2-3; ISO-NE 2, p. 6)

26. Failure to address known violations of mandatory North American Electric Reliability Corporation (NERC) reliability standards is subject to federal fines. However, fines are not imposed if the utility company has a plan to adequately address modeled violations and is actively pursuing such a plan. (Council Admin. Notice No. 33, FOF # 28, CL&P 1, Vol. 1, p. 2-3; Tr. 8, p. 46, Laskowski)

27. ISO-NE is responsible for managing the New England region's bulk electric power system, operating the wholesale electricity market, administering the region's open access transmission tariff, and conducting centralized electrical power planning. (Council Admin. Notice No. 33, FOF # 26; CL&P 1, Vol. 1, p. 3-3; ISO-NE 2, pp. 5, 6)

28. Long-term system planning for New England is conducted by ISO-NE through an annual, comprehensive Regional System Plan (RSP). A regional transmission plan is developed and reviewed by interested parties, including state regulators and the New England Power Pool (NEPOOL) market participants. (Council Admin. Notice No. 33, FOF # 29; ISO-NE 2, p. 8)

Planning Criteria and Reliability Standards

29. CL&P is obliged by binding tariff provisions to design and propose transmission improvements that will assure the bulk-power supply system complies with applicable reliability standards. (Council Admin. Notice No. 33, FOF # 33; CL&P 1, Vol. 1, p. 2-5)

30. ISO-NE's definition of reliability is governed by NERC. NERC's definition of reliability encompasses two concepts: adequacy and security. Adequacy is defined as the "ability of the system to supply the aggregate electric power and energy requirements of the consumers at all times." Security is defined as "the ability of the system to withstand sudden disturbances." (Council Admin. Notice No. 33, FOF # 34)

31. ISO-NE does not determine whether generation and load management resources could solve a given reliability problem more cost-effectively than transmission security. It leaves that "choice" up to the market. If the market fails to bring forward a solution, then ISO-NE is obligated, per NERC planning criteria and reliability standards, to plan a transmission security solution. (Council Admin. Notice No. 33, FOF # 35). ISO-NE is currently considering how it might improve its planning procedures to enhance the opportunities for market resource alternatives to transmission projects. (Council Admin. Notice No. 21)

32. A key element in planning for and testing transmission reliability (in the sense of transmission security) is the concept of "contingency" events, wherein certain generation and/or transmission facilities are assumed to be suddenly and unexpectedly out of service. Such contingency events could be caused by weather; by generator, transmission line, or substation equipment failures; by contingencies on other transmission systems connected to the New England transmission system; or by some combination of these factors. (Council Admin. Notice No. 33, FOF # 36; CL&P 1, Vol. 1, p. 2-3).

33. In accordance with ISO-NE Planning Procedure 3 (PP3), planners use the terms "N-1" and "N-1-1" to designate the contingency conditions in which the transmission system must be capable of reliable operation. N-1 designates the state of the transmission system following the occurrence of a single contingency. N-1-1 designates the condition of the transmission system following the occurrence of a second contingency, assuming that one element is already out of service. (Council Admin. Notice No. 33, FOF # 37; CL&P 1, Vol. 1, pp. 2-4, 2-5; Tr. 9, p. 130, Oberlin)

34. To evaluate compliance with NERC standards and PP3 reliability criteria, these contingencies are simulated on computer models developed to represent actual and expected future system conditions. If the simulations show that currents on a transmission element will exceed its thermal ratings (a thermal overload), or that system voltages cannot be maintained within acceptable limits following one or more of the contingencies (a voltage violation), appropriate solutions must be developed and implemented in order to maintain the reliability of the electric grid. (Council Admin. Notice No. 33, FOF # 38, CL&P 1, Vol. 1, p. 2-5)

35. Reliability standards and criteria require an assumption that there will be sufficient time between contingency events for the system operator to implement specific "manual system adjustments" to the system before the second contingency event occurs. Thus, the applicable standards and criteria require that in a planning study, after performing each of the required N-1 contingency analyses with all transmission facilities assumed to be initially in service, planning engineers test the ability of the system to be operated reliably with a key facility out of service. To do this, they apply a contingency; measure and document system performance prior to readjusting or reconfiguring the system (with "manual system adjustments"); then apply a second (unrelated) contingency; and then study the electric system's response. (Council Admin. Notice No. 33, FOF # 38, CL&P 1, Vol. 1, p. 2-5)

36. The criteria governing planning studies for the New England control area provide that, to make the system ready for the next contingency, only those manual adjustments that can be implemented within 30 minutes may be considered. These include adjusting the output of generation units, activating "quick start" generating reserves, and changing phase angle regulator taps. (Council Admin. Notice No. 33, FOF # 38, CL&P 1, Vol. 1, p. 2-5)

37. The contingencies modeled are simulated with normal loads forecast for the future, extreme weather peak loads, inter-regional power transfers, and "reasonably stressed" conditions, which are generally considered to be due to the unavailability of generation proximate to load – often with multiple units being unavailable. Requiring the transmission system to operate effectively under such "reasonable stress" recognizes that generation units may be unavailable for many reasons, such as economics, equipment failure, lack of fuel, maintenance requirements, and environmental restrictions. (Council Admin. Notice No. 33, FOF # 39; CL&P 1, Vol. 1, pp. 2-6, 2-8)

38. Major unplanned outages of generating units are common in the electric industry. In Connecticut, for instance, prolonged outages involving thousands of MWs at a time have happened in 1996, 2003, and 2008. (Council Admin. Notice No. 33, FOF # 40).

39. Unplanned outages of large quantities of generation capacity have continued to the present. On July 22, 2011, when the second highest New England historic peak load was reached, more than 1,400 MW of generation was unexpectedly unavailable due to forced outages and reductions. (CL&P 1, Vol. 1, p. 2-7; ISO-NE 4, ISO-NE Response to Q-Civie-02).

40. Historically, during times of peak summer demand, generator outages in New England have ranged from 2,000 MW to 4,000 MW. (Tr. 9, p. 50, Rourke)

41. The contingencies for which a system must be tested for any given planning simulation are prescribed by NERC, NPCC and ISO-NE standards and criteria, and are not left to an individual planner's discretion. (CL&P 1, Vol. 1, pp. 2-4, 2-5; ISO 2, p. 10; Tr. 9, p. 130, Oberlin)

42. However, the selection of system stress from generator outages, also known as "critical system conditions," is left to the judgment of the planning authority, which is ISO-NE for the New England Region. (Tr. 9, pp. 26-29, 120, Oberlin). "Reasonably stressed conditions" are defined by ISO-NE Planning Procedure 5-3 as "those severe load and generation system conditions which have a reasonable probability of actually occurring." (Tr. 9, p. 29, Oberlin). The planning authority makes a judgment as to the reasonableness of such stresses based on its experience with past system events, and its knowledge of how the system is typically stressed. (Tr. 9, p. 30, Oberlin; pp. 47-50, Rourke). Stressed conditions are not determined by calculations of statistical probability. (Council Admin. Notice No. 33, FOF # 41)

43. Contingency modeling under "reasonably stressed" conditions is meant to test the strength of the system. Planners design improvements to the system that address more than just the specific conditions and contingencies tested in power-flow simulations. Events represented in the simulations serve as proxies for multiple other potential future events that cannot be defined or predicted, but that the system should be able to survive. (Council Admin. Notice No. 33, FOF # 42; CL&P 1, Vol. 1, pp. 2-6, 2-8)

Transmission Interfaces

44. "Interfaces" are sets of designated transmission facilities that are used to transfer power, within defined reliability limits, from one area to another. The transfer capability across an interface depends on the power flows that all of the transmission elements crossing the interface can carry without violating prescribed limits of system stability, current carrying capability, or permissible ranges of voltage. (CL&P 1, Vol. 1, p. 2-12)

45. A constrained interface can prevent the delivery of power needed to serve load. (CL&P 16, p. 20)

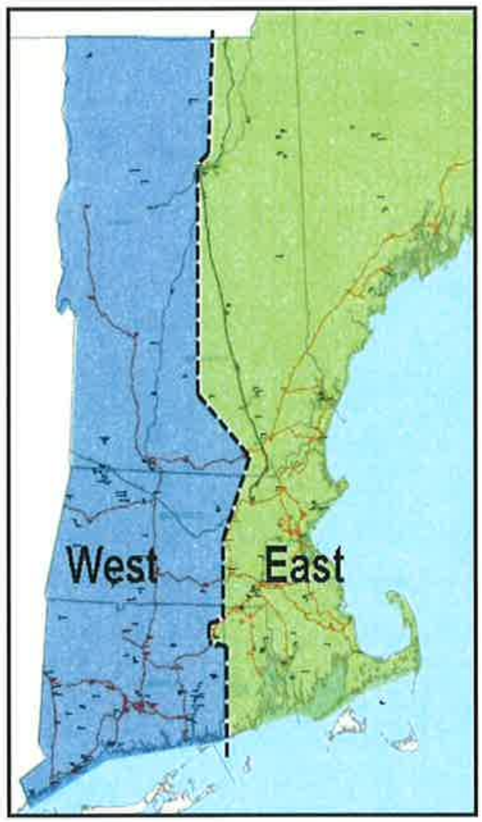
46. Interface transfer limits are important tools for transmission planning studies. ISO-NE establishes transfer limit levels for each New England interface for use in planning studies. In studies to define and improve interface transfer capability (such as the Interstate studies), the actual transfer capabilities that result from modeled system conditions are determined, and if the existing transfer capability is insufficient to comply with reliability requirements, then system improvements are designed to increase transfer capability. (CL&P 1, Vol. 1, p. 2-13; CL&P 16, pp. 17, 18)

The New England East-West (and West-East) Interface

47. The New England East-West Interface is made up of the facilities that connect the two large operating areas of New England. In its traditional configuration, this interface roughly corresponds to the boundaries of the service areas of major electric utilities, and divides New England approximately in half, separating the load centers of the Southeast

Massachusetts Area (SEMA)/Boston area and Connecticut. The interface follows the Connecticut – Rhode Island border (except for a jog around the Lake Road Generating Station in northeast Connecticut), then passes through Massachusetts, just west of the Millbury, Massachusetts hub, proceeds northeast into New Hampshire, west of the major generating facilities in southern New Hampshire, and then extends north through New Hampshire and Vermont, westerly of the high-voltage direct current (HVDC) line from Québec and its terminal facilities. The location of this interface is illustrated in the following figure.

Approximate Boundary of New England East – West Interface
(Figure 2-3 from CL&P 1, Vol. 1, p. 2-13)



(CL&P 1, Vol. 1, pp. 2-13, 2-14; CL&P 16, pp. 18, 19)

48. Three 345-kV transmission lines currently cross this interface. In addition, there are two 230-kV transmission lines, and a few underlying 115-kV facilities. Most of the 230-kV and 115-kV facilities extend for long distances, and have relatively low thermal capacity. (CL&P 1, p. 2-14; CL&P 16, p. 19)

49. The needed flows across the interface change both over time, and in the short term, depending on changes in system conditions. In the mid-1980s and early 1990s, monitoring the New England East-West Interface was important in day-to-day operations because of constraints in moving significant amounts of power from generating stations located in the west (including four nuclear generating units in Connecticut) to Boston and

its suburbs in the east. At that time, Connecticut was a net exporter of power. (CL&P 1, Vol. 1, p. 2-15; CL&P 16, p. 20)

50. In the late 1990s, following the influx of new generation in the east and the multi-year loss of four Connecticut nuclear generating units with an aggregate capacity of approximately 3,260 MW), this interface became severely constrained in the opposite direction, from east to west, as Connecticut became a large net importer of power. Following this period, only two of the Millstone generating units (units 2 and 3) returned to service in the late 1990s. Both Connecticut Yankee and Millstone Unit 1 were retired, resulting in a loss of approximately 1,240 MW. In the following years, Connecticut continued to be a heavy importer of power, often at levels approaching its import transfer limit. (CL&P 1, Vol. 1, p. 2-15; CL&P 16, pp. 20-21; Tr. 9, pp. 47-48, Rourke)

51. More recently, largely as the result of state-sponsored contracts, approximately 2,000 MW of new resources were committed in locations to the west of the interface, mostly in Connecticut, which has reduced Connecticut's need to import power. (CL&P 1, Vol. 1, p. 2-15; CL&P 16, p. 21)

52. Recent studies by ISO-NE have demonstrated, under existing and anticipating future conditions, power flows across New England may be constrained in both east to west and west to east directions, so that power generated to the west of the interface and needed in the east – or vice versa – cannot be delivered under conditions for which the system must be planned. (CL&P 1, Vol. 1, p. 2-15; CL&P 16, pp. 21-25)

Interstate Reliability Project Development

53. In 2004, ISO-NE began a study on deficiencies and interrelated needs throughout the Southern New England (SNE) electric supply system. After comprehensive studies by a "Working Group" including the planning staffs of NUSCO and National Grid, ISO-NE determined that Interstate was needed in order to comply with NERC, NPCC, and ISO-NE reliability standards and criteria. The basis for this determination was set forth in a report entitled "Southern New England Transmission Reliability Report 1 – Needs Analysis" (the *2008 Needs Analysis*). SNETR was the genesis of the New England East-West Solution (NEEWS) (Council Admin. Notice No. 33, FOF # 56; CL&P 1, Vol. 1, pp. 2-16, 2-17, 2-18; CL&P 1, Vol. 5, *2008 Needs Analysis*; CL&P 16, pp. 4-6)

54. NEEWS consists of four separate but related projects that would alleviate the deficiencies in the SNE transmission grid. The projects include:

- The Greater Springfield Reliability Project and Manchester to Meekville Junction Project, which were approved by the Council in 2010 and are now under construction.
- The Rhode Island Reliability Project (RIRP) – A National Grid project entirely within the State of Rhode Island, which was approved by the Rhode Island Energy Facility Siting Board in 2010 and is now under construction.

- The Interstate Reliability Project – the subject of this Docket.

- The Central Connecticut Reliability Project (CCRP) – a new 345-kV line from CL&P's North Bloomfield Substation to its Frost Bridge Substation in Watertown, Connecticut, which is now under review by ISO-NE.

(Council Admin. Notice No. 33, FOF # 31; Council Admin. Notice Nos. 33, 34; CL&P 1, Vol. 1, pp. 2-18, 2-19)

55. NEEWS is a comprehensive long-range regional plan for expansion that addresses electric transmission concerns throughout New England. (Council Admin. Notice No. 33, Opinion, p. 3)

56. Each of the NEEWS projects, including Interstate, will address system deficiencies by itself, as well as working together with other components to provide a coordinated resolution of region-wide issues. Thus, Interstate by itself and working together with the previously approved NEEWS projects (GSRP and RIRP) will meet identified reliability needs regardless of whether the fourth component of NEEWS (CCRP) is undertaken. (CL&P 1, Vol. 1, p. 2-21; Council Admin. Notice No. 33, FOF 43)

57. Following its *2008 Needs Analysis*, the SNETR Working Group analyzed potential transmission solutions to satisfy the identified needs for every concentrated load area of SNE. Their draft report entitled "New England East-West Solutions (Formerly SNETR) Report 2, Options Analysis" containing detailed solution options for each area was published by ISO-NE in April 2008. (CL&P 1, Vol. 1, pp. 2-20, 2-21; CL&P 1, Vol. 5, *Options Analysis*)

58. CL&P and National Grid evaluated five options, including a routing variation of one option, and selected Interstate as the preferred solution to address the reliability violations. Interstate was selected based on greater system benefit, lower cost, and lesser environmental impact. (CL&P 1, Vol. 1, p. 2-21; CL&P 17, pp. 48, 50) This analysis is described in a report entitled "Solution Report for the Interstate Reliability Project," Aug. 2008 (the *2008 Solution Report).* (CL&P 1, Vol. 5, *2008 Solution Report*)

59. ISO-NE is required by Attachment K to its FERC Open Access Transmission Tariff to update its needs assessments as new resources materialize through the Forward Capacity Auction, as load forecasts change, as new resources are built or committed, or other important changes in system conditions occur. In 2008, ISO-NE initially began updating its needs assessments for all NEEWS Projects. ISO-NE completed the Interstate needs reassessment in April 2011. (CL&P 1, Vol. 1, p. 2-22; CL&P 17, pp. 6-7; Council Admin. Notice No. 15)

60. ISO-NE described its 2011 re-analysis in a report titled *New England East-West Solution (NEEWS) Interstate Reliability Project Component Updated Needs Assessment* (April, 2011) (the *2011 Updated Needs Report*). (CL&P 17, p. 7; CL&P 1, Vol. 5, *2011 Updated Needs Report)*

61. The *2011 Updated Needs Report* concluded that Interstate continued to be needed to comply with NERC, NPCC and ISO-NE reliability standards and criteria. In addition to

a previously identified need to increase transfer capacity from eastern New England to western New England, the *2011 Updated Needs Report* identified a new, additional need for increased transfer capacity to move power from western to eastern New England. (CL&P 1, Vol. 1, pp. 22-33; CL&P 17, pp. 5-8; CL&P 1, Vol. 5, *2011 Updated Needs Report.*)

62. After completing the *2011 Updated Needs Report,* ISO-NE undertook a further study to determine if any changes to Interstate were necessary to serve this enhanced need; and to identify the most cost-effective design for any such required changes. ISO-NE assigned responsibility for these studies to the previously formed Working Group of planners from ISO-NE, NUSCO, and National Grid. For the purpose of this study, the group was expanded to include representatives of NSTAR, a Massachusetts electric public utility. The expanded Working Group determined that changes and additions to the Interstate facilities in Massachusetts and Rhode Island were required. No additions to the Connecticut portion of Interstate were needed. In fact, one section of new transmission line and a planned substation expansion were removed from the Interstate scope in Connecticut. The results of the analysis are set forth in detail in an ISO-NE report entitled *New England East-West Solution (NEEWS): Interstate Reliability Project Component Updated Transmission Analysis Solution Study Report* (*2011 Updated Solutions Report)* (CL&P 1, Vol. 1, pp. 2-34, 35; Vol. 1A, Sec. 13; Vol. 5, *2011 Updated Solutions Report*)

63. In July, 2012, ISO-NE updated its needs assessment once again, in light of new planning information, including the outcome of the Forward Capacity Auction #6 held on April 2-3, 2012, and newly approved changes to the New England system. ISO-NE also implemented a change in its approach to modeling energy efficiency measures in long-term planning studies. The effect of this change was to reduce the forecasted load by projected future energy efficiency measures. (CL&P 17, pp. 10, 11; CL&P 30, pp. 4-8)

64. ISO-NE determined that Interstate continued to be needed to comply with NERC, NPCC, and ISO-NE reliability standards and criteria. These conclusions are set forth in a draft report titled: *Follow-Up Analysis to the 2012 New England East-West Solution (NEEWS) Interstate Reliability Project Component Updated Needs Assessment* (the *2012 Follow-Up Need Report).* (CL&P Ex. 29; CL&P 30, p. 4 & Ex. A; ISO-NE 2; pp. 11-16; CL&P 29, p. 44; CL&P 30, pp. 6-12, 41)

65. ISO-NE further determined that Interstate as proposed remained the preferred transmission solution for the identified needs. This conclusion is set forth in a draft report titled: *Follow-Up Analysis to the 2012 New England East-West Solution (NEEWS) Interstate Reliability Project Component Updated Needs Assessment* (the *2012 Follow-Up Solution Report).* (CL&P 32, p. 41; CL&P 30, Ex. A, pp. 15, 16; ISO-NE 2, p. 16)

Deficiencies

66. The southern New England area includes Massachusetts, Rhode Island, and Connecticut and accounts for approximately 80 percent of the entire New England electrical load. The SNE load areas are concentrated in Boston and its suburbs, central Massachusetts,

Greater Springfield, Rhode Island, Greater Hartford and southwest Connecticut. (Council Admin. Notice No. 33, FOF # 24; CL&P 1, Vo. 1, pp. 2-10-2-12)

67. The "study area" in which the reliability problems to be addressed by Interstate were found included portions of the three southern New England states of Massachusetts, Rhode Island and Connecticut. The figure provided in ¶ 106 is a geographic map of the existing 345-kV system in the Study Area. (CL&P 16, pp. 15, 16)

68. The original SNETR studies published in 2008 identified, in addition to deficiencies that are now being addressed by projects other than Interstate, many thermal overload conditions and voltage violations that could occur on the Rhode Island system following contingency conditions; constraints on power flows on lines that traversed Massachusetts, Rhode Island, and Connecticut from east to west due to potential overloading of the lines and potential voltage violations at substations served by those lines; and constraints on power transfers into Connecticut needed to serve load under contingent conditions (CL&P 1, Vol. 1, pp. 2-19, 2-20; CL&P 1, Vol. 5, *2008 Needs Analysis*)

69. ISO-NE's *2011 Updated Needs Report* demonstrated widespread thermal and voltage violations under contingent conditions in the study area for the two study years tested (2015 and 2020). Thermal and voltage violations were demonstrated to occur under 2011 conditions in Rhode Island. Needs for additional transmission capacity (a) from western New England and Greater Rhode Island to eastern New England in 2011, (b) from eastern New England and Greater Rhode Island to western New England between 2017-2018 and (c) from eastern New England and Greater Rhode Island to Connecticut between 2014-2015 were shown. (CL&P 16, pp. 7, 8; CL&P Admin. Notice No. 25; CL&P 1, Vol. 5, *2011 Updated Needs Report*)

70. A deficiency in transfer capacity for moving power from west to east was documented for the first time in the *2011 Updated Needs Report.* This constraint became apparent when the extensive new generation constructed or committed for construction on the west side of the interface was modeled. (CL&P 1, Vol. 1, p. 2-33; CL&P 1, Vol. 5, *2011 Updated Needs Report*)

71. ISO-NE's *2012 Follow-Up Needs Report* confirmed the existence of the deficiencies identified in the 2008 and 2011 analyses, and the need to address them with transmission improvements. (CL&P 29, p. 44; CL&P 30, p. 3 & Ex. A; ISO-NE 2, pp. 12-14)

72. ISO-NE confirmed that the years of need for addressing these deficiencies are essentially unchanged, notwithstanding the changes in the assumptions for modeling system conditions made between the 2011 and 2012 studies. In particular, the year of need for improved west to east transfer capacity remains at 2011 – a year already past; the need for additional east to west transfer capacity across New England from east to west and into Connecticut remains at 2017 – 2018; and the need for improvements to avoid the potential of voltage collapse of the Rhode Island system is immediate. (Tr. 10, pp. 122-127, Oberlin)

