DOCKET NO. 424 - 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.	}	Connecticut Siting Council December 27, 2012

Findings of Fact

I. INTRODUCTION

Proceedings

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 Interstate Reliability Project (Interstate). (CL&P 1, Vol. 1,pp. ES-1, ES-7, FR-1)

2. Interstate involves the siting of transmission facilities in northeastern Connecticut, northwestern Rhode Island, and south-central Massachusetts. The proposed project would extend over 75 miles within the three states, predominantly within the existing utility rights-of-way (ROW). Refer to Figure 1. The Connecticut portion of Interstate includes new overhead 345-kV electric transmission lines extending approximately 36.8 miles between CL&P's Card Street Substation in Lebanon and the Connecticut/Rhode Island border in Thompson; and associated substation and switching station modifications. (CL&P 1, Vol. 1, pp. ES-1, 1-2, 3-2)

3. CL&P is a wholly-owned subsidiary of Northeast Utilities (NU). The Northeast Utilities Service Company (NUSCO) is another wholly-owned subsidiary of NU that provides centralized and coordinated management and technical services to NU companies. (CL&P 1, Vol. 1, p. ES-1, 2-16)

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

5. Parties to these proceedings include CL&P (the Applicant); NRG Energy, Inc. NRG Power Marketing Inc. (including: 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 Reources Corp. (including: Lake Road Generating Company LP; and Milford Power Company LLP) (collectively EquiPower); The United Illuminating Company (UI); Edward Hill Bullard; the Office of Consumer Counsel; Richard Cheney and the Highland Ridge Golf Range, LLC (Highland Ridge); Mount Hope Montessori School, Inc.; 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 proposed line; municipalities within 2,500 feet of the proposed line; federal, state, local and regional agencies, and elected officials; and published notice in The Willimantic Chronicle and The Norwich Bulletin on December 9, and December 16, 201. The Bozrah Light and Power Company sent its Lebanon customers bill inserts; and CL&P sent its customers within Lebanon, Columbia, Coventry, Mansfield, Chaplin, Hampton, Brooklyn, Pomfret, Killingly, Putnam, and Thompson bill inserts entitled "Notice of Proposed Construction of a High Voltage Electric Transmission Line" included in one or more monthly bills on or after October 31, 2011. (CL&P 1, Vol. 1, pp. FR-8, FR-9, FR-10; CL&P 2; CL&P 17, pp. 21, 22)

7. Pursuant to CGS §16-50*l*(e), CL&P began the municipal consultation process by meeting with representatives of each affected municipality in August 2008 and repeated it in July 2011. Prior to filing the application for Interstate with the Council, CL&P held more than forty project briefings with municipal officials and/or local boards or commissions. (CL&P 1, Vol. 1, p. FR-7, Table 9-3, pp. 9-8, 9-9; CL&P 17, p. 19)

8. In August of 2008, CL&P submitted its Municipal Consultation Filing for Interstate, stating it expected to file an application with the Council by the end of the year. Meanwhile, however, ISO-NE began re-analyzing the project and CL&P realized ISO-NE would likely not support the application while its reassessment was continuing. One part of the re-analysis—the Needs Analysis—was completed in April, 2011, and the second part—the Solutions Analysis—was completed in December, 2011. Thus, CL&P filed its application for Interstate with the Council on December 23, 2011. (CL&P 1, Bulk Filing 2; CL&P 16, pp. 9, 10)

9. Pursuant to CGS § 16-50*l*(b), CL&P provided notice to owners of property abutting the substations and switching station associated with Interstate, as well as water companies and community organizations. (CL&P 2; CL&P 17, pp. 21, 22)

10. CL&P developed a project website, email address and hotline through which residents and stakeholders could communicate with project management. (CL&P 17, p. 22)

11. CL&P hosted or participated in a number of public meetings, including open houses, town meetings, neighborhood meetings, and landowner meetings. (CL&P 17, p. 21)

12. In 2008, open houses were held in four towns including:
    a. Brooklyn on September 24, 2008
    b. Willimantic on September 30, 2008
    c. Mansfield on October 22, 2008
    d. Danielson (Killingly) on November 5, 2008
    (CL&P 1, Vol. 1, pp. 9-6, 9-9)

13. In 2008, each open house had four information stations, including a "Welcome" station with information about how to participate in the siting process and Route Locator station; a Project Needs station; a structure design and photosimulations station; and a station with materials about environmental management, electric and magnetic fields, and the proposed ROW. (CL&P 17, p. 22)