73. Although the *2012 Follow-Up Needs Report* modeled the load-reducing effect of expected future energy efficiency investments, it did not model potential generator

retirements within the study period, notwithstanding that such retirements are likely. Thus, DEEP in its 2012 Integrated Resource Plan cites an economic analysis by Brattle Group projecting 938 MW of economic retirements in Connecticut by 2015, and 1,687 MW of additional capacity outside of Connecticut. And ISO-NE has stated that it is plausible that over 5,000 MW of capacity may permanently shut down over the coming decade. Any such retirements would make the needs for less-constrained transfers of power across New England and into Connecticut more acute. (CL&P 30, pp. 2, 11-13; Council Admin. Notice No. 41, p. 10-12; Council Admin. Notice No. 21, p. 2)

74. The needs for additional transfer capability across New England and into Connecticut are due in large part to the constraints on the existing transmission path along the Card Street - Lake Road - Sherman Road - West Medway corridor (Connecticut-Rhode Island-Massachusetts). Due to these constraints, in many of the modeled system conditions, there is surplus generation on one side of the New England East-West Interface that cannot be delivered to the other side of the Interface when it is needed following certain contingency events. Such undeliverable generation is said to be "locked-in." (CL&P 1, Vol. 1, p. 2-28; CL&P 16, p. 20)

75. Along the Card Street – Lake Road – Sherman Road – West Medway 345-kV path, there are several modern and efficient gas-fired generators, most constructed since electric restructuring, which provide about 2,481 MW of capacity. However, these generating stations may not all be dispatched at the same time because of a potential for overloading one or more of the lines making up the New England East-West Interface in the event of a contingency. For this reason, ISO-NE has refused requests from generators to site an additional 430 MW of capacity along this corridor. (CL&P 1, Vol. 1, pp. 2-29, 2-30)

76. The Card Street - Lake Road - Sherman Road - West Medway 345-kV lines serve as a "super highway" transporting power from Connecticut resources to serve load in southeast Massachusetts (including the Boston area) and transferring power from southeast Massachusetts resources to Connecticut load centers. At the same time, they interconnect large, efficient base-load generating stations to the transmission system, thus providing large "on ramps" to the "highway" between the Card Street and West Medway Substations. (CL&P 1, Vol. 1, p. 2-30; CL&P 16, pp. 22-25)

77. Because of constraints on the Card-Lake Road-Sherman Road-West Medway transmission path, the New England East-West Interface must shift according to whether power is flowing on along the path into Connecticut or into southeastern Massachusetts; and aggregate flows must be maintained at levels where overloads will not result following the contingent loss of any of its elements. (CL&P 1, Vol. 1, p. 2-30; CL&P 16, pp. 22-25)

78. For similar reasons, the Connecticut import interface is different than the Connecticut export interface. When Connecticut is exporting power to or through Rhode Island, the Lake Road Generating Station capacity is treated as being within Connecticut, to avoid overloading the Connecticut export interface. On the other hand, when Connecticut is importing power, Lake Road is treated as being outside of Connecticut, so that its power counts as an import into Connecticut, rather than as native capacity. (CL&P 1, Vol. 1, p. 2-31; CL&P 16, p. 25)

Improvements

79. The proposed Interstate project addresses all of the criteria violations documented by the *2008 Needs Analysis,* the *2011 Updated Needs Report* and the *2012 Follow-up Needs Report* by eliminating the thermal and voltage criteria violations and improving transfer capabilities. (ISO-NE 2, p. 15; CL&P 32, p. 41)

80. Interstate resolves the criteria violations that could lead to a voltage collapse of the Rhode Island system by providing two new 345-kV lines into the West Farnum Substation. (CL&P 32, p. 41; Tr. 10, pp. 117-118, Carberry)

81. Interstate resolves the thermal and voltage violations due to the limited transfer capability of the Card – Lake Road – West Farnum – Millbury corridor by: 1) building a new line from Millbury into West Farnum to provide a new import line into eastern New England that allows for the movement of power from western New England and Greater Rhode Island to reliably serve load in eastern New England during capacity deficiency conditions in the east; and 2) provides a line into Card Street Substation via Lake Road and West Farnum to provide a new import path into Connecticut and western New England to allow for the movement of power from eastern New England and Greater Rhode Island to reliably serve load in Connecticut and western New England during capacity deficiency conditions in the west. (CL&P 32, p. 41)

82. Interstate will provide adequate transmission transfer capability into Connecticut at least through the ten-year ISO-NE planning horizon ending in 2022. (CL&P 10, Q15)

Connecticut-Specific Benefits

83. Interstate is a "pure reliability project," that is designed to better integrate the electric supply systems of Connecticut, Rhode Island and Massachusetts for the benefit of the entire New England control area. (CL&P 1, Vol. 1, p. 2-36; Tr. 9, p. 64, Rourke, p. 109, Laskowski) Nevertheless, it provides Connecticut-specific reliability improvements and other benefits.

84. In particular, Interstate eliminates thermal overloads on transmission lines within Connecticut and on critical transmission lines in Massachusetts that provide power to Connecticut customers; and it eliminates the conditions that could cause a voltage collapse of the Rhode Island transmission system that could easily propagate into Connecticut. (Tr. 10, p. 112, Zaklukiewicz)

85. Interstate will benefit Connecticut electric ratepayers by improving Connecticut import capacity and providing an essential link to the new regional transmission network to facilitate access to lower cost, efficient resources along the Millbury – West Farnum – Lake Road – Card Street corridor. (Tr. 10, pp. 124-126, Zaklukiewicz)

86. Interstate will also provide an essential link to access renewable resources that may be developed in Northern New England. (CL&P 1, Vol. 1, pp. 2-37, 3-38; Tr. 9, p. 97, Rourke)

87. Interstate will significantly increase Connecticut's import capability, which has both reliability and economic benefits. (CL&P Vol. 1, p. 2-36) Presently, of the New England states, Connecticut is the least able to import power to supplement its internal supply resources. Connecticut will only be able to import about 33% of its peak load even with GSRP in service. (CL&P 1, Vol. 1, p. 2-36).

88. Increased import capability will provide a capacity margin that will both provide "insurance" against future Connecticut generator retirements – whether due to economics or unforeseen sudden events - and to allow for building new, more efficient generation with lower emissions at the sites of generators that are taken out of service (repowering). (CL&P 1, Vol. 1, p. 2-37; Tr. 10, p. 112, 113, Zaklukiewicz)

Lake Road Generating Units

89. The Lake Road Generating Plant, located in Dayville, CT, consists of three independent combined cycle units with a total summer capacity of approximately 750 MW. (Council Admin. Notice No. 26, p. 3)

90. Because of its location along one of the three major import lines into Connecticut and the manner in which it is connected to the Connecticut system, it has been determined to be electrically located outside of Connecticut. (Council Admin. Notice No. 26, p. 3, 4)

91. With the completion of Interstate and other system modifications that have already been implemented since the Lake Road Generating Plant was installed, Lake Road will be considered inside the Connecticut import interface from an electrical perspective. (Council Admin. Notice No. 26, p. 7)

92. Interstate is therefore expected to qualify the Lake Road capacity to be counted toward Connecticut's Local Sourcing Requirement (LSR). The LSR is the minimum amount of generating capacity that must be electrically located within an import-constrained load zone to meet system-wide resource adequacy requirements. (CL&P 16, p. 42)

Department of Energy and Environmental Protection

93. In its 2012 Integrated Resource Plan (IRP), DEEP projects that there will be adequate resources in Connecticut to comply with its LSR well beyond 2022, even if all fossil steam generation units in Connecticut retired, if "the various components of the planned New England East-West Solution (NEEWS) transmission project will be completed." The IRP further notes that "The NEEWS project is planned to address several transmission security reliability issues, and it will also support local resource adequacy in Connecticut as a side benefit." (Council Admin. Notice No. 41, pp. 11, 14)

94. In its June 21, 2012 comment letter to the Council (Hearing Program, I.E.3), DEEP states in part, with respect to the need for Interstate:

> For Connecticut's review, as well as for ISO-NE, the Interstate Reliability Project has been relied upon to ensure that Connecticut, and the region, have sufficient resources to meet reliability requirements...DEEP has ...included the project in the "base case" for the 2012 Integrated Resource Plan (IRP). Moreover, the

inclusion of Lake Road as a Connecticut resource has been used in IRP's base case modeling for resource adequacy outlooks since the 2010 IRP.

In conclusion, DEEP supports the need for this project and believes it deserves Siting Council approval.

(*Id.*, p. 2)

III. PROJECT ALTERNATIVES

<u>System Alternatives</u>

Non-Transmission Alternatives

95. One non-transmission alternative is no action, i.e., no improvement of the electric supply system. The "no action" alternative would not eliminate violations of national and regional reliability standards and criteria and would be inconsistent with ISO-NE's determination that Interstate is needed to ease constraints on transfers of power. And, with no action, thermal and voltage violations in Rhode Island would continue and be exacerbated by future power demand increases. Finally, the SNE electrical system would lack the long-term flexibility to dispatch existing and future generation resources efficiently and reliably. (CL&P 1, Vol. 1A, p. 12-1; CL&P 17, p. 45)

96. The other potential non-transmission alternatives are additions of resources in Massachusetts, Rhode Island, and Connecticut. These could potentially be supply resources, such as new generation; demand resources, such as energy efficiency measures or voluntary load interruptions; or combinations of both. (CL&P 31, pp. 2-4; CL&P 1, Vol. 5, *ICF Report*; CL&P 1, Vol. 1A, pp. 13-32, 13-33; Tr. 9, pp. 27-39, Rose)

97. However, there is no feasible and practical non-transmission alternative that would meet the multiple regional reliability needs that Interstate is designed to meet. In addition, any hypothetical non-transmission alternative that could be considered would be unprecedented in scope, immensely costly, difficult or impossible to implement, and less flexible and robust in operation than Interstate. (CL&P 31, pp. 2-4; CL&P 1, Vol. 5, *ICF Report*; CL&P 1, Vol. 1A, pp. 13-32, 13-33; Tr. 9, pp. 27-39, Rose)

Transmission Alternatives

98. In its *2008 Options Analysis*, the ISO-NE Working Group identified five options as meeting the basic performance requirements that had been identified in the 2008 *Needs Analysis* for the Interstate Reliability Project component of NEEWS - strengthening the ties between the SNE states and increasing the ability to move power between eastern and western New England and into Connecticut. The options were:

    a. Option A: A 345-kV transmission line from the Millbury Switching Station in Millbury, Massachusetts to the West Farnum Substation and then to the Lake Road Switching Station in Killingly, Connecticut, terminating at the Card Street Substation in Lebanon, Connecticut. (This is the basic Interstate configuration.)

b. A 345-kV transmission line from the West Farnum Substation to the Kent County Substation in Warwick, Rhode Island [now part of RIRP] and then to the Montville Substation in Montville, Connecticut (Option B);

c. A 345-kV transmission line from the Millbury Switching Station in Millbury, Massachusetts to the Carpenter Hill Substation in Charlton, Massachusetts and then to the Manchester Substation in Manchester, Connecticut, with a 345-kV line from Sherman Road Switching Station to West Farnum Substation (Option C);

d. A 345-kV transmission line from the Millbury Switching Station to the Carpenter Hill Substation and then to the Ludlow Substation in Ludlow, Massachusetts, with a line from the Ludlow Substation to the Agawam Substation in Agawam, Massachusetts to the North Bloomfield Substation in Bloomfield, Connecticut [now part of GSRP] and a 345-kV line from Sherman Road Switching Station to West Farnum Substation, and reconductoring/rebuilds of an existing 345-kV line segment from Sherman Road to the Connecticut/Rhode Island border and an existing 345-kV line from Ludlow Substation to Manchester Substation (Option D); and

e. An HVDC option (Option E) consisting of a new 1,200 MW high-voltage direct-current tie between the Millbury Switching Station in Massachusetts and the Southington Substation in Connecticut.

The Working Group did not consider the cost, constructability or routing aspects of each option in this initial analysis. (CL&P 1, Vol. 1A, pp. 13-3, 13-4)

99. In the *2008 Solution Report*, the Working Group considered two configurations for Option C, called C-1 and C-2. For most of its length, Option C-1 would have been aligned on a new ROW parallel and adjacent to Interstate 84 in southern Massachusetts and Connecticut. Due to developments adjacent to Interstate 84, Option C-1 was found to be difficult to construct and extremely costly. Option C-2, involving the use of existing transmission line ROWs between the Carpenter Hill, Ludlow, and Manchester Substations, was carried forward for further evaluation. (CL&P 1, Vol. 1A, p. 13-8)

100. The Working Group eliminated Option E, the HVDC option, based on technical disadvantages and high cost. Option D was found to be impractical in the form envisioned in the *2008 Options Analysis*. It turned out to be more practical to add a new 345-kV line between Ludlow and Manchester, rather than to rebuild the existing line. With that modification, Option D was virtually indistinguishable from Option C, except for its new line connection to Ludlow Substation. The Working Group then found that Option E and Option B had distinct technical or performance disadvantages and provided no cost advantage. Option A's performance in computer simulations was equal to or somewhat better than Option C-2's performance in all tested categories. (CL&P 17, pp. 52-53; CL&P 1, Vol. 5, *2008 Solutions Report*)

101. To address the enhanced need identified in the *2011 Needs Re-Analysis*, the Working Group reconsidered, and in some cases, redesigned the options originally evaluated in 2008. These analyses affirmed the original conclusions that eliminated Options B, C-1, D, and E based on cost and/or system performance. Both Option A and Option C-2 were redesigned to meet the updated needs requirements; with the incorporation of modifications to address these needs, four variants of Option A (designated A-1 through

A-4) and a revised version of Option C (designated Option C-2.1) were identified. After further investigations, a variation of Option A, known as Option A-1 was selected as the preferred option in the *2011 Updated Solution Report*. The variation reflects additions to the original (2008) Option A only in Rhode Island and Massachusetts. (CL&P 1, Vol. 1A, pp.13-9 to 13-11, 13-22, 13-23, 13-32; CL&P 1, Vol. 5, *2011 Updated Solutions Report*)

102. The preferred solution for the Interstate project, Option A-1, provides the most system benefits of all of the options and was less expensive compared to Option C-2.1, which was the best performing of the other options. (CL&P 1, Vol. 1A, p. 13-32; CL&P 1, Vol. 5, *2011 Updated Solutions Report*, p. 136; CL&P 32, p. 41)

103. The environmental effects of all four of the A options within Connecticut would be identical because the Connecticut construction is the same in all options; however, Option A-1 was found to have fewer adverse environmental effects, as compared to the other A Options, based on a comparison of their effects in Rhode Island and Massachusetts. (CL&P 1, Vol. 1A, p. 13-32; CL&P 1, Vol. 5, *2011 Updated Solutions Report*, pp. 131, 132)

104. In the power-flow simulations that demonstrate the need for the proposed transmission improvements, there are thermal overloads on 115-kV lines located in Connecticut in the event of contingencies that involve the loss of the existing 345-kV line from Card Street to Lake Road. When these contingencies occur, power flowing on the 345-kV bulk-power system automatically redistributes to the lower capacity 115-kV lines, resulting in loads above the emergency rating of the lines. Those specific overloads could be addressed by rebuilding the overloaded lines to increase their current carrying capacity, and thus their emergency ratings (assuming available ROW and acceptable environmental impact.) However, that approach would do nothing to address the many other criteria violations that Interstate resolves, and would not provide equivalent system benefits, such as qualifying the Lake Road Generating Plant as electrically in Connecticut. (Tr. 9, pp. 55-66, Oberlin; Tr. 10, pp. 114, 115, Zaklukiewicz)

105. It is better engineering practice and more cost-effective to implement a 345-kV solution to accommodate power flows resulting from contingencies on the 345-kV bulk power system, rather than to attempt to upgrade elements of the 115-kV system to support such loads. (Tr. 10, pp. 114, 115, Zaklukiewicz)

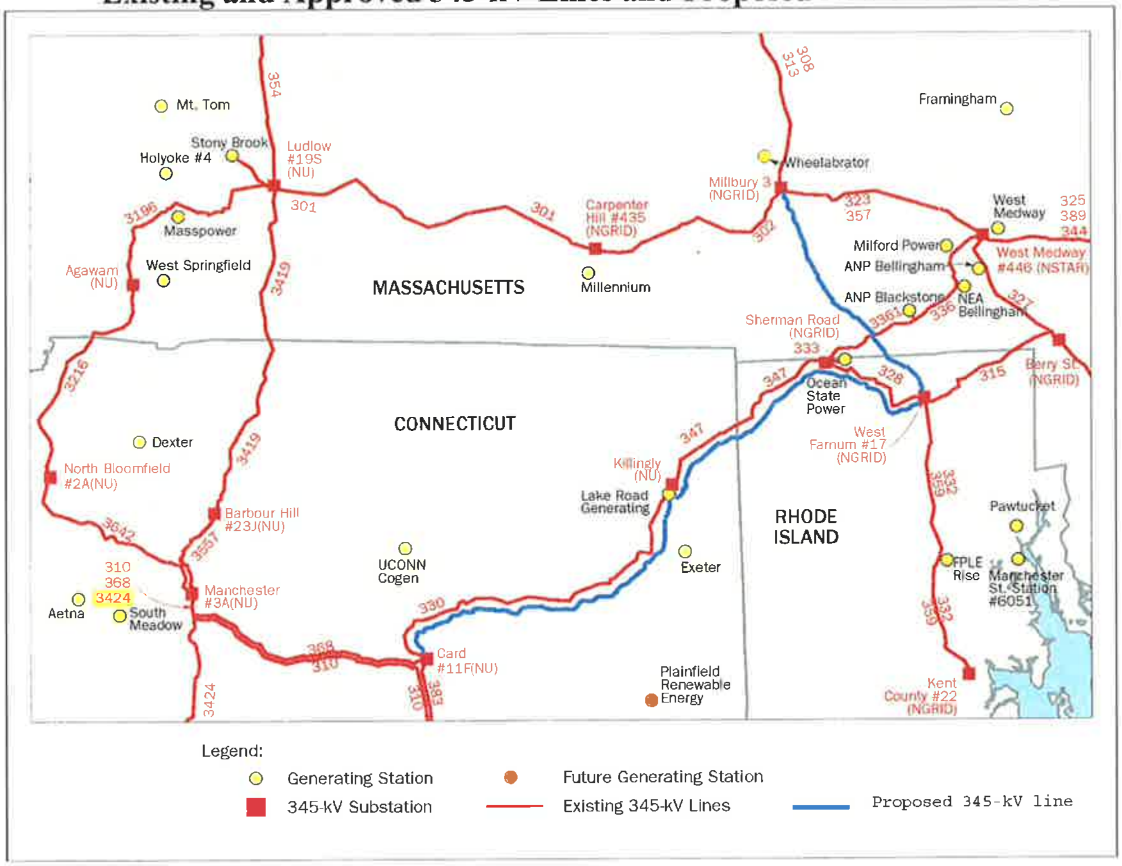
IV. PROJECT ROUTE AND DESIGN

<u>The Entire Interstate Project</u>

106. Interstate would involve the construction and operation of new overhead 345-kV lines over approximately 75 miles within Connecticut, Rhode Island and Massachusetts, located predominantly within existing transmission line ROWs. These lines would connect CL&P's Card Street Substation in Lebanon, Connecticut, CL&P's Lake Road Switching Station in Killingly, Connecticut, National Grid's West Farnum Substation in North Smithfield, Rhode Island, and National Grid's Millbury Switching Station in Millbury, Massachusetts. Interstate would also include equipment additions and

upgrades to these two substations and two switching stations. Refer to the following figure:

Existing and Approved 345-kV Lines and Proposed New 345-kV Line



(CL&P 17, p. 5)

107. The 345-kV lines shown as "existing" are those that will be in place before the Interstate lines are constructed. These include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, and the Manchester to Meekville Junction Project, which are now under construction. (CL&P 1, Vol. 1, p. 1-2; CL&P 17, pp. 4, 5)

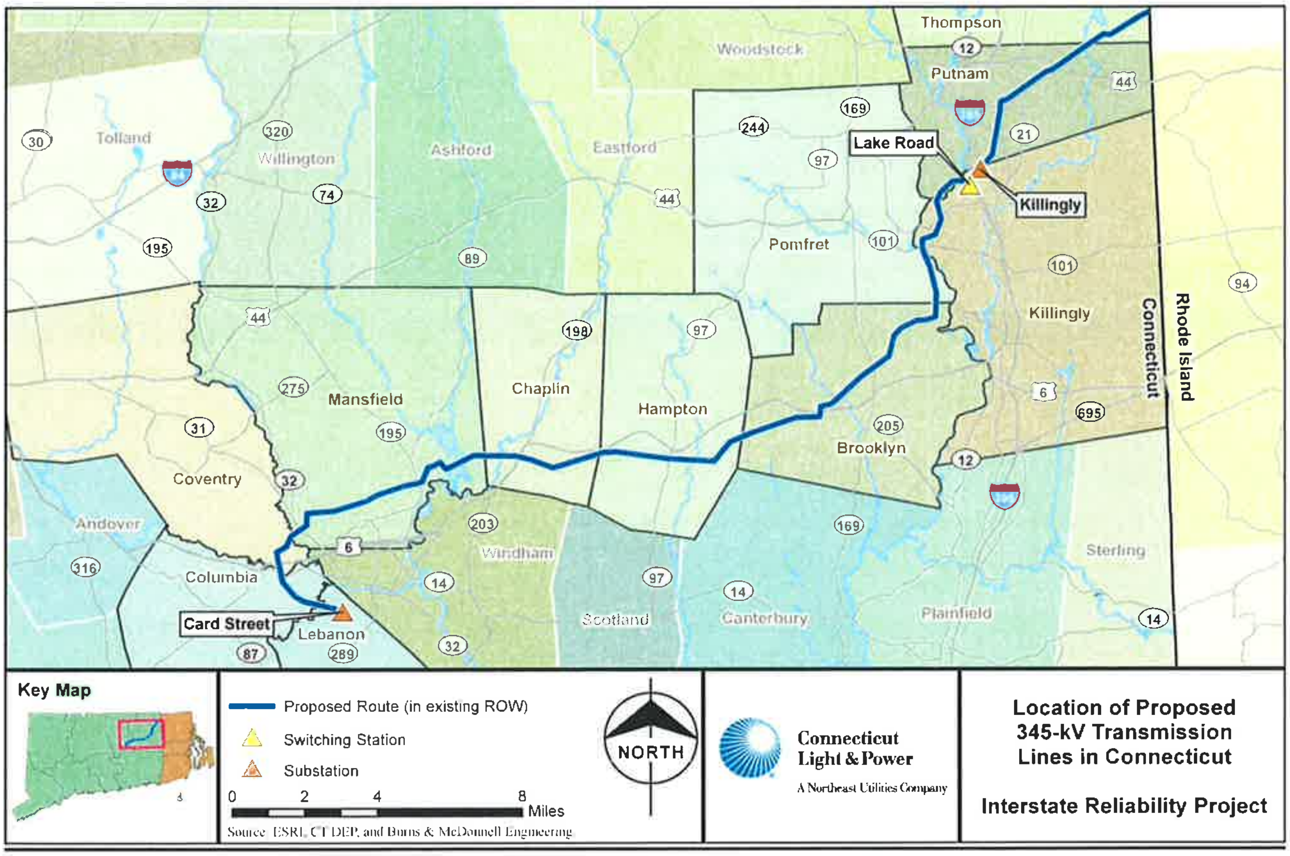
108. The new 345-kV transmission lines would extend through, but would electrically bypass, CL&P's Killingly Substation in Killingly, Connecticut, and would pass by Narragansett Electric's Sherman Road Switching Station in Burrillville, Rhode Island. (CL&P 1, Vol. 1, p. 1-2)

The Connecticut Portion of Interstate

109. The portion of Interstate proposed to be constructed in Connecticut (the Project) would consist of two 345-kV transmission lines in series that would begin at Card Street Substation in Lebanon, Connecticut and extend to the Lake Road Switching Station in Killingly, Connecticut (the 3271 Line); from there to the Lake Road Switching Station to the Connecticut/Rhode Island border in Thompson, Connecticut (the 341 Line) and then

into Rhode Island. Several potential variations to this route were also evaluated. Refer to the following figure. (CL&P 1, Vol. 1, p. 1-7)

(Figure ES-2 from CL&P 1, Vol. 1, p. ES-4)



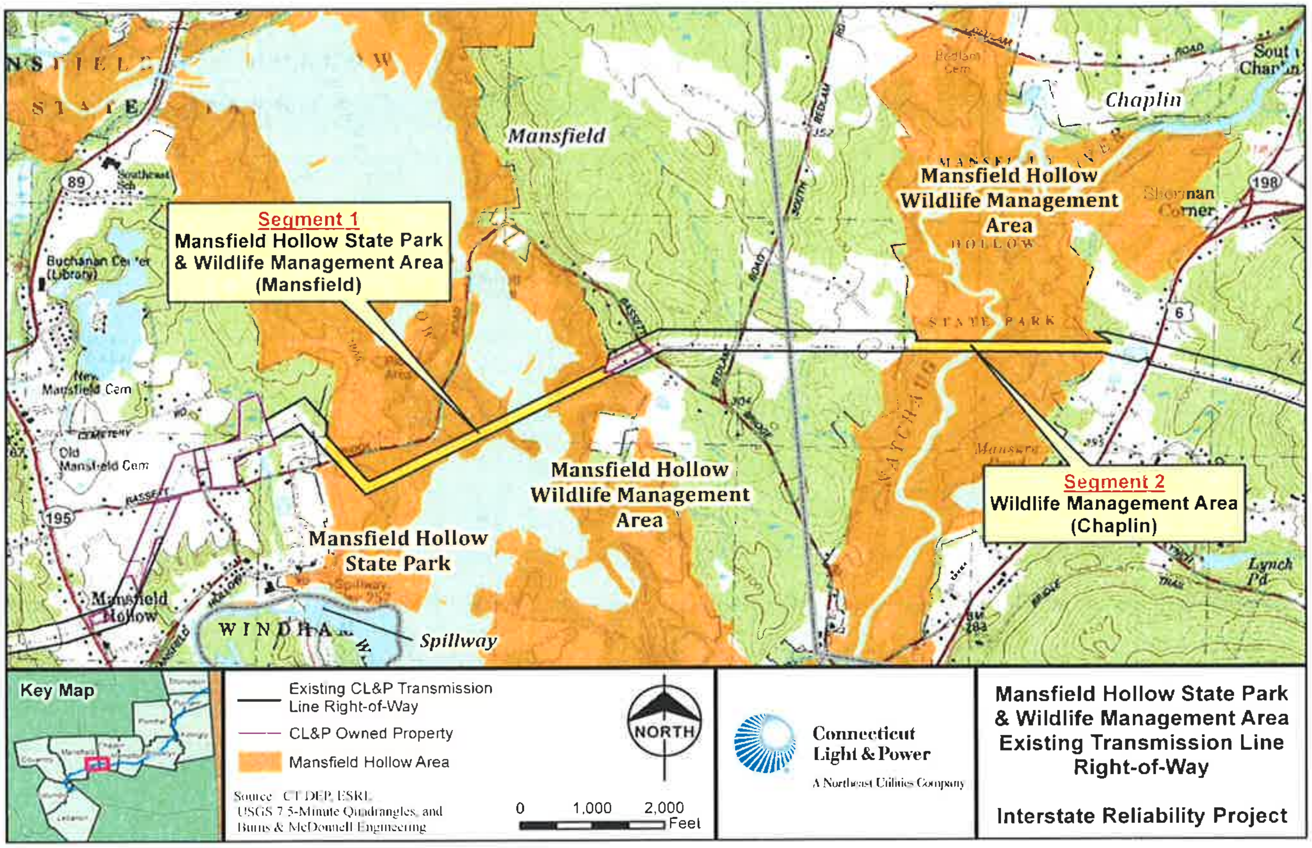
Federal Lands in Mansfield and Chaplin (the Mansfield Hollow Segments)

110. Two non-contiguous segments (referred to as Segment 1 and Segment 2) of the proposed Project route extend across federally-owned property in the area of Mansfield Hollow and would follow CL&P's existing ROWs where the ROW is 150 feet wide. Due to needed conductor separations, this ROW cannot accommodate the new 345-kV transmission line alongside the existing 345-kV line, which is centered within the ROW. The federally-owned property is managed by the U.S. Army Corps of Engineers (USACE) and is leased to the DEEP. (CL&P 1, Vol. 1, pp. ES-31 to 33; pp. 1-10 to 1-12; Section 10; Vol. 9, Ex. 2; CL&P 17, p. 25)

111. Because CL&P's eminent domain powers do not extend to federal land, any widening of these ROW segments can only occur through a voluntary grant by the USACE. CL&P has been coordinating with the USACE and is in negotiations with the USACE concerning a voluntary conveyance of additional ROW along both Segments 1 and 2 of the federal lands, and the ultimate configuration of the new line on these segments of ROW is entirely dependent on the outcome of these negotiations. (CL&P 1, Vol. 1, pp. 1-11 to 1-12; CL&P 17, p. 25)

112. Segment 1 is an approximately 0.9-mile segment in Mansfield that traverses Mansfield Hollow State Park, including an approximately 600-foot span of Mansfield Hollow Lake, as well as portions of the Mansfield Hollow Wildlife Management Area (WMA) near a Flood Control Levee Trail and on the eastern side of the lake. Segment 2 is an approximately 0.5-mile segment that traverses another portion of the WMA across and in the vicinity of the Natchaug River in Chaplin. Refer to the following figure. (CL&P 1, Vol. 1, p. ES-31, pp. 1-11 to 1-12, Section 10 Appendix 10B Cross-Sections; Vol. 9, Ex. 2A Minimal ROW Expansion Option; CL&P 17, pp. 25-26)

(Figure ES-5 from CL&P 1, Vol. 1, p. ES-32)



113. CL&P has discussed options for aligning the new 345-kV transmission line across federal lands in Mansfield Hollow with the USACE and DEEP since 2007. CL&P must demonstrate that the additional easement represents the least environmentally damaging practical alternative. (CL&P 1, Vol. 1, pp. 10-9 to 10-12; CL&P 17, p. 26)

114. CL&P proposed three options to the USACE for the new 345-kV line across the Mansfield Hollow federal properties: an 11-Acre ROW Expansion Option (also known as the Matching Structure Option), the No ROW Expansion Option, and the Minimal ROW Expansion Option (also referred to as the 4.8-Acre or 5-Acre ROW Expansion Option), each of which would involve different ROW widths and overhead transmission line configurations. These three options were presented in CL&P's Supplemental MCF and included in CL&P's Application to the Council. However, because the 11-Acre "Matching Structure Option" represented the least cost of the three options, CL&P incorporated this configuration into the proposed Project route included in the

Supplemental MCF issued in July 2012. (CL&P 1, Vol. 1, Section 10; Vol. 9, Ex. 2 and Ex.2A; CL&P 17, pp. 25 to 27, CCM-6)

115. As a result of the Supplemental MCF consultation process, CL&P received no substantive comments indicating a preference for one configuration option over another. Accordingly, in September 2011, CL&P filed a request for a grant of additional easement, amounting to 11 acres, from the USACE New England District's Real Estate Division for the construction, operation, and maintenance of the new 345-kV transmission line across the Mansfield Hollow Areas. The 11-Acre Easement Expansion Option also was incorporated into the proposed Project route presented in the Application to the Council. (CL&P 1, Vol. 1, pp. 1-10 to 1-12; 10-1 to 10-3; CL&P 17, p. 26; CL&P 15, Q. 38)

116. In February 2012, the DEEP notified the USACE of a preference for the Minimal ROW Expansion Option due to comparatively fewer impacts to water resources along the Chaplin segment of the ROW. The USACE also expressed a preference for this option during a field review conducted on February 29, 2012. Therefore, CL&P modified its request to the USACE for a grant of easement to reflect the use of the Minimal ROW Expansion. In addition, CL&P requested that the 11-Acre ROW Expansion Option be eliminated from consideration by the Council. CL&P now proposes the Minimal ROW Expansion Option, which is the USACE's choice, as the preferred configuration in Mansfield Hollow. (CL&P 15, Q. 38; CL&P 17, pp. 28-29 and CCM-8; DEEP Comments dated June 21, 2012, p. 4; Tr. 10, pp. 161-162, Carberry)

117. In correspondence to the Council in June 2012, the DEEP indicated that either the 11-Acre Expansion Option or the Minimal ROW Expansion Option would be acceptable. The DEEP stated that the No ROW Expansion Option is the least desirable due to the greater number of taller structures and the additional disturbance of reconstructing the existing line. (DEEP Comments dated June 21, 2012, p. 4)

118. The Minimal ROW Expansion Option would cost about $1.3 million more than the 11-Acre ROW Expansion Option. The No ROW Expansion Option would add about $16 million to the cost of the Project. The estimated costs for the Minimal ROW Expansion and the 11-Acre ROW Expansion exclude the costs for the acquisition of the expanded easement from the USACE. (CL&P 1, Vol. 1, p. 10-38 footnote 6, p. 10-39; CL&P 17, pp. 27, 28)

119. As part of the analysis of CL&P's request for the easement expansion in Mansfield Hollow, the USACE will issue an Environmental Assessment (EA) that reviews the potential environmental effects of the additional easement area to confirm consistency with the National Environmental Policy Act. In May 2012, CL&P, as the applicant to the USACE, submitted a draft EA regarding the Mansfield Hollow easement expansion to the USACE. The USACE has not yet acted on CL&P's request for an additional easement width. CL&P anticipates a decision from the Real Estate Division by the end of 2012, after the record in this Docket will have closed. (CL&P 17, pp. 26, 27; Tr. 6, pp. 55-60, Mango; Tr. 10, p. 163, Carberry)

The Hawthorne Lane ROW Shift in Mansfield Proposed By Landowners

120. In 2008, the owners of four properties accessed from a cul-de-sac on Hawthorne Lane in Mansfield requested that CL&P shift the existing ROW to avoid tree-clearing and limit visual effects from construction of the new line within CL&P's existing easement (Hawthorne Lane ROW Shift) (CL&P 17, pp. 30-31) This shift would eliminate an angle in the existing ROW and in the existing and proposed new lines, which would result in the ROW and lines being moved away from their homes and over the cul-de-sac, and the preservation of an existing tree screen between their homes and the lines. (CL&P 17, pp. 31, 32, Attachment CCM-8; Tr. 10, p. 131, Carberry)

121. The Hawthorne Lane ROW Shift would also reduce already low magnetic fields at the Hawthorne Lane homes. Accordingly, CL&P evaluated the Hawthorne Lane ROW Shift alternative in its EMF Field Management Design Plan, in which Hawthorne Lane is designated "Focus Area C." (CL&P 17, pp. 33, 54-56; CL&P Ex. 1, Vol. 1, Appendix 7B, pp. 7B-6-20, 27-30)

122. CL&P is not proposing the adoption of the Hawthorne Lane ROW Shift alternative. However, it has worked extensively with the Hawthorne Lane landowners in order to develop the information necessary to present the Shift to the Council for its consideration; and CL&P has identified several conditions that would be required for it to consider the Hawthorne Lane Shift to be a feasible and practical route variation that it would accept. (CL&P 17, pp. 30-33)

123. The conditions that CL&P identified as necessary for the Hawthorne Lane ROW Shift alternative to be practical and feasible include the landowners' performance of their proposal to convey to CL&P an easement for the relocated ROW for no consideration other than a release of the existing easement that would be replaced by the new one. In order to make such a conveyance, the landowners must obtain from the Town of Mansfield a release of a conservation restriction on land to which the ROW is to be relocated, in exchange for the grant of a replacement conservation easement on land now burdened by the existing easement. However, in order to convey the required rights to each of CL&P and the Town, the landowners must obtain the subordination of certain existing mortgages to the new CL&P easement and to the new conservation restriction. (CL&P 17, pp. 31-33) The Town has agreed to the relocation of its conservation easement, provided that the required subordinations are provided. (CL&P 17, p. 32, Tr. 10, p. 134, Carberry)

124. The incremental Project cost of adopting the Hawthorne Lane ROW Shift alternative would be approximately $1,800,000. Relocating the existing ROW would require outages on the existing line and the erection and use of temporary structures. However, due to the existing line layout on this segment of ROW, the alternate could be implemented with minor additional steps during construction, instead of a complex process requiring extended line outages. (CL&P 1, Vol. 1, Appendix 7B-19, Table 8; Appendix 7B-28, CL&P 17, p. 30; Tr. 10, p. 132, Carberry)

125. As of the close of testimony in this Docket, the Hawthorne Lane landowners had not been able to obtain all of the mortgage subordination commitments necessary to enable the

required ROW shift to be made. Their attorney had reported to CL&P that application packages requesting the outstanding subordinations had been submitted, and those applications were pending. (Tr. 10, pp. 135, 136, Carberry)

345-kV Transmission Lines

126. The Connecticut portion of Interstate would include new 345-kV overhead transmission lines extending between Card Street Substation, Lake Road Switching Station and the Connecticut / Rhode Island border. The new lines will follow CL&P ROWs across portions of 11 towns in northeast Connecticut. (CL&P 1, Vol. 1, pp. 1-7 to 1-12, 3-1 to 3-3, Vol. 9, Ex. 1 and 2)

127. The new transmission lines would extend in overhead configurations for about 36.8 miles adjacent to existing CL&P transmission lines including (a) 345-kV Lines 330, 3348 and 347, (b) 69-kV Line 800/900 or (c) 115-kV Lines 1505 and 1607. (CL&P 1, Vol. 1, pp. 3-2)

128. Approximately 96% or 35.4 miles of the Project would be located entirely within existing CL&P ROWs that are approximately 250 to 400 feet wide. (CL&P 1, Vol. 1, pp. 1-9, 3-3)

129. Additional or updated easement rights are required on fewer than 10 properties. (CL&P 1, Vol. 1, p. 3-10)

130. The only locations where new easements for additional ROW width would be required to accommodate the Project, as proposed, are within the federally-owned properties in the Mansfield Hollow area (towns of Mansfield and Chaplin) where, for two segments totaling 1.4 linear miles, the existing ROW is only 150 feet wide. (CL&P 1, Vol. 1, p. 3-10)

131. The ROWs on which the Project would be constructed extend through areas that are predominantly rural and sparsely settled. (CL&P 1, Vol. 1, pp. 5-56 – 5-69)

132. The new lines would consist of three sets of conductors, each comprised of a bundle of two 1,590,000 circular mil (1,590-kcmil) aluminum conductors with a steel core support (ACSS). Between Card Street Substation and Lake Road Switching Station, two lightning shield wires with optical glass fibers (OPGW) for communication would be installed. Between Lake Road Switching Station and the state border, one 19 No. 10 Alumoweld lightning shield wire and one OPGW would be installed. (CL&P 1, Vol. 1, p. 3-3)

133. The proposed base line design supports for the new lines would generally be steel or laminated wood H-frames with a typical height of 85 feet. (CL&P 1, Vol. 1, p. 3-4)

134. Across the federally-owned properties in the Mansfield Hollow Areas, the proposed design would be steel monopoles with vertically-configured conductors. (CL&P 17, pp. 25-27)

135. In the Town of Columbia (along the portion of CL&P's ROW between State Route 66 and the Hop River), one new steel pole (double-circuit) structure would be installed in CL&P's existing 69-kV double-circuit 800/900 line to eliminate a 900-foot span and to achieve the necessary clearances for high wind conditions, once the 345-kV line is installed. (CL&P 1, Vol. 1, p. 3-5, Vol. 9, mapsheet 3; Vol. 10, Plan & Profile Sheet 3 of 3, Card Street S/S to Babcock Hill Junction)

136. Guy wires on approximately 33 existing 345-kV transmission line structures and two 115-kV transmission line structures would be relocated to facilitate construction of the new 345-kV lines. (CL&P 10, Q-CSC-008)

137. With the proposed new lines, there will be 15 different combinations of existing and new line configurations and ROW widths along the Connecticut portion of the Interstate ROW. The locations of these different configurations are designated as "segments" or "Cross Sections" of the ROW. There are 15 different major ROW Cross Sections, including three EMF Best Management Practice Focus Areas for which CL&P has recommended or identified a line configuration with structures different than the base-line H-frame structure. No additional ROW is required except for the Mansfield Hollow Areas. (CL&P 1, Vol. 1, pp. 3-13 to 3-19)

138. The 15 segments, the ROW mileage, the ROW widths and the proposed new structure types are:

Cross Section (Municipality)	Approx. ROW Mileage	Existing ROW Width (Feet)	New Structure Type
1. Lebanon, Columbia & Coventry	2.8	350	Steel or wood-pole H Frames
2. BMP. Coventry & Mansfield	2.3	300	Steel monopole, delta
2 Coventry & Mansfield	3.3	300	Steel or wood-pole H Frames
3. Mansfield Hollow State Park, Lake & WMA, Mansfield	1.0	150 (0.9 mile)* 300 (0.1 mile)	Steel monopole, vertically-configured
4. Mansfield & Chaplin	0.8	300	Steel or wood-pole H frames
5. Mansfield Hollow WMA, Chaplin	0.5	150*	Steel monopole, vertically-configured
6. Chaplin, Hampton & Brooklyn	12.6	300	Steel or wood-pole H frames
6 BMP. Brooklyn	1.0	300	Steel monopole, delta

7. Brooklyn Pomfret & Killingly	2.3	360	Steel or wood-pole H frames
8. Killingly & Putnam	2.6	360	Steel or wood-pole H frames
9. Killingly	0.2	250	Steel monopoles, vertically configured
10. Killingly	0.7	400	Steel or wood-pole H frames
11. Killingly & Putnam	1.7	340	Steel or wood-pole H frames
12. Putnam & Thompson	4.5	300	Steel or wood-pole H frames
12 BMP. Putnam	0.6	300	Steel or wood-pole H frames

* Proposed ROW expansion across the federally-owned properties in Mansfield Hollow is 25 additional feet in Mansfield and 35 additional feet in Chaplin. (CL&P 1, Vol. 1, p. 3-19, 10-27 [Minimal ROW Expansion Option], Vol. 9, Ex. 1 and 2A; Vol. 10)

139. While CL&P identified "low cost" BMP configurations for portions of Cross Sections 2 and 6, it acknowledged that baseline H-frame construction may be preferable in those ROW sections, due to its lower cost, lower visibility, and the limited effectiveness of the alternate design in achieving additional magnetic field levels reduction, beyond that achieved by best-phasing the new line on H-frame structures. (CL&P 17, pp. 51-60)

140. While CL&P identified a BMP configuration for a portion of Cross Section 12 in its Application, it recommended against the use of that configuration in its testimony at the hearing. (Tr. 10, pp. 138-143, Carberry)

141. There may be minor variations within these segments, such as the Hawthorne Lane Shift alternative and the Highland Ridge variation. (CL&P 17, p. 33; CL&P 24)

142. The typical height for the new structures would be 85 feet except to the extent that taller structures are selected for Segments 2 BMP (110 feet), 3 (125-155 feet in Mansfield Hollow, Mansfield), 5 (115-135 feet in Mansfield Hollow, Chaplin), 6 BMP (110 feet) and 9 (130 feet) and 12 BMP (110 feet). (CL&P 1, Vol. 1, pp. 3-19, 10-29 [Minimal ROW Expansion Option], 7B-31)

143. To achieve better compatibility with the use of the Highland Ridge Golf facility as a driving range, CL&P has agreed to construct the new line using vertically-configured conductors on one structure approximately 125 feet tall. (CL&P Ex. 16, pp. 34, 35; CL&P Ex. 24; Tr. 4, pp. 39-43, Case; Tr. 6, p. 13, Case)

Cost

144. The estimated capital cost for the new 345-kV transmission lines for the Project is $193 million. This total includes an estimate of approximately $4.2 million is for EMF BMP line configurations in Focus Areas A and D, but no allowance for Focus Area E, where the BMP 12 configuration would add $4.3 million to Project cost, or for the Hawthorne Lane Shift in Focus Area C, which would add approximately $1.8 million to Project cost. (CL&P 1, Vol. 1, p. 3-24; CL&P 17, p. 18)

Schedule

145. Construction of the new 345-kV transmission lines would occur during the construction period of 2014-2015. (CL&P 1, Vol. 1, p. 8-1)

Substation and Switching Station Modifications

146. To interconnect the new 345-kV transmission lines with the existing transmission system, modifications would be required at two existing CL&P substations and one switching station. None of these modifications would require the acquisition of any additional property from private landowners. All modifications will occur within the existing developed (fenced) areas. (CL&P 1, Vol. 1, p. 3-21)

147. The Card Street Substation is located in the Town of Lebanon within a 150-acre property owned in fee by CL&P, which has frontage on Card Street. The existing substation occupies approximately 10 acres of the property. A substation has been in operation at the site since 1960, with 345-kV equipment in operation since 1969. In order to interconnect the new 345-kV line to the substation, the following facilities would be added: a new 345-kV transmission line terminal structure, three new 345-kV circuit breakers, lightning masts, four 345-kV disconnect switches, bus work and control cable trenches, three surge arresters, three coupling capacitor voltage transformers (CCVT), and one wave trap. New protection and control equipment would be installed within the existing relay/control enclosure, and some other work will occur to ensure that existing primary and backup protection and control equipment in the relay/control enclosure complies with requirements for proper separation. Several 345-kV disconnect switches will be replaced to increase their current ratings. (CL&P 1, Vol. 1, p. 3-21; CL&P 17, p. 11)

148. The tallest proposed structures to be constructed at Card Street Substation will be approximately 110 feet in height, consisting of the new line terminal structure and four new lightning masts. These are 15 feet lower than the height of the existing 330 terminal line structure, which has a total height of 125 feet, including the lightning mast. (CL&P 1, Vol. 1, p. 3-21; CL&P 17, p. 11)

149. The Lake Road Switching Station is located in the northwestern portion of the Town of Killingly, on private property off Alexander Parkway, and adjacent to the Lake Road Generating Station. Developed and interconnected in 2001, the switching station occupies an easement area of approximately 3.5 acres. The proposed Project would add

to the existing facilities: three 345-kV circuit breakers, six 345-kV disconnect switches, bus work, six surge arresters, ten CCVTs, four potential transformers, and new protection and control equipment within the existing control house. (CL&P 1, Vol. 1, p. 3-22; CL&P 17, p. 12)

150. The Killingly Substation is located in the northwestern portion of the Town of Killingly on CL&P's 29.4-acre property located adjacent to Tracy Road. Completed in 2006, the substation occupies approximately 5.6 acres. The proposed Project would require only the installation of two 345-kV transmission line terminal structures to support the new 345-kV line conductors as they pass over the substation. (CL&P 1, Vol. 1, pp. 3-22, 3-23; CL&P 17, p. 12)

151. The two proposed structures at the Killingly Substation will be approximately 110 feet high, and will be similar in appearance to the two existing line terminal structures. (CL&P 1, Vol. 1, p. 3-23; CL&P 17, p. 12)

Cost

152. The estimated capital cost for the Connecticut substation and switching station modifications is $25 million (CL&P 1, Vol. 1, p. 3-24)

Schedule

153. Construction of proposed substation and switching station modifications would occur during the construction period of 2014-2015. (CL&P 1, Vol. 1, p. 8-1; CL&P 17, pp. 18-19)

<u>Line Construction Process</u>

154. The overhead transmission line construction will occur in several stages and will generally consist of the following activities:

- Survey/marking of features
- Establishment of construction work areas and soil and erosion control measures
- Clearing
- Construction or improvement of access roads
- Work area preparation
- Excavation and construction of foundations
- Erection/assembly of new structures
- Wire stringing
- Testing, commissioning and restoration

(CL&P 1, Vol. 1, pp. 4-2 to 4-4; CL&P 17, p. 13)

155. To support the construction of the new 345-kV transmission lines, a combination of temporary storage areas, staging areas, crane pads for new transmission structure construction, pads for guard structures, and conductor pulling pads would be necessary, as follows:

- Temporary storage areas generally 2 to 5 acres in size will be needed to store construction materials, equipment and supplies, and for construction offices and parking. They would be located near active work locations and may be moved as Project construction progresses.