14. In 2011, open houses were held in two towns including:
    a. Danielson (Killingly) on August 23, 2011
    b. Mansfield on December 8, 2011
    (CL&P 1, Vol. 1, pp. 9-6, 9-9)

15. The 2011 open houses were similar to those held in 2008, with stations including: Needs and Benefits; the Proposed Upgrade; Transmission Construction; Mansfield Hollow; Electric and Magnetic Fields; ROW Information; and Public Participation in the siting process. (CL&P 17, p. 23)

16. On February 1, 2012, the Connecticut Energy Advisory Board (CEAB) met to consider issuing a request for proposals (RFP) for alternative solutions to the need that would be addressed by Interstate. The CEAB voted to not issue an RFP. (CEAB draft meeting minutes of February 1, 2012; Connecticut Energy Advisory Board Letter to NRG Energy, Inc., dated April 23, 2012)

17. Pursuant to CGS §16-50m, the Council held public hearings for citizen comment on April 18, 2012 at the Lebanon Fire Safety Complex in Lebanon; April 19, 2012 at the Quinebaug Valley Senior Citizens Center in Brooklyn; and April 24, 2012 at Mansfield Middle School in Storrs. 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)

18. The Council and its staff conducted public field reviews of the proposed route divided into three separate tours. Each field review was held on the same day as the public hearings in the municipalities referenced in FOF # 17. (Council Hearing Notice)

19. On April 4 and 5, 2012, CL&P posted 22 four-foot by six-foot signs at various locations along the proposed route to notify the public of all three public hearings. The signs were removed on April 25 and 26, 2012. (CL&P 17, pp. 24, 25)

20. The Council held public evidentiary hearings on June 4, 5, and 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 and August 28, and 30, 2012 at the offices of the Connecticut Siting Council, Ten Franklin Square, New Britain, Connecticut. (Transcript 4, June 4, 2012 [Tr. 4], p. 6; Transcript 5, June 5, 2012 [Tr. 5], p. 6; Transcript 6, June 26, 2012 [Tr. 6], p. 4; Transcript 7, July 31, 2012 [Tr. 7], p. 6; Transcript 8, August 2, 2012 [Tr. 8], p. 4; Transcript 9, August 28, 2012, [Tr. 9], p. 5; Transcript 10, August 30, 2012 [Tr. 10], p. 5)

21. Pursuant to CGS § 16-50o(c), on May 30, 2012, CL&P submitted a copy if its agreement with UI to sell a portion of the project assets to UI, requiring a partial transfer of the Certificate that CL&P would receive if the project is approved. (CL&P 21)

State Agency Permits and Comments

22. Pursuant to CGS §16-50j(h), on February 27, 2012 and August 30, 2012, the following state agencies were requested to submit written comments regarding Interstate: Department of Energy and Environmental Protection (DEEP); Department of Agriculture; Department of Public Health; Council on Environmental Quality; Public Utilities Regulatory Authority; Office of Policy and Management; Department of Economic and Community Development; Department of Emergency Management and Homeland Security; and the Department of Transportation (ConnDOT). (Record)

23. ConnDOT commented on the proposed project in a letter dated February 23, 2012. ConnDOT opposes the installation of any overhead or underground transmission facilities within state highway rights-of-way. (ConnDOT letter dated February 23, 2012)

24. DEEP provided comments on the proposed project in a letter dated June 21, 2012. DEEP supports the need for Interstate based on the repeated position taken by ISO-NE that the project is needed to meet regional reliability criteria. (DEEP comments dated June 21, 2012)

25. The proposed project would require permits from the U.S. Army Corps of Engineers (USACE) under the Clean Water Act Section 404. (CL&P 9, R. 26)

26. CL&P would apply to DEEP for Water Quality Certification under Section 401 of the Clean Water Act and a Stream Channel Encroachment Line permit under CGS § 22a-342. CL&P filed an application for the necessary DEEP permits on July 23, 2012. (CL&P 9, R. 26; Tr. 7, p. 14)

27. The proposed project would require encroachment permits from ConnDOT. (CL&P 9, R. 26)

Municipal Comments

28. The Town of Windham submitted comments on February 23, 2012 opposing any of the alternative transmission line routes that extend through Windham and supports the proposed transmission route. (Town of Windham Comments dated February 22, 2012)