- Staging areas, generally less than 2 acres in area, would be used for temporarily stockpiling materials for transmission line construction (e.g., erosion and sedimentation control materials, poles and structure components, insulators and hardware, and construction equipment). Staging areas also may be used to temporarily stockpile materials removed from the ROW or used during the construction process, prior to off-site disposal. The number and proposed location of staging areas will be determined by the transmission line construction contractor.

- At each transmission line structure site along the ROW, a work area, referred to as a "crane pad" will be required to stage structure components for final on-site assembly and to provide a safe, level work base for the construction equipment used to erect the new structure. The size and configuration of a crane pad at a structure location would vary based on site-specific conditions. However, along the Project ROWs, a crane pad for a typical (tangent) structure is assumed to be 100 feet by 120 feet.

- Guard structures are assumed to require temporary work pads of approximately 50 feet by 80 feet, with an associated 20-foot-wide temporary access road.

- Conductor pulling sites, each approximately 50 to 100 feet wide by 100 to 200 feet long, would be established along the transmission line route, usually within the ROW. The selection of conductor pulling sites is based on various factors such as accessibility, terrain, angles within the line sections where the conductors would be pulled, length of conductors to be pulled, design load of the structures, and minimization of environmental effects.

(CL&P 1, Vol. 1, pp. 4-4 to 4-9, 4-22 to 4-23; CL&P 17, p. 14; CL&P 18, pp. 34-35)

156. To construct the new transmission lines, work crews must have access from public highways or private roads to each location on the ROWs where a structure will be located, both to build it and for future maintenance. Although it will not be necessary for all construction vehicles and heavy equipment to be able to travel everywhere along the ROW, vegetation clearing crews must access all areas of the ROW where vegetation removal is required either to construct the new 345-kV transmission lines or to remove trees that could grow to interfere with line operation. In addition, clearing crews will have to access some areas outside of the defined limits of clearing to remove "danger trees" that could pose risks to the 345-kV lines. (CL&P 17, p. 15)

157. Vegetation clearing would be required adjacent to the existing managed portions of CL&P's ROWs, as summarized in the following table:

Summary of CL&P ROW Widths, Existing Managed ROW Widths, and Proposed Vegetation Clearing Widths for New 345-kV Transmission Lines

Town	EXISTING CL&P ROWS			
	Cross-Section Reference (refer to Vol. 1, Appendix 3A and to Vol. 10)	**Total ROW Width (feet)**	**Width of Current Vegetation Management Area along ROW (feet, typical)**	**Estimated Width of New Vegetation Clearing* Required for Proposed 345-kV Transmission Lines (feet)**
Lebanon	XS-1	350	275	0
Columbia	XS-1	350	275	0
Coventry	XS-1	350	275	0
Coventry	XS-2 BMP	300	140	70
Mansfield	XS-2 BMP	300	140	70
Mansfield	XS-2	300	140	90
Mansfield	XS-3 (0.9 mile)	150	100	50 (includes vegetation removal in proposed 25-foot-wide expanded ROW)
Mansfield	Within XS-3 MRE (0.1 mile, but not depicted on XS)	300	140	90
Mansfield	XS-4	300	140	90
Chaplin	XS-4	300	140	90
Chaplin	XS-5 MRE	150	140	40 (includes vegetation removal in proposed 35-foot-wide expanded ROW)
Chaplin	XS-6	300	140	90
Hampton	XS-6	300	140	90
Brooklyn	XS-6	300	140	90
Brooklyn	XS-6 BMP	300	140	70
Brooklyn	XS-7	360	260	90
Pomfret	XS-7	360	260	90
Killingly	XS-7	360	260	90
Killingly	XS-8	360	345	0
Putnam	XS-8	360	345	0
Killingly	XS-9	250	250	0
Killingly	XS-10	400	385	0
Killingly	XS-11	340	210 (140 transmission line; 70 distribution line)	90
Putnam	XS-11	340	210 (140 transmission line; 70 distribution line)	90
Putnam	XS-12	300	140	90
Putnam	XS-12 BMP	300	140	80
Thompson	XS-12	300	140	90

*Note: Clearing refers to vegetation removal required for the Project within un-managed portions of CL&P's existing ROWs or – in the case of the USACE properties in Mansfield and Chaplin – also areas of expanded easement within which vegetation removal would be required using the Minimal ROW Expansion (MRE). Locations with "0" new clearing pertain to portions of the existing ROWs where the new 345-kV line would be aligned within areas where CL&P presently manages vegetation on a routine basis. To construct the new 345-kV lines, this managed vegetation will be removed as necessary. Within these ROW segments, some areas of forested and other vegetation, located in the center of the CL&P ROW, also would have to be removed.

(CL&P 1, Vol. 1, p. 4-13; Vol. 9, Ex. 2 and 2A (MRE); Vol. 10; CL&P 18, pp. 51-52, CL&P 23; Corrected pages 53 and 56 of CL&P 18)

158. Vegetation removal crews may use timber mats or equivalent to provide a stable base for clearing equipment when crossing wetlands along the ROW. Such "access routes" for clearing crews may extend into areas of the ROWs where other temporary or permanent access is not otherwise needed. Temporary access routes used by the clearing crews are assumed to involve a 20-foot-wide workspace. (CL&P 18, p. 34)

159. Construction vehicles will access work sites using defined on-ROW access roads, some of which already exist for the ongoing maintenance of the transmission lines that presently occupy the Project ROWs. As part of the Project planning, CL&P has identified the anticipated locations of on-ROW access roads. A detailed evaluation of access roads required for construction would be conducted and incorporated in the Project D&M Plan. Construction vehicles and equipment will use public roads to reach on-ROW access roads. (CL&P 1, Vol. 1, pp. 4-18 to 4-19; Vol. 9, Ex. 2, Vol. 11; CL&P 17, p. 15)

160. Along most portions of the Project ROWs, existing access roads (which are nominally 12 feet wide) have been established to provide ingress / egress for maintaining the existing CL&P transmission lines and ROWs. Most of these access roads have been in existence for approximately 40 years and will have to be improved, widened or otherwise modified to accommodate the modern heavy construction equipment that will be required to install the new 345-kV transmission lines. When existing access roads cannot be used to reach the new 345-kV structure locations, new on-ROW access roads will be developed. (CL&P 1, Vol. 1, pp. 4-18 to 4-19; Vol. 9, Ex. 2, Vol. 11; CL&P 17, p. 15)

161. Construction access roads along the Project ROWs (either new access roads or improvements to existing access roads along the ROWs) would typically be approximately 25 feet wide, with a minimum travel width of approximately 20 feet. These typical access road widths are based on analyses of the terrain (principally slope and wetlands) along the Project ROWs. For construction purposes, to account for the turning radii of large trucks and steep slopes, access roads would be wider in some areas. Typically, access roads must have grades of 10% or less to safely accommodate construction equipment. In certain locations, such as where slopes must be graded or equipment turning radii must be accommodated, access road travel-way widths will have to be wider. Temporary construction access roads would be brought back to the 12- to 16-foot width after construction. (CL&P 1, Vol. 1, pp. 3-10 to 3-11; CL&P 17, p. 15; CL&P 18, p. 34; Tr. 4, pp. 95, 142, Mango)

162. CL&P will follow its policies for construction and maintenance of transmission facilities on agricultural lands, which were made part of the record as an attachment to the pre-filed testimony of Edward Hill Bullard (Bullard 2). These policies require, among other things, the separation of excavated top soil and the restoration of top soil unmixed with subsoil. CL&P would also consult with the U.S.D.A. Natural Resources Conservation Service for restoration of agricultural lands. (Tr. 5, pp. 88-101, Johnson, Mango; Tr. 10, pp. 165-170, Carberry; Bullard 2, 3; Tr. 10, p. 169, Mango)

V. TRANSMISSION LINE ROUTE ALTERNATIVES

163. Before proposing the Project, CL&P identified and evaluated alternative transmission line routes and configurations for the new transmission lines, considering both overhead and underground cable systems in the context of routing objectives and route selection criteria. (CL&P 1, Vol. 1A, pp. 14-1 to 14-3)

Overhead Line Alternatives

164. There is no existing transmission ROW between the Card Street Substation in Connecticut and the West Farnum Substation in Rhode Island other than that proposed to be used for the Project. (CL&P 1, Vol. 1A, pp. 14-6, 14-7)

165. The development of a new transmission line ROW, not within or adjacent to any existing roads or other linear corridors, would require the acquisition of more than 500 acres for new utility easements; would result in environmental and land use impacts; would not conform to federal and state policies regarding the collocation of linear facilities; and would create a new linear corridor within the Quinebaug and Shetucket Rivers Valley National Heritage Corridor. (CL&P 1, Vol. 1A, pp. 14-9 to 14-10)

166. The use of existing pipeline and railroad ROWs for a new overhead transmission line is not practical because none of the existing pipeline or railroad ROWs extend directly between the Connecticut substation and switching station facilities and National Grid facilities that must be interconnected for Interstate. In addition, both the railroad and pipeline corridors are narrow and are bordered by land use development. The acquisition of additional ROW for the construction and operation of new overhead transmission lines would affect such land uses and would be excessively costly. (CL&P 1, Vol. 1A, pp. 14-10, 14-12, 14-16, 14-17)

167. Although there are several railroad corridors crossing northeast Connecticut, construction and operation of 345-kV lines along these corridors is not practical because none are located proximate to the Card Street Substation, Lake Road Switching Station, or National Grid's Rhode Island facilities; consequently, new "Greenfield" ROW would have to be acquired. Moreover, there is insufficient room for construction on or between the railroad ROWs and adjoining developments; thus, easements from private property owners would be required to construct and operate a new transmission line along the rail corridor as well. (CL&P 1, Vol. 1A, p. 14-16)

168. Highway ROWs, particularly limited access highways (e.g., U.S. Route 6, Interstate 395), also do not present a practical alternative for collocation of the transmission lines. The Connecticut Department of Transportation (CDOT) does not permit longitudinal collocation of transmission lines in its limited access highways, particularly if other routing options, such as the use of existing utility ROWs, are available. Thus, the construction and operation of the new transmission lines adjacent to highway ROWs would require additional easements from adjacent private landowners; easement acquisition would be difficult due to existing residential, commercial, and industrial development adjacent to the highway ROWs. (CDOT Comments dated February 23, 2012; Council Admin. Notice No. 43)

169. Locating the transmission lines along a highway would also entail significant construction difficulties and constraints, greater visual impacts as compared to those of construction along the existing electric utility ROWs, and unacceptable social effects associated with the need to remove homes and businesses. (CL&P 1, Vol. 1A, pp. 14-12 to 14-15)

Underground Line Alternatives

Technical Considerations

170. Underground High Voltage Alternating Current (HVAC) transmission systems consist of buried electric cables, splice vaults installed at specific intervals, and transition stations at each end. Transition stations typically occupy two to four acres of land and contain switching equipment necessary to isolate the underground cables from the overhead line conductors. Underground electric cables may be used in situations when overhead transmission lines are undesirable or impractical due to environmental, social, construction, or regulatory issues. (Council Admin. Notice No. 33, FOF # 115; CL&P 1, Vol. 1A, pp. 14-17)

171. Underground electric distribution lines are relatively easy to add to the existing distribution system, but adding underground transmission lines to the existing transmission system is more problematic. There are several differences between the technologies of overhead lines and underground cables for electric transmission:

a. Underground transmission cables are typically installed over short distances in urban environments with strong electrical sources. Underground cables installed over long distances or in suburban and rural settings require design consideration to prevent damage and disruptions to the transmission system and potential damage to customer equipment.
b. Underground 345-kV cables have a much lower current-carrying capacity than overhead 345-kV lines. Therefore, multiple underground cables are required to achieve the same power-transfer capacity as a 345-kV overhead line.
c. The capacitive charging currents of an underground cable system are significantly higher than those of overhead lines. These capacitive currents are also many times higher for 345-kV cables than 115-kV cables. For medium and long length underground 345-kV cable systems, compensation in the form of special switching devices and large shunt reactors may be required to prevent unacceptably high system voltages from disrupting power flows during normal operating conditions.
d. In transmission circuits with an underground segment (i.e., hybrid line), the special devices necessary for energizing and de-energizing the underground segments may affect the overall dynamics of power flow such that excessive voltages build up and damage the cable itself, other electrical equipment associated with the overhead portion of the system, and potentially customer equipment.
e. The special charging and dynamic characteristics of underground and hybrid systems mean that whenever underground cables are contemplated for use in a given location, special studies must be conducted to determine the maximum length of cable feasible to install without adverse effects on the New England transmission system overall.

(Council Admin. Notice No. 33, FOF # 116; CL&P 1, Vol. 1A, pp. 14-18 -14-22)

172. The complexity of underground transmission cables by themselves, and especially when integrated with overhead lines in "hybrid" systems, merits special attention to system reliability. (Council Admin. Notice No. 33, FOF # 117; CL&P 1, Vol. 1A, pp. 14-21, 14-22; CL&P 17, p. 65)

173. The failure of an underground cable results in extended repair time, because such a fault typically damages the cable. Following identification of the fault, the repair time for a cable can take weeks to complete, compared to hours or a few days for most overhead lines. For this reason and because of lower capacities of cables, a 345-kV underground circuit would be constructed with two cables per phase plus a spare set of cables that would be available if one set was out of service. (Council Admin. Notice No. 33, FOF # 118; CL&P 1, Vol. 1A, p. 14-23)

Constructability and Environmental Impacts

174. Transmission engineers now prefer cross-linked polyethylene (XLPE) cable technology over high-pressure fluid-filled technology (HPFF), at one time a standard technology, in large part because XLPE does not use insulating fluid, which can leak into the environment around the cables. (Council Admin. Notice No. 33, FOF #123)

175. The construction of a new 345-kV underground XLPE cable system would require a 40-60-foot-wide work area to accommodate the excavation of a trench for the duct bank for the cables, as well as access for construction equipment. Nine XLPE cables would be installed; six would be operational at any one time. (Council Admin. Notice No. 33, FOF # 119; CL&P 1, Vol. 1A, p. 14-29 to 14-30; CL&P 17, p. 67)

176. The construction and operation of underground transmission cable systems located outside of road ROWs (such as along CL&P's overhead transmission line ROWs or along an entirely new cross-country "greenfield" route, not adjacent to any linear corridors) may require additional temporary work space to accommodate construction activities and to account for terrain and subsurface conditions. (CL&P 1, Vol. 1A, pp. 14-31 to 14-32)

177. Pre-cast concrete splice vaults (typically 10 feet wide x 10 feet deep x 32 feet long, external dimensions) would have to be located at approximately 1,600-foot intervals along the length of the underground line. The installation of vaults of this size would require an excavation area approximately 14 feet wide, 13 feet deep, and 36 feet long. Extra work pads for cranes to install each splice vault also would be required; such crane pads would be approximately 80 feet wide by 130 feet long. (Council Admin. Notice No. 33, FOF # 119; CL&P 1, Vol. 1A, pp. 14-29, 14-33 to 14-34; CL&P 17, p. 67)

178. Due to current-carrying limitations and the assumed underground duct-bank configuration involving three separate circuits, three separate splice vaults would be required at each cable-splice interval along the length of an underground line. (CL&P 1, Vol. 1A, p. 14-33)

179. Splice vaults located outside of public road ROWs would require a minimum of 12,000 square feet of permanent easement (for access to perform maintenance) and an additional minimum of 4,300 square feet of temporary easement for cable-system construction. (CL&P 1, Vol. 1A, p. 14-33)

180. Each 345-kV line transition station would typically require approximately 2 to 4 acres of land, within which a fenced area of about 1.7 acres (typically 270 feet by 270 feet) would be needed to connect the three sets of underground 345-kV cables to one overhead 345-kV line (at a typical line transition station). The amount of land developed at a line transition station site would depend on site-specific topographic features, including the need for grading or filling and access. In addition, the amount of developed area would increase if shunt reactors were required. The land outside the fenced-in area at a transition station is needed for setbacks from property lines, cable and overhead line entries, access, and other site-specific requirements. (Council Admin. Notice No. 33, FOF ## 120, 121; CL&P 1, Vol. 1A, p. 14-37; CL&P 17, pp. 67-68)

181. Cable-system construction is time-consuming and highly dependent on subsurface conditions (e.g., need for rock removal (blasting), dewatering, special handling for excavated material), and duct-bank construction could proceed at a rate of only 50 feet /day. The excavation and installation of each splice vault could require a week or more to complete. (CL&P 1, Vol. 1A, pp. 14-35 to 14-37)

182. Whereas an overhead transmission line can span wetlands, watercourses, vegetation, rock outcroppings and steep slopes, the installation of an underground cable system requires a continuous trench and the operation of the cable system requires continuous permanent access so that any splice vault or portion of the cable duct-bank along the length of the cable system can be reached by heavy equipment for maintenance and repairs. A 20-foot wide permanent, continuous access road along an in-ROW underground system is required. (Council Admin. Notice No. 33, FOF # 122; CL&P 1, Vol. 1A, pp. 14-17, 14-24)

183. Construction of the 20-foot wide access road on the ROW would involve cutting and filling, including permanent fill in any wetlands along the cable route and permanent crossings (e.g., culverts, bridges) of any streams. The access road would be installed during the cable construction phase and would have to be designed to handle all anticipated construction equipment. (CL&P 1, Vol. 1A, p. 14-32)

184. Most access roads will need to remain in place across existing wetlands and be properly maintained to provide access to splice vaults and transition stations, causing permanent impacts to wetlands. Also, where large embankments are needed for constructing wetland crossings, the width of wetland impacts may be 50 feet or greater. (Council Admin. Notice No. 33, FOF # 127)

185. The installation of an underground cable system requires continuous and linear grading, excavation, and soil disturbance along the entire length of the underground cable route. (CL&P 1, Vol. 1A, Appendix 15A, p. 15A-7)

186. After the completion of conduit and splice-vault installation, the excavated trench and splice-vault areas would be backfilled with special "flowable fill," a concrete mix

designed to better dissipate heat from the cables. Generally, the materially originally excavated from the trench would not be used for backfill, but rather would be trucked off-site for disposal at approved sites. (Council Admin. Notice No. 33, FOF # 124; CL&P 1, Vol. 1A, Appendix 15A, p. 15A-10)

187. The clearing and grading of the underground cable ROW typically exposes large areas of soil to erosional forces and increases the potential for sedimentation into water resources. (Council Admin. Notice No. 33, FOF # 124; CL&P 1, Vol. 1A, Appendix 15A, p. 15A-11)

188. The construction and operation of an underground cable system would cause both direct and potentially indirect impacts to water resources. In order to install the cable system, excavations would be required through streams and wetlands. Whereas subsurface techniques, such as jack and bore or horizontal directional drill (HDD) could be considered for some larger watercourse crossings, even these techniques (which are costly and time-consuming) would involve impacts to water resources, including impacts to water quality. For example, groundwater encountered in jack and bores must be pumped continuously from the excavated pits and must be ultimately discharged to a surface water, while HDDs require withdrawal of water for the drilling fluid mix and also may result in inadvertent returns of drilling fluid / drill cutting mix to surface or ground waters. In addition, the flowable fill placed in the cable system excavations could have a long-term adverse effect on water resources by disrupting natural subsurface water flows or infiltration rates. (Council Admin. Notice No. 33, FOF # 126; CL&P 1, Vol. 1A, Appendix 15A, pp. 15A-10 to 15A-12)

189. The construction and operation of an underground cable system within or adjacent to roadway ROWs would generally result in minimal effects on vegetation and wildlife resources, whereas the alignment of a cable system in non-paved ROWs would result in permanent impacts to vegetation and wildlife as a result of vegetation clearing, grading, and the establishment of a permanent gravel-type access road along the length of the cable route. (CL&P 1, Vol. 1A, Appendix 15A, p. 15A-13)

190. The construction and operation of 345-kV line transition stations would result in a range of environmental impacts, depending on site location. Site development activities would require vegetation removal (displacing wildlife habitat), grading, and soil disturbance. Line transition stations developed in rural or rural residential areas would not typically be consistent with existing land use patterns and would create permanent visual changes. In contrast, collocation of line transition stations within or adjacent to an existing substation would be consistent with the utility use of the property and typically would result in an incremental visual impact. (CL&P 1, Vol. 1A, Appendix 15A, p. 15A-19, 15A-22, 15A-23)

191. Underground transmission facilities, in any settling, have fewer visual impacts than overhead lines. However, the line transition stations that are necessary for underground facilities do add visual impact. (Council Admin. Notice No. 33, FOF # 128)

All-Underground Alternative Routes and Designs

192. The shortest potential alignment for an "all-underground" cable system between Card Street Substation, Lake Road Switching Station, and National Grid's facilities is a 39.1-mile combination highway and overhead transmission line route. The underground cable system would follow a combination of road ROWs (36.3 miles) and CL&P ROWs (1.8 miles along two segments of transmission line ROW) and would involve a 1.1-mile segment of overhead line, extending from a new line transition station in the Town of Thompson to National Grid's overhead transmission line. (CL&P 1, Vol. 1A, pp. 14-46, 14-47; CL&P 17, p. 68)

193. To accommodate the possibility that National Grid could be required to develop its new 345-kV transmission line in an underground configuration in Rhode Island, a route variation to the combined highway and transmission line ROWs underground alternative was identified and evaluated. This route variation would extend the underground alternative system in Connecticut to connect to National Grid at the Rhode Island border, and thus would replace the easternmost 2.9 miles of the combined highway and transmission line ROWs route. The resulting 38.5-mile all-underground cable system would extend along U.S. Route 44 into Rhode Island, eliminating the need for a line transition station in Connecticut. Otherwise, this alternative underground alignment would be the same as the combined highway and transmission line ROWs route and would have the same issues. (CL&P 1, Vol. 1A, pp. 14-56, 14-57; CL&P 17, p. 68)

194. Based on considerations of constructability, reliability, cost, and environmental factors, neither of these "all-underground" cable system options would be practical for the Project as a whole. Cost and construction schedule would be significant issues for any of these alternatives; compared to an overhead transmission line, any of the all-underground cable systems would require up to 12 months longer to construct (delaying the energization of the Project). Further, both the capital and life-cycle costs of an underground cable system would be significantly more, by an order of magnitude, than a comparable overhead transmission line. (CL&P 1, Vol. 1A, pp. 14-39 to 14-40)

Constructability and Environmental Issues: New ROW, Pipeline / Railroad, CL&P, and Highway ROWs

195. To construct and operate an "all-underground" cable system along a new ("greenfield") ROW, new easements would have to be acquired from private property owners along the length of the route. A minimum 40-foot-wide easement width would be required. Assuming a 28-mile straight line route between Card Street Substation, Lake Road Switching Station, and National Grid's facilities, approximately 136 acres of easement thus would have to be acquired, a costly and time-consuming process. The creation of a new ROW for the all-underground cable system would create significant environmental impacts due to the conversion of previously undisturbed forested uplands and wetlands, as well as disturbance to water resources (including crossings of various rivers) and potentially to unknown archaeological sites. (CL&P 1, Vol. 1A, p. 14-41)

196. The use of pipeline and railroad ROWs for an "all-underground" cable system is impractical due to lack of available space for the cable system within the existing ROWs; thus, significant additional easements would be required. (CL&P 1, Vol. 1A, p. 14-42)

197. The use of CL&P's existing transmission line ROWs for an "all-underground" cable route would require the acquisition of underground easement rights from private landowners for the development of the cable system. Land also would have to be acquired for a 345-kV line transition station at the Connecticut / Rhode Island border. Approximately 122 splice vault locations would be required at approximate intervals of 1,600 feet and, based on a 40-foot-wide work space along the 36.8-mile route, approximately 175 acres of land would be affected by construction. A permanent 20-foot-wide access road would affect approximately 88 acres, permanently converting land along the ROWs to road use. Finally, the terrain and environmental features along the ROWs that are spanned by the overhead transmission lines pose severe constraints for underground cable system installation and operation. Long and/or steep grades could potentially overstress the cables and cable splices; the construction of the cable system would directly or indirectly affect various significant water resources (including Mansfield Hollow Lake); and state-listed species habitat would be disturbed. (CL&P 1, Vol. 1A, p. 14-43 to 14-44)

198. Alignment of an all-underground route along highways is not practical. Key construction, engineering, and environmental factors related to highway ROWs include the presence of road embankments or elevated sections (which would make cable-system excavation difficult); rock (where excavating would potentially require highway closures for blasting); water resources adjacent to or crossed by highways (through which the cable system could have to be buried); traffic congestion associated with cable system construction and maintenance; and CDOT policies. (CL&P 1, Vol. 1A, pp. 14-45 to 14-46)

199. Due to major coordination and delay problems for CDOT roadway improvement projects, CDOT opposes any proposal for the installation of any underground or overhead facilities within its highway ROW. (CDOT Comments dated February 23, 2012)

200. CDOT will not allow the installation of splicing vaults within its highway ROW because vaults in such locations have a major impact on the traveling public and future roadway improvement projects. (CDOT Comments dated February 23, 2012)

201. For an all-underground cable system, 345-kV line transition facilities would be required at Card Street Substation (on presently undeveloped portions of the CL&P property), at Lake Road Switching Station (where land outside the existing station property could be required and the existing overhead lines connecting to the switching station might need to be reconfigured), and (for the 39.1-mile combined highway and transmission line ROW route) in the vicinity of undeveloped CL&P land east of Quaddick Town Farm Road and Elmwood Hill Road in the Town of Thompson. Additional privately-owned land in Thompson would have to be acquired for this line transition station. (CL&P 1, Vol. 1A, pp. 14-47, 14-50)

202. The combination underground route would avoid Mansfield Hollow Lake and the Mansfield Hollow area in general by aligning the cable system underground along U.S.

Route 6 and, by using road ROWs, would avoid areas of potential difficult construction to the extent possible. However, the use of road ROWs would raise conflicts with CDOT policy and easements for the cable system would have to be acquired from private landowners, the costs of which would be significant. Further, various residential, commercial and industrial uses abutting the road ROWs would be affected where the cable system must be constructed on private property. (CL&P 1, Vol. 1A, pp. 14-51, 14-53, 14-54)

203. Along highway ROWs, the underground cable system would cross 15 watercourses, including the Shetucket, Quinebaug, and Five Mile rivers, as well as 22 wetlands. Along the 1.8 miles of CL&P ROWs, the cable system would directly affect six wetlands, as well as habitat for state-listed species, and vernal pools. (CL&P 1, Vol. 1A, p. 14-52)

204. Although the combined highway and transmission line ROW route, and the U.S. Route 44 variation to it, reflect the optimal "all-underground" cable system between Card Street Substation, Lake Road Switching Station and the National Grid facilities, these alternatives nonetheless pose constructability, environmental, land use, and schedule issues; would be less reliable than the proposed overhead transmission lines; and would require an estimated $1.1 billion to construct. Thus, the combined highway and ROW route alternative and the U.S. Route 44 variation to it are not a practical, cost-effective, or environmentally-sound solution for the Project. (CL&P 1, Vol. 1A, pp. 14-54, 14-57; CL&P 17, p. 68)

Transmission Cost Allocation

205. Pursuant to Schedule 12C of the ISO-NE Open Access Transmission Tariff and ISO-NE Planning Procedure No. 4, ISO-NE has the authority to allocate the costs of transmission projects to "load" within the region. (Council Admin. Notice No. 18; Council Admin. Notice No. 15)

206. Pursuant to this allocation procedure, the costs of projects that qualify for inclusion in New England regional transmission rates are shared by consumers throughout New England, based on each electric transmission company's share of the regional electric load. Connecticut accounts for approximately 27% of the New England load; therefore, Connecticut consumers would bear approximately 27% of the cost of Interstate (and other projects) included in regional rates. (CL&P 1, Vol. 1A, p. 14-24)

207. Recovery of Project costs through regional rates, however, is not automatic. Only costs determined by ISO-NE to be eligible for regionalization according to specific tariff provisions would be included in regional rates. Experience has shown that where a transmission line (or a line segment) that would normally be constructed overhead, in conformity with good utility practice, is instead constructed underground, ISO-NE does not allow the extra costs of underground line construction to be included in regional rates. Instead, such extra costs are "localized" and must be borne solely by consumers in the area in which the underground system is situated. (Council Admin. Notice No. 33, FOF #167; Council Admin. Notice No. 18, pp. 42-60; CL&P 1, Vol. 1A, p. 14-24)

208. For the Bethel - Norwalk Project, ISO-NE determined that $117.4 million of the total costs of $357.2 million would be localized, primarily associated with undergrounding segments of the project. (Council Admin. Notice No. 18, pp. 42-60)

209. In Connecticut, the effect of localizing excess underground cable costs is that in-state consumers would bear 27% of the cost of an overhead line (or segment), plus 100% of the difference between that cost and the cost of an underground cable system. For example, if CL&P were to build an all-underground line that cost 10 times more than a comparable overhead line (constructed in accordance with standard good utility practice), the cost to Connecticut consumers for the underground cable system would likely be 34 times more than that of the overhead line [(1 x 27%) + (9 x 100%) = 9.27 ÷ 0.27 = 34.3] (Council Admin. Notice No. 33, FOF # 168; CL&P 1, Vol. 1A, p. 14-24)

210. The appropriate baseline from which to identify localized costs is the alternative that represents a practical and feasible configuration, consistent with good utility practice, that is less expensive to construct but that would provide the same benefits to the bulk-power system as the Project. The costs of the Project that exceed the costs of such an alternative are localized costs. (Council Admin. Notice No. 18, p. 32)

<u>Cost Comparisons: All-Overhead Lines vs. All-Underground Lines</u>

211. The initial capital cost of the Connecticut portion of Interstate with an all-overhead transmission line construction is estimated to be approximately $218 million. The initial capital cost for the new transmission line construction is estimated at approximately $193 million, and the cost of substation and switching station modifications is estimated at approximately $25 million. The estimated life-cycle costs of the Project would be approximately $319 million, including substation and switching station improvements. (CL&P 1, Vol. 1, p. 3-24)

212. This estimated $218 million Project cost includes $4.2 million for delta designs in Focus Areas A and D. This $4.2 million would likely be localized. (CL&P 9, Q7)

213. The initial capital cost of an underground cable system along the combined highway and transmission line ROW route within Connecticut is approximately $1.1 billion. The estimated life-cycle costs would be approximately $1.6 billion. (CL&P 1, Vol. 1A, pp. 14-54, 14-55)

214. The initial capital cost of an all-underground, in-street transmission cable route along or adjacent to public roads within Connecticut is approximately $1.1 billion. The estimated life-cycle costs for all-underground transmission lines would be approximately $1.6 billion. (CL&P 1, Vol. 1, pp. 14-54, 14-55, 14-57)

215. The probable cost to Connecticut customers for an all-overhead line in Connecticut, as proposed in CL&P's Application, would be approximately $61.8 million (27% of the base design cost, plus 100% of the preferred EMF BMP design alternatives in Focus Areas A and D). (CL&P 1, Vol. 1A, pp. 14-54, 14-55)

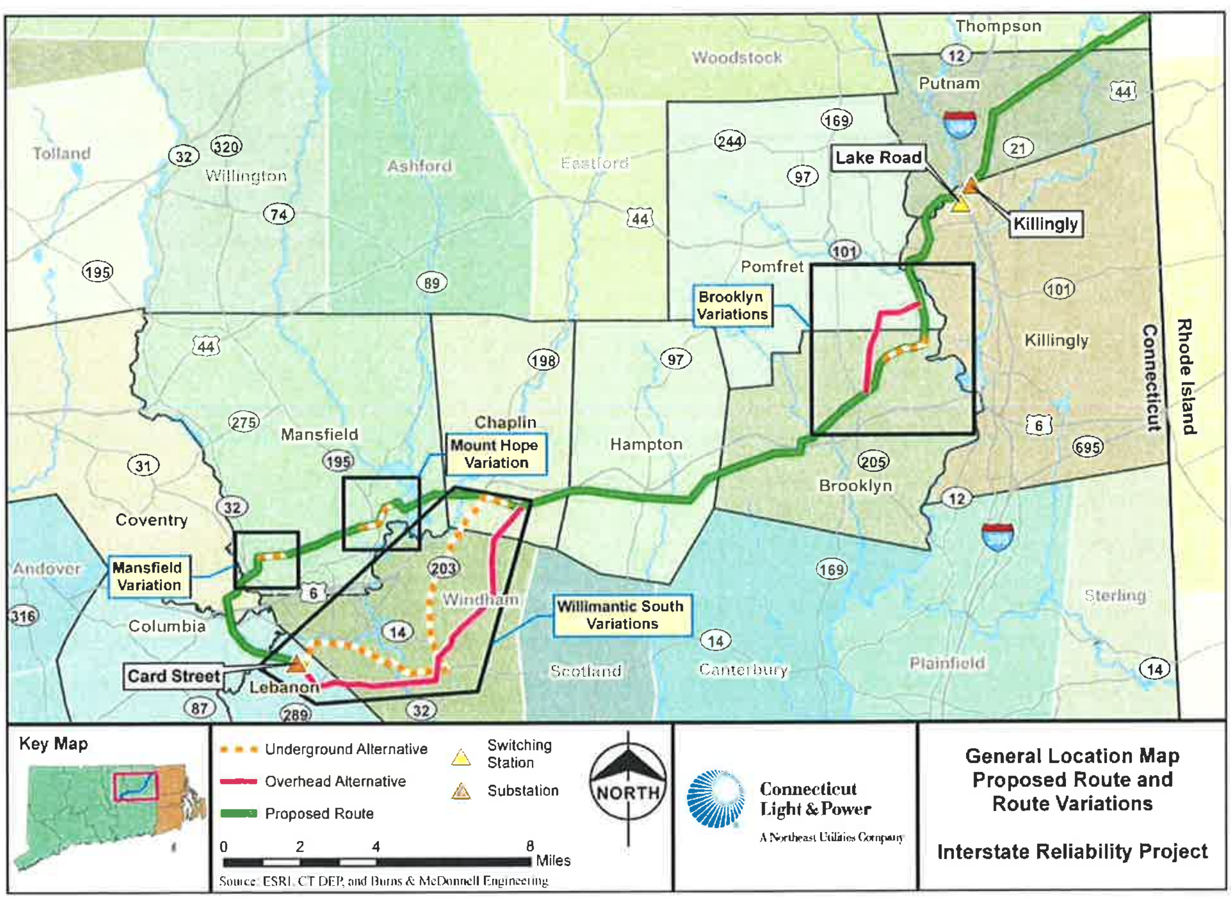
216. Localization of the costs for undergrounding the transmission facilities would result in Connecticut ratepayers paying approximately $950 million. (CL&P 1, Vol. 1A, p. 14-55)

VI. ROUTE VARIATIONS

217. As part of the alternatives evaluation process that led to the selection of the overhead line design and route for the Project, six 345-kV transmission line-route variations (two with overhead line configurations and four with underground cable configurations) were evaluated. Each of these route variations represented a potential alternative to the construction of the proposed overhead 345-kV transmission line along certain segments of CL&P's existing ROWs. Of the six route variations, two (the Willimantic South Variations) were identified to avoid the Mansfield Hollow Areas, while four were identified as alternatives for consideration should the Council determine that statutory facilities are located adjacent to the proposed overhead 345-kV line in certain locations. During the proceedings on this Docket, one of the parties, Victor Civie, proposed an extension of one of the underground variations identified by CL&P. CL&P has determined that there is no basis for considering the Willimantic South Variations, and does not recommend any of the underground variations. (CL&P 1, Vol. 1A, pp. 15-1 to 15-15; CL&P 17, p. 69; Civie 3, Tr. 10, pp. 34-54, V. Civie)

218. The location of the six route variations identified by CL&P is shown in the following figure.

Proposed Route and Route Variations
(Figure 15-1 from CL&P 1, Vol. 1A, p. 15-2)



Willimantic South Overhead and Underground Line-Route Variations

219. The Willimantic South Overhead and Underground Variations were identified to provide potential routing and transmission line configuration alternatives to avoid aligning the new 345-kV transmission line across the federally-owned properties in the Mansfield Hollow Areas. Accordingly, the two Willimantic South Variations would extend east from Card Street Substation in the Town of Lebanon, replacing the western 11.6 to 11.9 miles of the proposed Project before reconnecting to CL&P's existing ROW east of U.S. Route 6 in the Town of Chaplin. (CL&P 1, Vol. 1A, p. 15-107)

220. After the identification and analysis of the Willimantic South Variations, CL&P determined that it would be possible to align the new 345-kV transmission line, in an overhead configuration, across the Mansfield Hollow Areas using the "No ROW Expansion Option" in the event that additional easement width could not be obtained from the federal government. Although the No ROW Expansion Option would be more expensive and require complex construction sequencing compared to both the preferred 5-acre Minimal ROW Expansion Option and 11-acre Expansion or "Matching Structure" Option across the Mansfield Hollow Areas, it would be preferable to either of the Willimantic South Variations. The No ROW Expansion Option would cost less and have fewer environmental and social impacts than either of the Willimantic South alternatives. Accordingly, CL&P elected not to pursue the Willimantic South Variations further. (CL&P 17, p. 70)

Mansfield Underground Variation

Route and Design

221. The 0.7-mile Mansfield Underground Variation would involve the alignment of the new 345-kV line in an underground cable configuration within CL&P's existing transmission line ROW in the western portion of the Town of Mansfield. The variation was identified as an alternative to developing the new 345-kV line in an overhead line configuration, adjacent to CL&P's existing 345-kV 330 Line, near a group of homes along Highland Road, Woodmont Road, and Stone Ridge Road. (CL&P 1, Vol. 1A, p. 15-16, Appendix 15B; CL&P 17, p. 73; Vol. 9, Ex. 3)

222. The variation would replace a 0.7-mile segment of the overhead transmission line within a portion of Focus Area A, where CL&P proposes to construct the overhead line on delta steel-pole structures rather than on H-frames. (CL&P 1, Vol. 1A, p. 15-16; CL&P 17, p. 73)

223. The variation would place an underground cable system north of the existing 330 Line and would consist of nine XLPE cables in a common duct bank. The cable system would be offset 41 feet north of the centerline of the 330 Line. Given the short length of the cable route, splice vaults would be placed at intervals of 1,200 to 1,300 feet. In addition, two 345-kV line transition stations (one on either end of the cable route) would be required. (CL&P 1, Vol. 1A, p. 15-18, 15-31; CL&P 17, p. 73)

224. CL&P would have to acquire easement rights to install the underground cable system within the overhead transmission line ROW and would have to purchase up to 8 acres of land from private property owners for the two line transition stations. (CL&P 1, Vol. 1A, p. 15-18; CL&P 17, p. 73)

225. The construction of the underground variation, including the line transition stations, could require up to 18 months to complete. (CL&P 1, Vol. 1A, p. 15-20)

Environmental and Social Impacts

226. The construction and operation of the underground cable system along the Mansfield Underground Variation would disturb approximately 3.6 acres of land, directly affecting topography, soils, water resources (including wetlands and vernal pools), land uses, visual resources, cultural resources, and transportation. The installation of the cable system and the need for a permanent access road across wetlands and vernal pools would involve approximately 0.4 acre of fill, resulting in a net loss of habitat. Approximately 1.1 acres of forested vegetation (0.8 acre of forested upland and 0.3 acre of forested wetland) would be converted to scrub-shrub along the cable system route. (CL&P 1, Vol. 1A, pp. 15-19, 15-28 to 15-31)

227. The development of the two 345-kV line transition station sites would require the conversion of up to 8 acres of upland forest habitat to utility use and would represent permanent changes to the local visual environment. (CL&P 1, Vol. 1A, pp. 15-19, 15-28 to 15-31)

Cost

228. The estimated cost of the Mansfield Underground Variation to Connecticut consumers would be approximately $58.2 million or approximately 12 times the estimated $4.7 million cost of the section of overhead line that it would replace. (CL&P 1, Vol. 1A, pp. 15-37 to 15-38; CL&P 17, p. 77)

Summary

229. Compared to the proposed overhead delta line configuration, the incorporation of the 0.7-mile Mansfield Underground Variation into the Project would cause greater long-term impacts to environmental resources, pose transmission line design and construction complexities, and substantially increase Project costs. Moreover, the use of the variation would not result in a significant reduction in magnetic fields along the ROW. (CL&P 1, Vol. 1A, pp. 15-35 to 15-39)

Mount Hope Underground Variation

Route and Design

230. The 1.1-mile Mount Hope Underground Variation, as presented in CL&P's Application to the Council, would extend within CL&P's existing transmission line ROW in the southeastern portion of the Town of Mansfield, west of Mansfield Hollow State Park and traversing Storrs Road (State Route 195). The variation was designed as an alternative to

developing the new 345-kV line in an overhead line configuration near three licensed day care facilities and a school (Come Play With Me Day Care, Mount Hope Montessori School, and the Green Dragon Day Care). (CL&P 1, Vol. 1A, p. 15-39, Appendix 15B; CL&P 17, p. 74; Vol. 9, Ex. 3) The Come Play With Me Day Care has since given up its licenses and gone out of business. (CL&P 17, p. 53)

231. The underground variation, as presented in the Application, would replace a 1.1-mile segment of the overhead transmission line, which CL&P proposes to construct on horizontal H-frames centered approximately 85 feet from the center of the 330 Line. (CL&P 1, Vol. 1A, p. 15-41; Vol. 9, Ex. 3)

232. The underground cable system would be installed within CL&P's existing 255-300-foot-wide ROW, and would be located north or west of the existing 330 Line. The cable system would consist of nine XLPE cables in a common duct bank. The centerline of the cable duct bank would be offset 15 feet from the outside conductor of the 330 Line between existing structures 9068 and 9078. Two 345-kV line transition stations (one on either end of the cable route) would be required. (CL&P 1, Vol. 1A, pp. 15-40 to 15-42; Vol. 9, Ex. 3)

233. CL&P would have to acquire easement rights to install the underground cable system within the overhead transmission line ROW and would have to purchase up to 6 acres of land from private property owners for the two line transition stations (one of the line transition station sites would be located in part on CL&P property). (CL&P 1, Vol. 1A, p. 15-42; CL&P 17 p. 74)

234. CDOT would not allow the cable system to be installed across Storrs Road using an open-cut method; as a result, a subsurface method (HDD or jack and bore) would be required. Staging areas would be required on either side of Storrs Road to accommodate the drilling or jacking equipment, support vehicles, and materials. (CL&P 1, Vol. 1A, p.15-50)

235. The construction of the underground variation, including the line transition stations, could require up to 18 months to complete. (CL&P 1, Vol. 1A, p. 15-43)

Environmental Impacts

236. The construction and operation of the underground cable system along the Mount Hope Underground Variation would disturb land for the installation of the duct bank (5.3 acres), splice vaults at three locations (0.4 acre), access road (2.5 acres). Land at the sites of two line transition stations also would have to be purchased from private landowners and up to 4 acres at each site would have to be cleared of forested vegetation and converted to utility use. (CL&P 1, Vol. 1A, p. 15-44 to 15-45)

237. The construction and operation of the Mount Hope Underground Variation would affect topography, soils (including 2.3 acres of agricultural land, some of it prime farmland soils and farmland soils of statewide importance), water resources (including two streams, six wetlands), land uses, visual resources, cultural resources, and transportation. The installation of the cable system and the need for a permanent access road across wetlands would involve approximately 0.1 acre of fill, resulting in a net loss of habitat.