29. The Windham Region Council of Governments, which includes Chaplin, Columbia, Coventry, Hampton, Lebanon, Mansfield, Scotland, Willington, and Windham, submitted comments dated March 31, 2009. The comment letter recommended that: 1) non-transmission alternatives should be thoroughly studied before new transmission is considered; and 2) if new transmission must be considered, routes that do not cross through rural eastern CT should be thoroughly investigated. (Windham Region Council of Governments dated March 31, 2009)

30. The Town of Brooklyn First Selectman Austin Tanner submitted comments on April 19, 2012. He stated that due to the existing limits on Connecticut's ability to import power, and CL&P's proposal to use the existing transmission ROW for the routing of the proposed project, the town supports the proposed project route. (First Selectman of Brooklyn Comments dated April 19, 2012; Tr. 2, p. 8)

31. The Town of Killingly Planning and Development Office submitted comments to the Council dated April 19, 2012. The Office requests consideration and use of EMF Best Management Practices (BMPs) near Killingly residences; they also request consideration of priority funding for residential areas when implementing EMF BMPs. They have further requests regarding the Development & Management (D&M) phase of Interstate should the Council approve the application. The Killingly Planning Department recommended the D&M Plan:
    a. Be provided once completed;
    b. Include a requirement for a meeting with town staff prior to commencement of construction within Killingly;
    c. Include language telling all contractors and sub-contractors that local land use permits would be needed for any residence requesting excess project fill;
    d. Specify the use of temporary versus permanent construction access roads where possible, with temporary roads restored upon completion of construction; and
    e. Provide for notice to the Office when work is planned near vernal pools, wetlands, and state protected species habitat.

    (Town of Killingly Planning & Development Office comments dated April 19, 2012)

32. The Town of Killingly Economic Development Coordinator, Elsie Bisset, on behalf of the EDC, supports the proposed route through the Town of Killingly along existing CL&P ROWs, as it would have the least impact to area businesses. (Killingly Economic Director comments dated April 19, 2012)

33. The Town of Putnam Economic and Community Development Director, Delpha M. Very, submitted comments dated April 19, 2012 supporting the proposed route of Interstate through Putnam. (Putnam Economic and Community Development comments dated April 19, 2012)

34. The Town of Mansfield submitted comments dated April 24, 2012. The town opposes the proposed route, asserting that alternative transmission routes should have been given more consideration and that the project would result in land use impacts. Specifically, Mansfield recommends:
    a. The relocation of proposed structure No. 39 on Highland Ridge Golf Range property;
    b. The use of the Mansfield Underground Variation and a modified Mount Hope Underground Variation that would move the western end of the variation to a point west of Sawmill Brook Lane between structure Nos. 66 and 67 and move the eastern end of the variation to a point west of Route 195/Storrs Road near proposed structure No. 71;
    c. Use an EMF BMP configuration between Route 195 and Mansfield Hollow;
    d. Relocation of Mount Hope Montessori School;
    e. A land transfer between Diane Dorfer, owner of Green Dragon Day Care, and Northeast Utilities. Exchanging the rear portion of Ms. Dorfer's land, which is crossed by CL&P's ROW, with land east of her property, which is owned by CL&P;
    f. Use of the Hawthorne Lane Alternative;
    g. Use of the No-ROW Expansion option for the proposed transmission lines through Mansfield Hollow;
    h. Minimize impact to farmland that is crossed by the proposed line; and
    i. Locate construction access roads as far from residences as possible.

    (Town of Mansfield comments dated April 24, 2012)

35. The Town of Thompson Conservation Commission provided comments on the proposed project in a letter dated August 4, 2009. The Commission recommended CL&P consult with the DEEP Natural Diversity Database and the DEEP Natural History Survey in order to protect species associated with sensitive areas along the proposed route. (Thompson Conservation Commission comments dated August 4, 2009)

36. The Town of Thompson Inland Wetlands Commission Agent, Marla Butts, submitted comments in a letter dated May 29, 2012. The Agent stated that members inspected the route through Thompson on April 13, 2012 to identify environmental conditions or problems that may impact wetlands and watercourses during construction. The Commission recommends:
    a. Using sediment and erosion controls that incorporate wood chips and slash from clearing at the site into tubular mesh filter socks.
    b. Using a floating access road with road stabilization geotextile and geogrid designed to disperse and better distribute loads. This would solve a potential problem that multiple timber mats laid on top of each other to form a temporary access road during construction might sink into the deep organics below and create a mud wave.
    c. Preventing erosion along the access road at various locations by means of stormwater diversion, permanent culverts and waterbars.