Approximately 8.1 acres of forested vegetation (8.1 acre of forested upland and less than 0.1 acre of forested wetland) would be affected. (CL&P 1, Vol. 1A, pp. 15-52, 15-54 to 15-55)

238. The development of the two 345-kV line transition station sites would represent permanent changes to the local visual environment and would be potentially visible from residences in the vicinity and from public recreational use sites (e.g., Mansfield Hollow State Park). (CL&P 1, Vol. 1A, pp. 15-55)

239. Compared to the proposed H-frame line design along this segment of the ROW, the underground variation would result in higher magnetic field levels along the east/south ROW edge nearest to the existing 330 Line. This is because the placement of the new 345-kV line overhead, adjacent to the 330 Line, would allow mutual magnetic field cancellation. (CL&P 1, Vol. 1A, pp. 15-57; CL&P 17, p. 77)

Cost

240. The estimated cost to Connecticut consumers of the Mount Hope Underground Variation, as presented in the Application, is $65 million, or approximately 12 times the $5.4 million cost of the section of overhead line that it would replace. (CL&P 1, Vol. 1A, pp. 16-61, 15-62; CL&P 17, p. 77)

241. The estimated costs to Connecticut ratepayers for the entire Connecticut portion of Interstate would be approximately 24 cents per month, based on the incremental retail rate for a 700 kilowatt hour rate 1 residential customer. In contrast, the incremental cost for <u>only</u> the Mount Hope Underground Variation, in lieu of the overhead section it would replace, would be an additional 25 cents, thereby doubling the cost to Connecticut ratepayers for the Project. (Tr. 8, pp. 7-9, Taupier)

242. The length, and therefore the cost, of the Mount Hope Underground Variation could be reduced if the underground variation were redesigned to terminate to the east of the former Come Play With Me Day Care, which is no longer operating. However, the major cost of the two line transition stations would remain the same, so that there would still be an enormous cost discrepancy. (CL&P 17, p. 53)

Summary

243. Compared to the proposed overhead delta line configuration, the incorporation of the Mount Hope Underground Variation into the Project would be significantly more costly and would require the acquisition of up to 6 acres of land from private landowners for the line transition station sites and the acquisition of underground easement rights along the overhead transmission line ROW. (CL&P 1, Vol. 1A, pp. 15-59 to 15-62)

<u>**The Civie Extension of the Mount Hope Variation**</u>

244. Victor and Richard Civie are the owners of property in the Town of Mansfield that is traversed by the ROW on which a second overhead 345-kV line is proposed to be built. (Civie 1, Civie 3)

245. As designed, the western terminus of the Mount Hope Underground Variation would be at a line transition station on the Civies' property. (CL&P 1, Vol. 9, Ex. 3, Mount Hope Variation Mapsheet 1 of 2)

246. Messrs. Civie propose that the Mount Hope Underground variation be extended to the west so that it would traverse their property and terminate on adjacent property, along the ROW between the locations proposed by CL&P for new structures 67 and 66 (which would then not be built). (Civie 1; Tr. 10, pp. 38, 39, 52-54, Civie)

247. The proposed extension would increase the length of the Mount Hope Underground Variation by approximately 0.3 mile. (CL&P 1, Vol. 9, Ex. 3, Mount Hope Variation Mapsheet 1 of 2)

248. The cost of this extension would be more than that of the Mount Hope variation, because there would be more underground construction. The Civie Extension would have all of the environmental impacts that the Mount Hope Underground Variation would have. In addition, the grading and filling that would be required to construct a 345-kV line transition station at the grade of the site designated by the Civies would impact a large wetland, a stream, and vernal pools, potentially tripling the wetland impacts of the entire Project, and creating an obstacle to the permitting of the Project by the USACE. (Tr. 10, pp. 146, 147, Mango)

Brooklyn Variations

249. Within the Town of Brooklyn, CL&P proposes to align the new 345-kV transmission line in an overhead configuration within the existing ROW, which extends northeast through most of the town before turning north at Day Street Junction. In the northeastern portion of Brooklyn (west and north of Day Street Junction), the 300-to-360-foot-wide ROW traverses near residential land uses located along Church Street, Darby Road, Hickory Lane, and Meadowbrook Lane. (CL&P 1, Vol. 1A, pp. 15-62 to 15-65, Vol. 9, Ex. 3)

250. Along a 0.5-mile segment of ROW beginning approximately 0.2 mile west of Church Street and continuing 0.3 mile east of Church Street, nine homes (one of which is a residential child day-care facility) are located within 100 feet of the north or west edge of the ROW; in total, 24 homes are within 300 feet of the north or west edges of this ROW segment. A second residential day-care facility abutting Hickory Lane is approximately 500 feet from the existing ROW, while five homes (including two within 100 feet) are within 300 feet of the south edge of the ROW. This area is within Focus Area D, for which CL&P evaluated EMF BMPs. (CL&P 1, Vol. 1, Appendix 7B; Vol. 1A, pp. 15-63, 15-65; Vol. 9, Ex. 2, 3)

251. CL&P identified two variations to the proposed overhead line construction along the ROW in Brooklyn (the Brooklyn Overhead Variation and the Brooklyn Underground Variation) as potential alternatives to avoid developing the new 345-kV transmission line in an overhead configuration along the 0.5-mile segment near homes and residential child day-care facilities along and in the vicinity of Church Street. (CL&P 1, Vol. 1A, pp. 15-62 to 15-106; Vol. 9, Ex. 3)

252. In general, compared to the proposed overhead line design along CL&P's existing ROW, both of the Brooklyn Variations would be more costly, would result in greater environmental impacts, and would require land acquisition from private property owners. (CL&P 1, Vol. 1A, pp. 15-66 to 15-68)

Brooklyn Overhead Variation

Route and Design

253. The 3.3-mile Brooklyn Overhead Variation would involve the development of the new 345-kV transmission line in an overhead configuration on a new "greenfield" corridor. The variation would diverge from CL&P's ROW near existing structure 9201 and would traverse 1.7 miles in the northeastern portion of the Town of Brooklyn and 1.6 miles of the southeastern portion of the Town of Pomfret before rejoining CL&P's ROW near structures 9229 and 9230. The variation would replace 3.4 miles of the proposed overhead line. (CL&P 1, Vol. 1A, pp. 15-68 to 15-69, 15-74; Vol. 9, Ex. 3)

254. The Brooklyn Overhead Variation would require the acquisition of permanent easement rights, amounting to approximately 58.8 acres, for a new 150-foot-wide ROW along the new 3.3-mile corridor. The overhead line would be supported on H-frame structures, ranging in height from 85 to 90 feet. The existing 345-kV line (the 330 Line) would remain on the existing CL&P ROW. (CL&P 1, Vol. 1A, p. 15-69; Vol. 9, Ex. 3)

Environmental Impacts

255. The construction and operation of the overhead line along the Brooklyn Overhead Variation would affect 58.8 acres of land, of which approximately 47.6 acres consist of mature mixed upland forest and 2.1 acres are forested wetland. Other vegetative communities within the new greenfield ROW include agricultural land (3.1 acres), commercial/industrial areas (1.8 acres), open field/shrub land (1.5 acres), road ROW (0.4 acre), scrub-shrub wetland (1.2 acres), and emergent marsh (1.1 acres). (CL&P 1, Vol. 1A, p. 15-73)

256. The construction and operation of the Brooklyn Overhead Variation would create a new utility corridor within the Quinebaug-Shetucket Rivers Valley National Heritage Corridor and would generally be inconsistent with the land preservation policies advocated by the heritage corridor designation. (CL&P 1, Vol. 1A, pp. 15-75, 15-76)

Cost

257. The estimated cost of the Brooklyn Overhead variation is $27.4 million, as opposed to the $16.9 estimated cost of the overhead section that it would replace. The difference of $10.5 million would be borne entirely by Connecticut consumers. (CL&P 1, Vol. 1A, p. 15-67)

Summary

258. Compared to the development of the new 345-kV overhead transmission line as proposed within CL&P's existing ROW, the use of the Brooklyn Overhead Variation would cause

greater environmental impacts (particularly to forested habitat), land uses, visual resources, and privately-owned properties. The use of the variation would also increase Project costs and would be inconsistent with FERC environmental guidelines to which new transmission line projects must conform. (CL&P 1, Vol. 1A, pp. 15-81 to 15-84)

Brooklyn Underground Variation

Route and Design

259. The 1.4-mile Brooklyn Underground Variation would be located within CL&P's existing transmission line ROW in the Town of Brooklyn and would replace 1.4 miles of the proposed overhead transmission line. The variation would begin northeast of proposed new 345-kV structure 208 and would end near proposed structure 222 north of Day Street Junction. (CL&P 1, Vol. 1A, p. 15-85; CL&P 17, pp. 74-75; Vol. 9, Ex. 3)

260. The cable system would consist of nine XLPE cables in a common duct bank. The centerline of the cable duct bank would be offset 15 feet from the outside conductor of the 330 Line. Two 345-kV line transition stations (one on either end of the cable route) would be required; although one of these line transition stations would be on CL&P property, up to 4 acres of privately-owned property would have to be acquired for the western station. (CL&P 1, Vol. 1A, pp. 15-85, 15-86, Appendix 15B [XS-UG-2 and -3]; Vol. 9, Ex. 3)

261. CL&P would have to acquire easement rights to install the underground cable system within the overhead transmission line ROW. (CL&P 1, Vol. 1A, p. 15-85)

262. The construction of the underground variation, including the line transition stations, could require up to 18 months to complete. (CL&P 1, Vol. 1A, p. 15-87)

Environmental Impacts

263. The construction and operation of the underground cable system along the Brooklyn Underground Variation would disturb up to 15 acres for the installation of the duct bank, splice vaults at four locations, permanent access road, and two line transition stations. Land at the line transition station sites would be converted to utility use. Access to the line transition station sites would be via a permanent access road along the ROW, which would be accessible from Church Street. (CL&P 1, Vol. 1A, pp. 15-86 to 15-87)

264. The Brooklyn Underground Variation would extend across and directly affect three Class A perennial streams (White Brook, Creamery Brook, and an un-named watercourse), as well as six wetlands, including a 1,615-foot crossing of wetland W20-157. The underground cable system would also extend through wetlands that contain vernal pool habitat. (CL&P 1, Vol. 1A, pp. 15-89 to 15-91)

265. Land uses that would be affected by the underground variation include 6.7 acres of open field/shrubland, 4.6 acres of forest, 1.8 acres of agricultural land, 1.2 acres of emergent wetland, 0.7 acre of scrub-shrub wetland and less than 0.1 acre of road ROW. In

addition, the variation would extend through approximately 1,100 feet of land within the Wolf Den Land Trust's White Brook property. (CL&P 1, Vol. 1A, pp. 15-92, 15-93)

266. Other impacts associated with the Brooklyn Underground Variation include permanent changes in topography along the ROW as a result of grading and the permanent access road, and permanent changes in topography and soils at the line transition station sites. Approximately 1 acre of wetlands would be filled as a result of duct banks and the permanent access road. The development of the two 345-kV line transition station sites would represent permanent changes to the local visual environment and would be potentially visible from residences in the vicinity and from the Wolf Den Land Trust White Brook property. (CL&P 1, Vol. 1A, pp. 15-95, 15-96)

Cost

267. The estimated cost to Connecticut consumers of the Brooklyn Underground Variation is $82 million, ten times the estimated $8.2 million of the section of overhead line that it would replace. (CL&P 1, Vol. 1A, pp. 15-103, 15-104; CL&P 17, p. 77)

Summary

268. Compared to the proposed overhead line configuration along this 1.4-mile ROW segment, the incorporation of the Brooklyn Underground Variation into the Project would substantially increase Project costs and the burden of those costs on Connecticut consumers. The use of the variation also would cause direct impacts to environmental resources (wetlands, including a large wetland complex, vernal pools, amphibian habitat), visual resources, and privately-owned properties. (CL&P 1, Vol. 1A, pp. 15-102 to 15-105)

VII. ENVIRONMENT TRAVERSED BY THE PROPOSED LINES AND ENVIRONMENTAL EFFECTS

Geology, Topography, and Soils

269. Elevations along the Project ROWs range from 210 feet National Geodetic Vertical Datum (NGVD) to approximately 600 feet NGVD, and topography is generally characterized by hills and valleys. The Project ROWs do not traverse any ridgelines or traprock or amphibolite ridge areas as identified in C.G.S. Section 8-1aaa(1). (CL&P 1, Vol. 1, pp. 5-4 to 5-5)

270. Based on soils mapping, the CL&P ROWs within which the new transmission lines would be located encompasss approximately 24 acres of soils considered to be prime farmland soils and approximately 30 acres of soils considered to be farmlands of statewide importance. (CL&P 1, Vol. 1, pp. 5-7 to 5-9, Table 5-1 [pp. 5-113 to 5-118]; CL&P 18, pp. 30-31)

271. The construction and operation of the new 345-kV transmission lines would have negligible effects on topography and geology, and only minor, generally short-term, and

highly localized effects on soils. These effects would be concentrated primarily in the vicinity of work sites where grading and filling are required, such as at structure sites where work pads must be established, or along access roads that must be improved or developed to safely support construction equipment. Grading would not be required, in most instances, where the terrain along the ROWs is relatively level, where no access road improvements or new access roads are needed, or where the conductors span the underlying terrain. (CL&P 1, Vol. 1, p. 6-4; CL&P 18, pp. 29 – 30)

272. The Project would only affect portions of the total width of CL&P's ROWs. As a result, approximately 20 acres of prime farmland soils and 25.6 acres of farmlands of statewide importance soils would be temporarily affected by Project construction. Because these soil types are typically characterized by minimal slopes, construction activities (e.g., access roads, crane pads) can be expected to require minimal grading. Impacts to active agricultural fields would be minimized by restoration, including decompaction, disking, or equivalent. New transmission line structure foundations would cause permanent effects to approximately 0.1 acre of prime farmland soils and 0.1 acre of farmlands statewide importance soils. (CL&P 18, p. 31)

273. In some locations, permanent access roads must be maintained to facilitate the operation and maintenance of the transmission lines. Such permanent access roads would result in long-term but highly localized changes in grade. (CL&P 1, Vol. 1, p. 6-4)

274. All activities involving soil disturbance would be performed in accordance with CL&P and state requirements (including CL&P's *2011 Connecticut Best Management Practices Manual* and the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control,* as well as the DEEP's *General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities*). CL&P would prepare Project-specific *Stormwater Pollution Control Plans* that would incorporate these requirements, including specifications for the deployment and maintenance of temporary erosion and sedimentation control measures during construction. (CL&P 1, Vol. 1, p. 6-6, Vol. 6; CL&P 18, p. 30)

Water Resources (Watercourses, Wetlands, and Vernal Pools)

275. The Project ROWs extend across 104 water bodies, of which 54 are perennial (including 13 lakes or ponds) and 50 are intermittent. The largest watercourse is the Quinebaug River; the proposed span of Mansfield Hollow Lake (at approximately 600 feet) is the longest crossing. The new transmission line would span one state-designated Stream Channel Encroachment Line (SCEL) along the Willimantic River, which forms the boundary between the towns of Coventry and Mansfield, and would extend across the 100-year floodplains (as designated by the Federal Emergency Management Agency) of various waterbodies. (CL&P 1, Vol. 1, pp. 5-12 to 5-13, 5-23 to 5-25; CL&P 18, p. 17)

276. The Project ROWs, including the Minimal ROW Expansion in Mansfield Hollow, encompass 227 federal and state jurisdictional wetlands. Of these, all but five met the criteria for both state and federal wetlands. State only wetlands are W20-5, W20-162, W20-164, W20-172, and W20-178. Because the construction, operation, and maintenance of the new 345-kV transmission lines would not affect the entire width of

the CL&P ROWs, not all of the 227 wetlands would be affected by the Project. (CL&P 1, Vol. 1, pp. 6-18 to 6-25; Vol. 2, Vol. 9 Ex. 2 and 2A, Vol. 11; CL&P 18, pp. 17-18)

277. During field surveys performed in 2008 and again in 2011, 88 vernal pools and 29 amphibian breeding habitats were identified within and adjacent to CL&P's ROWs. Of the 88 vernal pools, 59 are located in whole or in part along presently managed portions of CL&P's ROWs. Of these 59 vernal pools, 10 are traversed by or adjacent to existing CL&P on-ROW access roads. Of the 29 amphibian breeding habitats, 20 are located in whole or in part along managed portions of CL&P's ROWs. (CL&P 1, Vol. 1; Vol. 2; Vol. 9, Ex. 2 and 2A; Vol. 11; CL&P 18, p. 19)

278. The new 345-kV transmission line would span the Willimantic River SCEL. No permanent access roads, structures, or fill would be placed within the SCEL. However, forest vegetation along the ROW within the SCEL would have to be removed. (CL&P 1, Vol. 1, p. 6-27; CL&P 18, p. 37)

279. Along the new 345-kV transmission line route, 36 new structures would be located within FEMA-designated 100-year floodplains along 14 watercourses. In addition, permanent access roads, affecting less than 0.5 acre, would be located within 100-year floodplains. However, no Project facilities would be located in floodways. (CL&P 1, Vol. 1, pp. 6-27 to 6-29; Tr. 2, p. 24, Mango)

280. The Project would result in an estimated 35.1 acres of temporary effects on water resources due to construction activities such as access roads, crane pads, guy easements, vegetation clearing access routes, and guard structures. Approximately 1.1 acres of water resources (wetlands) would be filled for permanent access roads, guys, and structure foundations. A total of approximately 50 acres of forested wetlands would be converted to scrub-shrub or emergent marsh habitat. (CL&P 18, pp. 31 to 33, 35 to 36)

281. No new transmission line structures would be located in vernal pools. However, existing on-ROW access roads requiring improvements for construction would impact four vernal pools; permanent on-ROW access roads would affect two vernal pools; and temporary work pads for Project construction would affect four vernal pools. In addition, tree removal along the ROW would be required in or near 30 vernal pools. CL&P would implement avoidance and minimization protocols to limit impacts to vernal pools to the extent practicable. (CL&P 15, CSC-030 and Ex. CSC-030-1; CL&P 18, pp. 39 to 41)

Wildlife

282. Based on initial consultations with DEEP and on field surveys, 29 state-listed species (as designated in the DEEP Natural Diversity Data Base [NDDB]) were identified as potentially occurring within or observed in the Project area. (CL&P 1, Vol. 1, Vol. 9, Ex. 2 and 2A; Vol. 4; CL&P 18, p. 20-21; DEEP Comments dated June 21, 2012)

283. No federally listed species occur in the Project vicinity. The New England cottontail (*Sylvilagus transitionalis*), a candidate species, is known to occur in Lebanon. The development of the new transmission lines would create additional shrubland habitat favored by this species. (CL&P 18, p. 20)

284. State-listed species initially reported by DEEP NDDB to occur in the Project vicinity or observed during field surveys are:

- *Butterflies*: Horace's duskywing *(Erynnis horatius)*, Frosted elfin *(Callophryus irus)*, Sleepy duskywing *(Erynnis brizo)*, Harris' checkerspot *(Chlosyne harrisii)*, Persius duskywing *(Erynnis persius)*; moths: Noctuid moth *(Zale oblique)*, Pine barrens noctuid moth *(Zanclognatha martha)*, Scribbled sallow *(Sympistis pescripta)*, Noctuid moth *(Apamea burgessi)*, Noctuid moth *(Chaetaglaea cerata)*, Noctuid moth *(Eucoptocnemis fimbriaris)*, Noctuid moth *(Shinia spinosae)*, Shrub euchlaena *(Euchlaena madusaria)*, Barrens metarranthis *(Metarranthis apiciara)*, Slender clearwing *(Hemaris gracilis)*, Noctuid moth *(Lepipolys prescripta)*, Buck moth *(Hemileuca maia)*;

- *Birds*: Horned Lark *(Eremophila alpestris)*; Grasshopper Sparrow *(Ammodramus savannarum)*, American Kestrel *(Falco sparverius)*; Savannah Sparrow *(Passerculus sandwichensis)*, Eastern Meadowlark *(Sturnella magna)*; Brown Thrasher *(Toxostoma rufum)*; Whip-poor-will *(Caprimulgus vociferous)*;

- *Turtles*: Wood turtle *(Glyptemys insculpta)*; snakes: Eastern ribbon snake *(Thamnophis sauritus)*, Eastern hognose snake *(Heterodon platirhinos)*;

- *Aquatic Species*: Aquatic snail *(Gyraulus circumstriatus)*, Moustached clubtail dragonfly *(Gomphus adelphus)*.

(CL&P 1, Vol. 1, p. 5-42; CL&P 18, pp. 20-21)

285. No state-listed amphibian species were reported to occur in the Project vicinity based on NDDB data and none were found during the vernal pool/amphibian breeding habitat surveys conducted in 2008 and 2011. (CL&P 18, p. 20)

286. Based on a 2012 review of more precise NDDB data regarding the locations of state-listed species (pursuant to data-sharing agreement between DEEP and CL&P), fewer state-listed species now may be known to inhabit areas that overlap with the Project ROWs. CL&P would continue to consult with DEEP NDDB representatives to assess the need for further field studies (if any) and to define construction BMPs and mitigation measures to protect state-listed species during Project construction. (CL&P 18, pp. 21-22)

Habitat and Vegetation

287. The old field and shrubland that will be created within the ROW will benefit any wildlife species that are declining in our state and region, including shrubland bird species. Habitat is being lost as former agricultural land is being developed or as it reverts to woodland. (DEEP Comments dated June 21, 2012; CL&P 18, p. 39)

288. In Connecticut, transmission line ROWs are considered a major source of shrubland habitat. (CL&P 18, p. 39; Audubon Society Comment Letter)

289. The old field habitat created in the Project ROW will be maintained indefinitely and will continue to provide habitat value for critical species as along as the corridor is maintained for utility purposes. (DEEP Comments dated June 21, 2012, p. 3)

290. The early successional vegetative regime provides excellent butterfly habitat. (DEEP Comments dated June 21, 2012, p. 3)

291. Because the cleared ROW is already in existence, the additional early successional habitat from the Project is created without fragmenting any existing upland forest blocks. (DEEP Comments dated June 21, 2012, p. 3)

292. During construction, measures to minimize the potential for spreading wetland invasive species along the ROWs would be implemented as described in the Wetland Invasive Species Control Plan (May 2012). After the completion of Project construction, wetland invasive species would be monitored and controlled along the ROWs pursuant to CL&P's agreement with DEEP. (Tr. 4, pp. 84-87; CL&P 23)

293. The ROWs would be managed pursuant to CL&P's well-established vegetation management program, which is designed to maintain safe access to the transmission facilities and to promote the growth of vegetative communities that are compatible with transmission line operation. (CL&P 1, Vol. 1, pp. 6-32 to 6-34)

ROW Clearing

294. About 268 acres of vegetation will be cleared for the Project, consisting of about 218 acres of upland forest and 50 acres of palustrine (mostly deciduous) wetland forest. (CL&P 18, p. 38)

295. About 56,000 trees with diameter breast height greater than 5-6 inches will be removed for the Project, representing 0.015% of the state's total trees. (CL&P 18, p. 38)

296. Vegetation types found along the ROWs are common in the region and vegetation removal would represent a negligible overall impact on wildlife habitats and populations. (CL&P 18, p. 38)

Land Use

297. The Project is not located within the state-designated coastal boundary. (CL&P 18, p. 24)

298. The Project does not traverse any designated wild and scenic or protected rivers. (CL&P 18, p. 25)

299. The Quinebaug and Shetucket Rivers Valley National Heritage Corridor, which was designated by Congress in 1994, encompasses approximately 695,000 acres of land within 35 municipalities in northeastern Connecticut and south-central Massachusetts. In Connecticut, the heritage corridor includes 26 towns, 10 of which are traversed by the Project ROWs. Of the 11 towns along the Project route, only Columbia is not within the heritage corridor. In July 2009, Connecticut similarly designated the Quinebaug and

Shetucket Rivers Valley as a state heritage corridor, pursuant to Public Act No. 09-221; the designation recognizes the heritage corridor as a place that has historic, recreational, cultural, natural, and scenic resources that form an important part of the state's heritage. (CL&P 1, Vol. 1, p. 5-71; Vol. 8, pp. 3 to 4, 10 to 11; CL&P 18, pp 22-23)

300. The Project ROWs traverse various designated recreational areas, including the Airline State Park Trail, Hop River State Park Trail, Mansfield Hollow State Park and WMA, Nipmuck Trail, and Tracey Road Trail. (CL&P 1, Vol. 1, pp. 5-71 to 5-73; Vol. 8; Vol. 9, Ex. 2; Vol. 11; CL&P 18, pp. 23-24)

301. The Project facilities would be located along long-established utility corridors and would be consistent with existing and future land use plans, as well as with federal guidelines for collocating new transmission lines on existing ROWs. (CL&P 1, Vol. 1, p. 6-57; CL&P 18, p. 45)

Cultural Resources

302. CL&P commissioned cultural resource consultants to perform studies of the Project ROWs and to assist in coordinating the Project review, conducted by the USACE pursuant to the National Historic Preservation Act. In addition, CL&P and it cultural resource consultants have conducted field reconnaissance of the entire 36.8-mile Project ROWs with representatives of Native American Tribes. (CL&P 1, Vol. 1, pp. 5-85 to 5-92, Vol. 3; CL&P 18, pp. 25)

303. CL&P would conform to federal and state regulatory requirements for protecting significant cultural resource sites and would continue to coordinate to that purpose with the State Historic Preservation Office, the USACE, and Native American Tribes. When more intensive cultural resources field studies are performed to determine the significance of sites, some modifications to construction plans (e.g., work pad dimensions, access road configurations) may be required to avoid or minimize impacts to significant sites or to address Native American Tribal concerns. (CL&P 1, Vol. 1, pp. 6-68 to 6-70; CL&P 18, p. 49)

Noise

304. Noise emissions associated with the construction of the Project would be localized and short-term and would generally be due to construction equipment operation, truck traffic, earth-moving vehicles and equipment, jackhammers and structure erection equipment (cranes). The impact of construction-related noise emissions would vary depending on the location of the noise source due to sound attenuation with distance and with the presence of vegetative buffers or other barriers. Construction contractors would be required to properly maintain vehicles to prevent excessive noise emissions. (CL&P 1, Vol. 1, pp. 6-71, 6-72; CL&P 18, p. 49)

305. Some construction activities, such as heavy equipment operation in general and any uses of imploding connectors in some areas would result in short-term and localized increases in ambient sound levels. (CL&P 18, pp. 49-50)

306. The new 345-kV transmission lines would not be a significant source of audible noise. Such noise typically can result under certain weather conditions causing corona on the line conductors or hardware. Generally, the operation of 345-kV transmission lines would create noise that ranges from inaudible levels during fair weather to barely audible levels in relatively dry snow or light fog to distinctly audible levels in rain or wet snow. (CL&P 1, Vol. 1, p. 6-73)

Air Quality

307. Air-quality effects associated with the construction of the Project would be short-term, minor, and highly localized. (CL&P 1, Vol. 1, p. 6-71)

308. Properly maintained construction equipment and vehicles and minimized diesel construction equipment idling time would limit vehicular emissions. (CL&P 1, Vol. 1, p. 6-71)

309. Fugitive dust emissions during construction of the Project would be suppressed by watering on access roads. Crushed stone aprons would be installed at access road entrances to public roads to minimize tracking of soil onto the pavement. (CL&P 1, Vol. 1, p. 6-71)

310. No long-term effects on air quality are associated with the operation of the transmission lines. (CL&P 1, Vol. 1, p. 6-71)

Visual Resources

311. The effects of the new transmission lines on visual resources will be incremental because the Project would be aligned along existing ROWs (where the overhead transmission lines have been part of the landscape for decades) and, for the most part, because the new structures would be similar in appearance to the existing structures. (CL&P 1, Vol. 1, Sections 5, 6; CL&P 1, Vol. 8; CL&P 18, p. 46)

312. Views of the Project facilities from designated scenic areas and public recreational areas would be limited as a result of the combination of distance from the ROW, topography, dense vegetative cover, and/or intervening land development. (CL&P 18, p. 46; CL&P 1, Vol. 1, Sections 5, 6; CL&P 1, Vol. 8)

313. The new transmission lines would alter views at certain locations, including where the ROW crosses public roads, and vegetation clearing would result in greater visibility of the structures in some locations, but the new lines would not be apparent as a new dominant landscape element due to the location of the existing ROWs and the screening afforded by topography and vegetation. (CL&P 1, Vol. 8; CL&P 18, p. 47)

Safety and Security

314. The design of the Project incorporates high-speed protective relaying equipment to automatically detect abnormal system conditions and send a protective trip signal to the associated circuit breaker(s) at each end of a line to isolate the faulted section of the transmission system. (CL&P 1, Vol. 1, p. 4-39)

315. The transmission line facilities may also provide for electronic communications between substations with overhead transmission facilities using carrier signals impressed upon the overhead conductors. (CL&P 1, Vol. 1, p. 4-39)

316. Fire/smoke detection systems are in place in the existing control and relay enclosures at the Killingly Substation and Lake Road Switching Station. These systems would automatically activate an alarm at Connecticut Valley Electric Exchange (CONVEX). (CL&P 1, Vol. 1, p. 4-39)

317. CL&P would adopt siting security measures that are consistent with the Council's "White Paper on the Security of Siting Energy Facilities". (CL&P 1, Vol. 5, CEII Appendix; Council Admin. Notice No. 27)

318. The construction of transmission line facilities and additions to Card Street Substation, Killingly Substation and Lake Road Switching Station would not pose a safety threat or create any undue hazard to the general public, including persons or property along the area traversed by the Interstate facilities. All work would be designed and constructed in accordance with all applicable national, electric utility industry, state and, to the extent practical, local codes. (CL&P 17, p. 82)

<u>Compliance with Requirements of Other State and Federal Agencies</u>

319. An Individual Permit from the USACE-New England District is needed to construct the entire Project pursuant to Section 404 of the federal Clean Water Act. Together with National Grid, CL&P has applied for such a permit. To obtain such a permit, CL&P and National Grid must also obtain Water Quality Certificates pursuant to Section 401 of the Clean Water Act from each of the states in which Interstate will be constructed. CL&P has applied to DEEP for such a Certificate with respect to the Project. As part of this permit application, CL&P developed a "wetland invasive species control plan," which has been filed with the Council. (CL&P 1, Vol. 1, p. 9-3; CL&P 23, USACE Application Appendix F; Tr. 7, p. 81, Carberry; Tr. 4, pp. 85, 86, Mango; Tr. 10, p. 152, Mango)

320. CL&P would coordinate with the involved regulatory agencies (e.g., DEEP, USACE) to define appropriate compensatory mitigation for the Project's effects on water resources. DEEP prefers a single large parcel as a mitigation site and expects a framework for the compensatory wetland mitigation plan in the 401 application. (CL&P 18, p. 33; DEEP Comments dated June 21, 2012, p. 4)

321. The DEEP requires a SCEL Permit for the crossing of the Willimantic River even though no new transmission line structures would be located within the established stream channel encroachment lines. This application can be combined with the Section 401 Water Quality Certification. (DEEP Comments dated June 21, 2012, p. 5)

322. The applications for the 401 Water Quality Certification and SCEL Permit were filed with the DEEP on July 23, 2012. (Tr. 7, p. 14, Mango)

323. The FAA has recommended aircraft warning lights for 20 structures. Unless CL&P is able to refine designs to reduce the heights of these structures, they would be lit at night with low intensity lights. (Tr. 10, p. 155, Case)

VIII. ELECTRIC AND MAGNETIC FIELDS

General

324. The Council's *"Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Lines in Connecticut"* (EMF BMPs) were approved on December 14, 2007 to address concerns regarding potential health risks from exposure to electric and magnetic fields (EMF) from transmission lines. (Council Admin. Notice No. 23; p. 1)

325. Electric fields (EF) and magnetic fields (MF) are two forms of energy that surround an electrical device. Transmission lines are a source of both EF and MF. (Council Admin. Notice No. 23, p.1)

326. EF is the result of voltages applied to electrical conductors and equipment. EF are measured in units of kilovolts/meter. As the weight of scientific evidence indicates that exposure to EF, beyond levels traditionally established for safety, does not cause adverse health effects, and as safety concerns for EF are sufficiently addressed by adherence to the National Electrical Safety Code, as amended, health concerns regarding EMF focus on MF rather than EF. (CL&P 1, Vol. 1, p. 7-2; Council Admin. Notice No. 23, p.1)

327. MF are produced by the flow of electric currents. The MF at any point depends on the characteristics of the source, including the arrangement of conductors, the amount of current flow through the source, and the distance between the source and the point of measurement. MF are typically measured in units of milliGauss (mG). (CL&P 1, Vol. 1, p. 7-3)

328. International health and safety agencies, including the World Health Organization (WHO), the International Agency for Research on Cancer (IARC), and the International Commission on Non-Ionizing Radiation Protection (ICNIRP), have studied the scientific evidence regarding possible health effects from MF produced by non-ionizing, low-frequency (60-Hertz (Hz)) alternating currents in transmission lines. Two of these agencies attempted to advise on quantitative guidelines for mG limits protective of health, but were able to do so only by extrapolation from research not directly related to health: by this method, the maximum exposure advised by the International Committee on Electromagnetic Safety (part of IEEE) was 9,040 mG, and the maximum exposure (as revised in 2010) advised by the ICNIRP is 2,000 mG. Otherwise, no quantitative exposure standards based on demonstrated health effects have been set world-wide for 60-Hz MF, nor are there any such state or federal standards in the U.S. (Council Admin. Notice No. 23, pp. 2-3; CL&P 1, Vol. 1, Appendix 7C, p. 8; CL&P 17, p. 82)

329. "Current Status of Research on Extremely Low Frequency Electric and Magnetic Fields and Health: Interstate Reliability Project", a report by Exponent, Inc., systematically evaluates peer-reviewed research and reviews by scientific panels published from January 2006 through May 2011 to determine if there are new developments that might alter the current scientific consensus as articulated in the Council's 2007 EMF BMPs. The review concluded that no recent studies provide evidence to alter the conclusion that the research

evidence suggests EMF exposure is not the cause of cancer or any other disease process, at the levels we encounter in our everyday environment. (CL&P 1, Vol. 1, pp. 7-47, 7-48; Appendix 7D, p. 56)

330. The Connecticut DEEP, Radiation Division, did not find anything inconsistent with the Exponent report's assertion that recent studies do not provide evidence to alter the WHO's 2007 status report on EMF. (DEEP Comment Letter dated June 21, 2012, p. 3)

331. As of March 16, 2010, there was no new evidence that might alter the scientific consensus articulated in the Council's 2007 EMF BMP document. (Council Admin. Notice No. 33, Opinion, p. 12)

332. Electrical engineers have numerous options for mitigating the effects of EMF. The Council's EMF BMPs support the use of effective no-cost and low-cost technologies and management techniques to reduce MF exposure to the public while allowing for the development of electric transmission line projects. (Council Admin. Notice No. 23, pp. 8-9; CL&P 1, Vol. 1, pp. 7-8)

333. Burying transmission lines underground can reduce but does not eliminate MF as a source of exposure. Underground transmission lines are typically three to five feet below ground, a near distance to anyone passing above them, and MF can be quite high directly over the line. MF on either side of an underground line, however, decreases more rapidly with increased distance than the MF from an overhead line. (Council Admin. Notice No. 23, p. 9)

334. The Council requires transmission-line planners to provide a baseline design (the Field Management Design Plan) – with cost estimates – against which effective mitigations can be measured. The Council defines "significant reduction" as an approximately 15 percent reduction from baseline MF; and "low cost" as approximately four percent of the Project's baseline cost (including related substation work). (Council Admin. Notice No. 23, pp. 4, 5; CL&P 1, Vol. 1, p. 7-8)

335. CL&P calculated pre- and post-construction EMF levels for a baseline Project design. Such calculations involve determining the amount of current that will flow through the lines under each set of conditions to be studied. Currents are determined in a conservative manner by various factors, including system configuration, system load level, generation dispatch, the level and direction of transfers of power into and/or from Connecticut, and assumptions about transmission line load flows. Therefore, the calculation results are higher than actual values under an assumed loading condition, all else equal. The pre-construction system model was for 2015. The post-construction system model was for 2020; it included all four of the NEEWS Projects. Finally, calculations are run for three different load conditions: annual peak load, peak daily average loads, and average annual loads. (CL&P 1, Vol. 1, pp. 7-9, 7-10, 7-11, 7-12, 7-13)

336. CL&P provided the estimated edge-of-ROW AAL electric and magnetic fields at each edge of the ROW in tabular form for each ROW cross section. An example of such a table (Table 7-4 from CL&P Vol. 1, p. 7-19 of the Application), relating to Cross Section 1, is provided below:

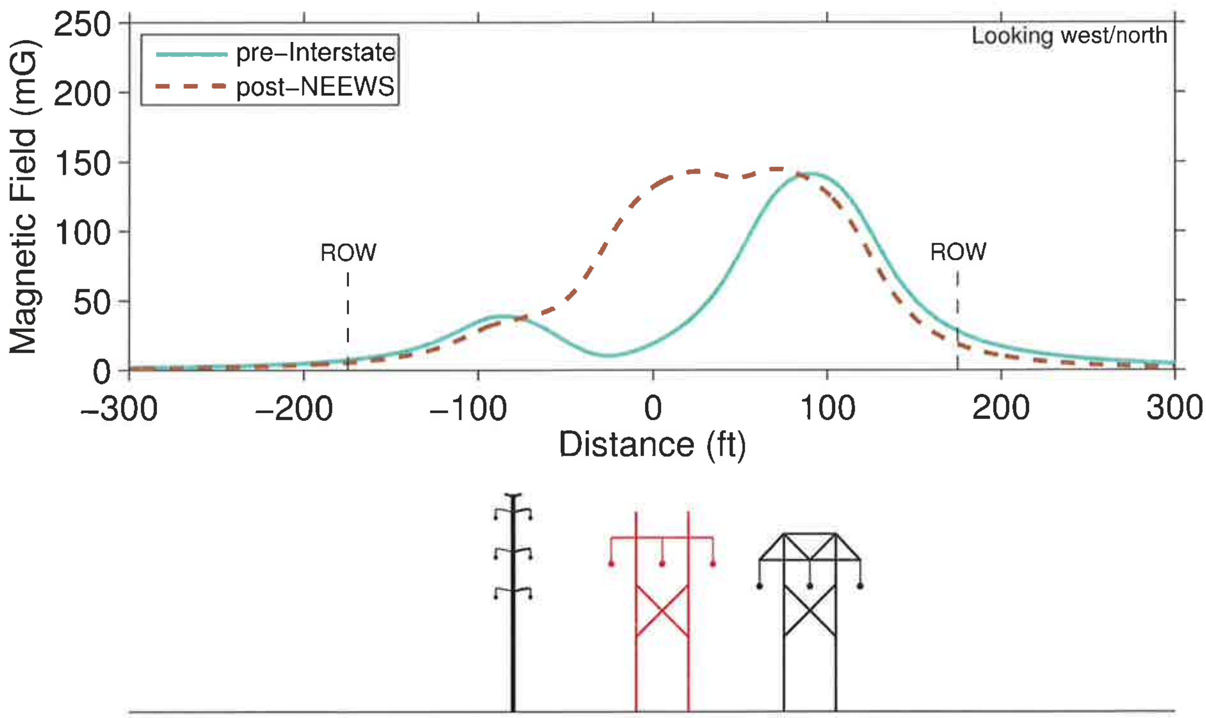
Pre-Interstate (2015) and Post-NEEWS (2020) EMF Levels at the Edge of the ROW at Annual Average Loading (AAL) – Card Street Substation to Babcock Hill Junction – XS-1

Cross-Section	Magnetic Field (mG)		Electric Field (kV/m)	
	West/South ROW	East/North ROW	West/South ROW	East/North ROW
XS-1 – Pre	**7.6**	**28.2**	**0.06**	**1.20**
XS-1 – Post	**5.8**	**18.7**	**0.06**	**1.18**

(CL&P 1, Vol. 1, pp. 7-16 to 7-46; CL&P 17, pp. 46-50, Attachment CCM-10, Carberry)

337. In addition, CL&P provided a figure illustrating the pre-Interstate (2015) and post-NEEWS (2020) curves of magnetic fields across and beyond the ROW, covering a distance of 300 feet from the center of the ROW in each direction. An example of these figures (Figure 7-3 from CL&P 1, Vol. 1, p. 7-18), again relating to Cross Section 1, is provided below:

Profile XS-1: Card Street Substation to Babcock Hill Junction – Magnetic Fields under Pre-Interstate (2015) and Post-NEEWS (2020) Conditions at AAL



Existing and New Lines (Structures not drawn to scale)

(CL&P 1, Vol. 1, pp. 7-16 to 7-46; CL&P 16, pp. 46, 47)

338. Where a BMP configuration has been identified for part of a Cross Section, CL&P provided both the "base case" and BMP values. (CL&P 1, Vol. 1, Appendix 7B, pp. 7B-25 to 7B-33; CL&P 17, pp. 50-60, Carberry)

339. CL&P also provided estimated AAL magnetic field values that would be associated with the implementation of the route variations identified as potential means of avoiding adjacency of the proposed line to day care centers or groups of homes that might be considered to be "residential areas." (CL&P 1, Vol. 1A, Sec. 15; CL&P 17, pp. 78-81, Attachment CCM-10, Carberry)

340. Overall, the post-NEEWS AAL magnetic fields at the edges of and beyond the ROW are quite similar to the pre-Project fields. Pre-project, the fields on the west/north ROW edge range from 1.2 mG to 17 mG; post-NEEWS, the range is from 2.2 mG to 25.1 mG. On the east/south ROW edge, the pre-Project range is 5.1 mG to 35.2 mG, and the post-NEEWS range is 11.2 mG to 24.1 mG. Pre-construction, the fields are (with some exceptions) generally higher along the east/south edge than along the west/north edge, and this remains the case after construction. For the great majority of Cross Sections, the fields on the east/south edge are modestly reduced by the construction, and those on the west/north edge are modestly increased. (CL&P 17, pp. 48, 49, Carberry)

341. Calculating weighted averages of the AAL magnetic field levels before and after construction of the Project provides a reasonable impression of the overall change in the magnetic field environment brought about by the Project. (CL&P 17, p. 49, Carberry)

342. The calculated edge-of-ROW AAL fields, weighting the levels for each Cross Section according to the length of the Cross Section as a proportion of the total length of the Connecticut portion of the project yields the following results:

Weighted Average of AAL Magnetic Fields (Base Line Design)

	West/North ROW Edge	East / South ROW Edge
Pre-Project	5.54 Mg	23.02 mG
Post-NEEWS	8.79 mG	18.81 mG

If the increase on the west/north edge is netted against the decrease on the east/south edge, the difference is less than 0.1 mG. (CL&P 17, p. 49, Carberry)

343. The pre and post construction magnetic fields are so similar primarily because locating a new line on an existing ROW adjacent to an existing line offers the opportunity to phase the conductors of the new line so that there will be partial cancellation of the magnetic fields associated with each of the two lines. As a result, the fields associated with the two lines at the ROW edge will be much lower than those that would be associated with a single line carrying the same amount of current, and lower than those that would be associated with each line if constructed on its own right-of-way. In this respect, using an existing ROW for a new line is itself a "no-cost" magnetic field reduction strategy. (Council Admin. Notice No. 21, p. 9; CL&P 17, pp. 49, 50, Carberry)

344. The aggregate post-construction current loadings on the two lines in the ROW are much higher than the modeled pre-construction load, but the higher load is shared between two optimally phased lines, which produces significant field cancellation. The cancellation is particularly effective for the Card Street to Lake Road circuits, because they share the same terminal points and thus tend to share load equally. The circuits from the Lake Road Switching Station to the Rhode Island border have different terminal points in Rhode Island, so the currents in the two circuits will rarely be equal. (CL&P 17, p. 50, Carberry)

345. Underground variations have been described that would replace portions of the Project as proposed. (Refer to Section VI, Route Variations, for further facts.) Estimated magnetic fields (in mG) at the ROW edges that would result from the adoption of these route variations, along with the estimated magnetic fields that would result from the implementation of the Project as proposed are shown in the following table. Where an EMF BMP overhead line configuration has been identified for the location of the potential underground variation (see the next section), values for both the base-line and the BMP overhead line configurations are provided:

Comparison of Magnetic Field Levels at AAL for Overhead Lines and the Underground Variations (mG)

	Pre-Interstate (2015)	Post-NEEWS (2020)		
ROW Edge	**Existing Configuration**	**Base Line H-Frame Design**	**Underground Variation**	**BMP Configuration (if not H-frames)**
	Mansfield Underground Variation			
North	4.6	7.2	2.8	5.2
South	28.0	18.4	24.6	20.6
Average Both Sides	16.3	12.8	13.7	12.9
	Mount Hope Underground Variation			
North	4.6	7.2	2.8	N/A
South	28.0	18.4	24.6	N/A
Average Both Sides	16.3	12.8	13.7	N/A
	Brooklyn Underground Variation			
West/North, XS-6	4.6	7.2	2.8	5.2
East/South, XS-6	28.0	18.4	24.6	20.6
Average Both Sides	16.3	12.8	13.7	12.9
West, XS-7	6.4	20.0	4.5	N/A
East, XS-7	16.6	18.7	19.8	N/A
Average Both Sides	11.6	19.4	12.2	N/A
Elvira Heights Underground Variation Considered but Eliminated				
North	1.2	2.2	2.6	1.8
South	7.2	20.4	21.2	13.3

(CL&P 17, pp. 78-80, Carberry; CL&P 1, Vol. 1A, pp. 15-101) Note that in CL&P 17, values for XS-7 West side were repeated and those for XS-6, East Side were not given. Correct values were provided in the Application, and the table has been revised accordingly.)

Statutory Facilities

346. CGS Section 16-50p(i) designates a group of land uses (to which the Council refers, for convenience, as "Statutory Facilities") that the Council must pay particular attention to in its review of new electric transmission facilities. "Statutory Facilities" include: private or public schools; licensed child day-care facilities; licensed youth camps; public playgrounds; residential areas. (CGS Section 16-50p(i); Council Admin. Notice No. 33, FOF # 295)

347. CGS Section 16-50p(i) states that electric transmission lines with a voltage of 345 kV or greater shall be constructed underground if they are adjacent to Statutory Facilities, unless burying the lines is infeasible for technical or economic reasons. If undergrounding the transmission lines is deemed infeasible, the Council may approve overhead construction provided that it is installed within an area that is adequate to protect health and safety. (CGS Section 16-50p(i); Council Admin. Notice No. 33, FOF # 295)

348. Wherever the project is adjacent to statutory facilities, or other locations that might be deemed by the Council to warrant precautionary measures, CL&P, as required, has modified the baseline design to show various options for reducing MF. (Council Admin. Notice No. 23; CL&P 1, Vol. 1, Appendix 7B)

349. In accordance with the Council's *EMF Best Management Practices* (BMP), CL&P submitted a Field Management Design Plan (FMDP), which presents design alternatives that could be used to reduce magnetic fields in certain areas along the Proposed Route, (Council Admin. Notice No. 23, p. 4; CL&P 1, Vol. 1, Appendix 7B)

350. The new lines as proposed will not be adjacent to any licensed youth camps and public playgrounds. (CL&P 17, p. 71, Carberry)

351. The new line will be near to the Mount Hope Montessori School in Mansfield, which is both a school and a licensed child day-care facility; and near a licensed home-based day care facility in Mansfield, the Green Dragon Day Care (CL&P 1, Vol. 1, p. 7-21; CL&P 17, p. 71, Carberry; CL&P 28)

352. Although the Application refers to two additional day care facilities, neither of them has continued in operation. (CL&P 1, Vol. 1, pp. 7-21, 7-29; CL&P 17, p. 53; Tr. 7, p. 13, Carberry)

353. There are groups of homes in scattered locations along the ROW. (CL&P 1, Vol. 1, Appendix 7B, pp. 7B-4 to 7; CL&P 17, pp. 51-58)

354. The sections of ROW adjacent to the Montessori School and the Green Dragon home day-care facility, and nearby the groups of homes were treated as BMP "Focus Areas" in the FMDP. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-6)

Focus Areas

355. In its FMDP, CL&P considered five Focus Areas, designated A, B, C, D, and E, for potential MF-reducing line designs, (CL&P 1, Vol. 1, Appendix 7B; CL&P 17, p. 51-58)

Focus Area A

356. Focus Area A is an approximately 2.3-mile-long section of ROW in Coventry and Mansfield. Homes have been developed near each side of the ROW along crossing streets. The AAL magnetic field comparison for this segment of ROW, before considering additional BMP measures is as shown in the table below:

Magnetic Field Comparison for Focus Area A: Base Line Design

XS-2 and XS-6 Configurations	Magnetic Fields for Annual Average Load Case		
	Maximum Level on ROW (mG)	North/West ROW Edge Level (mG)	South/East ROW Edge Level (mG)
Pre-Interstate (2015)	140.5	4.6	28.0
Post-NEEWS (2020) - Base-Line Case	146.9	7.2	18.4

Accordingly, the average of the AAL fields on both sides of the ROW in this Focus Area is 16.3 mG before the construction of Interstate, and 12.8 mG after construction of the NEEWS projects, assuming that the Project is built with the base-line H-frame configuration. (CL&P 1, Vol. 1, Appendix 7B, pp. 7B-6, 7B-16; CL&P 17, pp. 51-52)

357. The most effective design for reducing MF in Focus Area A is the delta configuration, which decreases fields by 28% on one side of the ROW but increases them by 12% on the other, as shown in the table below:

Focus Area A
Base Line / BMP Comparison

Focus Area A XS-2 Cross Section Configuration	Typical Structure Height (ft)	Magnetic Field for Annual Average Load Case					Cost	
		Maximum Level on ROW (mG)	North ROW Edge		South ROW Edge		Section Amount ($)	Project Increase (%)
			Level (mG)	Change (%)	Level (mG)	Change (%)		
Base Line Design H-Frame	85	146.9	7.2		18.4		$10,320,459	-
Alt 2 – delta Configuration	110	143.6	5.2	-28%	20.6	12%	$13,040,737	1.3%

(CL&P 1, Vol. 1, Appendix 7B, p. 7B-18; Tr. 4, p. 29, Carberry; CL&P 17, corrected p. 52)

Accordingly, the average of the AAL fields on both sides of the ROW in this Focus Area after construction of the NEEWS projects is 12.9 mG if the BMP configuration with taller poles is used, as compared to 12.8 mG it the base line H-frame configuration is used.

358. The increase in Project cost of the BMP designs is calculated as a percentage of $213.7 million, the base project cost without implementing BMP designs in any of the Focus Areas. (CL&P 1, Appendix 7B, p. 7B-18)

359. As compared to the base line design, the implementation of the delta design in Focus Area A would cause MF at the nearest corners of the nearest homes to decline on one side of the ROW but to increase on the other, as shown in the following table:

MF Levels at Nearest Corners of Homes in Focus Area A (AAL)

Facility	Distance to Nearest Edge of ROW (ft)[a]	Magnetic Fields for Annual Average Load Case		
		2015 Pre-Interstate (mG)	2020 Post-NEEWS	
			Base Line Design (mG)	Delta Design (mG)
Homes North of ROW	4	4.4	6.7	4.9
Homes South of ROW	5	25.2	16.2	18.3

[a] Distance is to the home closest to the ROW edge. Homes further from ROW edges will have lower field levels.

(CL&P 1, Vol. 1, Appendix 7B, p. 7B-20; CL&P 17, p. 53)

Focus Area B

360. Focus Area B is a 0.9-mile-long segment of ROW in Mansfield. It passes by the Mount Hope Montessori School and the Green Dragon home-based day care facility, and was also designed to pass by the Come Play With Me Day Care, which is no longer operating. (CL&P 1, Vol. 1, Appendix B, p. 7B-6; CL&P 17, p. 53; CL&P 17, p. 53)

361. The pre-Project and post-NEEWS edge-of-ROW levels of magnetic fields in Focus Area B are the same as those in Focus Area A, shown in the table in ¶ 357 above. (CL&P 1, Vol. 1, Appendix B, p. 7B-6; CL&P 17, p. 53)

362. Based only on edge-of-ROW levels, the delta design appears to be the preferable MF-reducing design for Focus Area B, were one to be implemented instead of the base line H-Frame configuration. (CL&P 1, Vol. 1, Appendix B, p. 7B-18; CL&P 17, p. 53)

363. The delta design results in the same changes in MF levels as those shown for Focus Area A, achieving a reduction on one side of the ROW, with a slight increase on the other. (CL&P 1, Vol. 1, Appendix B, p. 7B-18; CL&P 17, p. 53)

364. Compared to the proposed H-frame line design along this segment of the ROW, the underground variation would result in higher magnetic field levels along the east/south ROW edge nearest to the existing 330 Line. This is because the placement of the new

345-kV line overhead, adjacent to the 330 Line, would allow mutual magnetic field cancellation. (CL&P 1, Vol. 1, pp. 15-57)

365. The delta design does not lower magnetic fields at the school or at the nearby day-care facility. As shown in the table below, the baseline H-frame design reduces the already low AAL magnetic field levels at the nearest corners of the Mount Hope Montessori School and the home day care facility in this Focus Area, to a greater extent than the delta configuration would.

MF Levels at Nearest Corners of Statutory Facilities in Focus Area B

Facility	Distance to Nearest Edge of ROW (ft)	Magnetic Fields for Annual Average Load Case		
		2015	2020 Post-NEEWS	
		Pre-Interstate (mG)	Base Line Design (mG)	Delta Design (mG)
Mount Hope Montessori School	137	1.7	1.2	1.4
Green Dragon Day Care	196	2.7	0.9	1.7

(CL&P 1, Vol. 1, Appendix 7B, p. 7B-20, 27; CL&P 17, p. 54)

366. The delta design for Focus Area B would be 25 feet taller than the base line H-frame design, and would add more than $1,000,000 (0.5%) to the Project cost. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-18; CL&P 17, p. 54)

367. The incremental cost of implementing the delta design in Focus Area B could be lowered by shortening the length of the delta section, by relocating its western terminal point to the east side of Route 195. Since the Come Play With Me home day care facility, which was located west of Route 195, has ceased operations, the Focus Area need not extend past it. Assuming that the delta design structures would be installed from existing structure 9073 to 9078 (5 spans) rather than for the 8 spans of the original design, this adjustment would reduce the length of the section using the delta design by approximately 0.3 mile (34%) and would reduce its incremental cost commensurately, to approximately $550,000. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-18; Vol. 9, Ex. 2 Mapsheets 8 and 9 of 40; CL&P 17, p. 36)

368. If Focus Area B were to be extended to include the conceptual Beech Mountain subdivision on the Civie property, the edge of ROW magnetic field estimates would be the same as those for the remainder of the Focus Area. Moreover, as compared to the proposed H-frame base line design, alternate line configurations would not lower magnetic fields at the probable locations of the houses to be constructed there by as much as 15%. (Civie 3; Tr. 10, pp. 147-150, Carberry)

Focus Area C

369. Focus Area C abuts Focus Area B. It is the Hawthorne Lane area. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-6; CL&P 17, p. 54)

370. The edge-of-ROW pre-Project and post-NEEWS magnetic fields levels, with the base line H-frame construction, are the same for this Focus Area as for Focus Areas A and B, see ¶ 357. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-16; CL&P 17, p. 54)

371. The BMP alternative that CL&P designed and analyzed at the request of the residents, a vertical configuration of both the existing and new lines on a relocated ROW (the Hawthorne Lane ROW Shift), results in a reduction of an already low magnetic field level on the side of the ROW that is nearer to the Hawthorne Lane homes, and an increase on the other side, as follows:

Focus Area C

Focus Area C XS-2 Cross Section Configuration	**Typical Structure Height (ft)**	**Magnetic Field for Annual Average Load Case**					**Cost**	
		Maximum Level on ROW (mG)	**North ROW Edge**		**South ROW Edge**		**Selection Amount ($)**	**Project Increase (%)**
			Level (mG)	Change (%)	Level (mG)	Change (%)		
Base Line Design H-Frame	85	146.9	7.2		18.4		$3,311,244	-
Alt 7 (Hawthorne Lane ROW Shift) Vertical Configuration of Two Lines on Relocated ROW	130	80.2	2.0	-72%	22.9	25%	$5,084,530	0.8%

Accordingly, the average of the AAL fields on both sides of this cross section of the ROW is 4.2 mG before construction of Interstate and 11.3 mG after construction of the NEEWS projects, assuming that the baseline H-frame configuration is used.

(CL&P 1, Vol. 1, Appendix 7B, p. 7B-18; CL&P 17, p. 55)

372. The Hawthorne Lane ROW Shift also results in a small reduction of fields at all but one of the nearby homes, over and above the reduction achieved by the base line design, as follows:

MF Levels at Nearest Corners of Homes in Focus Area C with Alternative 7 (Hawthorne Lane ROW Shift)

Facility	Distance to Nearest Edge of ROW (ft)[a,b]	Magnetic Fields for Annual Average Load Case		
		2015	2020 Post-NEEWS	
		Pre-Interstate (mG)[c]	Base Line Design (mG)[c]	Alternative 7 (mG)
Homes North of ROW	125 (70)	2.6	2.5	0.5
Home South of ROW	185 (240)	2.0	0.6	1.0

[a] Distance is to the home closest to the ROW edge. Homes further from ROW edges will have lower field levels.
[b] Distances from ROW edges before ROW shift are shown in parentheses.
[c] Pre-Interstate and Base Line Design magnetic fields based on current ROW limits before relocation during the Project.

(CL&P 1, Vol. 1, Appendix 7B, p. 7B-20; CL&P 17, p. 55)

Focus Area D

373. Focus Area D is a one-mile-long section of ROW in Brooklyn. The Application identifies two home-based child day-care facilities to the north of the ROW. One of these (the Susan Kirkconnell Day Care) is nearly 500 feet from the ROW. The other, the Jacqueline Ben Day Care, ceased operations during the hearings. Thus, there are now no day care facilities "adjacent to" the ROW in Focus Area D. (CL&P 1, Vol. 1, Appendix 7B, pp. 7B-6, 7B-21; Tr. 7, p. 13, Carberry)

374. However, there are homes located along both sides of the ROW in this Focus Area. The northern side of the ROW has more homes than the south. The comparison of pre-Project and post-NEEWS AAL levels using the base line H-frame design is the same as that for Focus Areas A, B, and C. <u>See</u> ¶ 357. As with Focus Areas A and B, of all the alternate designs analyzed, the delta configuration appeared to be most consistent with the BMP criteria. The comparison of the base line and delta options is shown in the table below:

Focus Area D

Focus Area D XS-6 Cross Section Configuration	Typical Structure Height (ft)	Magnetic Field for Annual Average Load Case					Cost	
		Maximum Level on ROW (mG)	North ROW Edge		South ROW Edge		Section Amount ($)	Project Increase (%)
			Level (mG)	Change (%)	Level (mG)	Change (%)		
Base Line Design H-Frame	85	146.9	7.2		18.4		$5,118,233	-
Alt 2 – Delta Configuration	110	143.6	5.2	-28%	20.6	12%	$6,529,045	0.7%

(CL&P 1, Vol. 1, Appendix 7B, pp. 7B-6-7; CL&P 17, pp. 56, 57)

375. From existing structure 9210 to Day Street Junction (structure 9219), CL&P identified a BMP configuration to mitigate magnetic fields by supporting the new overhead line on steel monopoles with delta-configured conductors. North of structure 9219, the new line is proposed as the base line configuration of horizontally-configured conductors

supported on H-frame structures. (CL&P 1, Vol. 1, Appendix 7B, XS-6 BMP, Vol. 1A, p. 15-64)

376. In this area, the 28% reduction would be achieved at the edge of the ROW where there are more homes. (CL&P 17, p. 56)

377. The increased height of the delta structures, in addition to increasing the visual impact may have regulatory significance. This segment of ROW is approximately 2,800 feet west of the Danielson Airport, and the Federal Aviation Administration has issued Notices of Presumed Hazard (NPHs) for seven H-frame structures along the existing 345-kV line. The new structures could also result in NPHs. Coordination with the FAA would be required to resolve issues related to the NPHs. This effort could be complicated by the choice of the taller structures. (CL&P 17, p. 57)

Focus Area E

378. Focus Area E is a residential area known as "Elvira Heights." A number of homes in Elvira Heights are located a short distance southeast of the ROW, just beyond a parallel natural gas transmission pipeline ROW. The new 345-kV transmission line in this area would be constructed farther away from these homes than the existing 345-kV line. The base-case H frame line design produces higher magnetic field levels on both edges of the ROW when compared to the 2015 pre-Interstate conditions, as shown in the following table:

Magnetic Field Comparison for Focus Area E: Baseline Construction

XS-12 Configuration	Magnetic Fields for Annual Average Load Case		
	Maximum Level on ROW (mG)	North/West ROW Edge Level (mG)	South/East ROW Edge Level (mG)
Pre-Interstate (2015)	36.1	1.2	7.2
Post-NEEWS (2020) - Base-Line Case	112.7	2.2	20.4

Accordingly, the average of the AAL magnetic fields on both sides of the ROW in this Focus area before the construction of Interstate would be 4.2 mG, and after construction of the NEEWS projects would be 11.3 mG, assuming that the baseline H-frame configuration were used. (CL&P 1, Vol. 1, Appendix 7B, pp. 7B-22 to 7B-24, 7B-31 to 7B-33; CL&P 17, p. 57)

379. None of the six alternative line designs for the new line, including a split-phase configuration, would achieve a MF reduction on either ROW edge in the Elvira Heights segment of the ROW, as compared with the base-line design. Of the four additional alternatives involving rebuilding the existing line, one BMP alternative would involve reconstructing the existing line along its existing center line, and constructing the new line alongside it, both on steel-pole structures with delta-configured conductors. This alternative would only achieve a small reduction in MF levels and would increase environmental impacts, including vegetation disturbance along the ROW and temporary

and permanent impacts on wetlands and watercourses from rebuilding the existing line segment. As a result, CL&P recommends the base case H-frame line design for the Elvira Heights area. ((CL&P 1, Vol. 1, Appendix 7B, pp. 7B-22 to 7B-24, 7B-31 to 7B-33; CL&P 17, p. 57-59; Tr. 10, pp. 138 to 142, Carberry)

380. DEEP notes that the existing 345-kV transmission line structures are well-screened by vegetation from the homes along Elvira Heights, and that the taller delta-configured structures would likely be seen above the tree line from these residences. The aesthetic impacts of the BMP option in this area appear to be more significant than the very limited reduction in EMF levels. (DEEP Comments dated June 21, 2012)

Conn. Gen. Stats. § 16-50p(i)

381. The Council's BMP have been developed in conjunction with Conn. Gen. Stats. § 16-50(p)(i). (Council Admin. Notice No. 21, p. 4). Accordingly, in considering whether the cost of requiring a new line to be constructed underground as it is "adjacent to" statutory facilities imposes an "unreasonable burden" on consumers, the Council will consider the magnetic field levels that overhead construction of the line would produce in the vicinity of statutory facilities if designed in accordance with the Council's EMF Best Management Practices. (Council Admin. Notice No. 21, p. 4)

382. The large investment that would be required for any of the underground variations would not produce a large reduction in magnetic fields along the edges of the ROW, as compared with the proposed base-line H-frame design, or the identified BMP configurations. The estimated AAL edge of ROW fields before construction, with the proposed baseline and BMP overhead designs, as compared to those that would result from construction of any of the underground variations, are as shown in the table in Proposed FOF ¶ 345.

Brooklyn Overhead Variation

383. If the Brooklyn Overhead Variation were incorporated into the route for the new 345-kV line, two separate ROWs, each occupied by 345-kV transmission lines, would extend through the eastern portion of the Town of Brooklyn. The existing transmission lines would remain on the existing CL&P ROW segments, but would carry different currents in 2020 than they would prior to the Project. As a result, magnetic field levels in 2020 along the ROW edges would be slightly reduced in some places and slightly increased in others, as compared to pre-project levels. (CL&P 1, Vol. 1A, pp. 15-79 to 15-83)

384. However, the Brooklyn Overhead Variation would result in magnetic fields along two separate ROWs, and the opportunity for reducing magnetic fields along the existing ROW by cancellation through best circuit phasings with a new line would be lost. Therefore, as compared to construction of the overhead line segment as proposed, magnetic fields would be lower along the West/North ROW edge, but essentially the same or higher along the East/South ROW edge. Thus, overall, the Brooklyn Overhead Variation would present greater magnetic field exposure than the proposed overhead line. (CL&P 1, Vol. 1A, p. 15-81, Table 15-22)

Compliance With Statutory and BMP Requirements

385. CL&P has complied with the statutory and the BMP requirements regarding EMF, as follows:

- CL&P has provided an update of scientific research and group positions re: MF;
- CL&P has provided measurements and calculations that were developed in accordance with the BMP;
- CL&P has prepared an FMDP with a base design that incorporates standard utility practice with no-cost MF mitigation design features, and with modified line designs that incorporate low-cost MF reduction designs;
- CL&P's base line FMDP designs, would produce MF levels at the ROWs edges that are essentially the same as the pre-project fields; and
- CL&P's ROWs would provide an adequate buffer zone between any new or modified lines and any adjacent statutory facilities.
(CL&P 17, p. 81)

386. The IEEE International Committee for Electromagnetic Safety (ICES) and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) have guidelines for long-term public exposures to MF. The ICES reference level is 9,040 mG, and the ICNIRP reference level is 2,000 mG. Projected MF levels for Interstate are well below these guideline levels. (CL&P 17, p. 82)

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By: ______________________

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CERTIFICATION

I hereby certify that a copy of the foregoing Applicant's Proposed Findings of Fact has been electronically mailed / sent by U.S. Mail on this 1st day of October, 2012 upon all parties and intervenors as referenced in the Connecticut Siting Council's Service List dated August 13, 2012.

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