    (Thompson Inland Wetlands Commission Agent comments dated May 29, 2012)

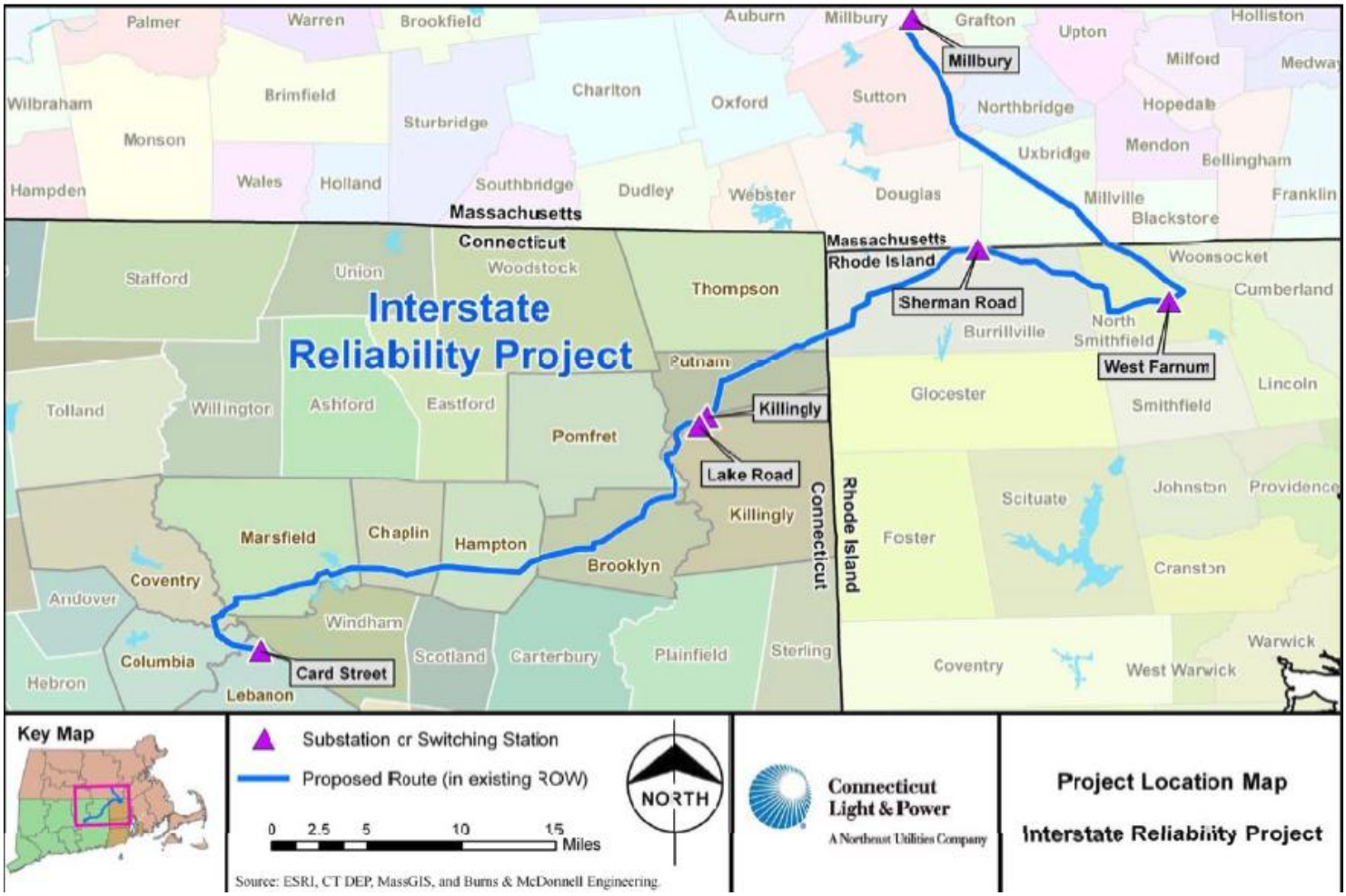
37. On June 19, 2012, the Town of Thompson Inland Wetlands Commission submitted additional comments regarding the proposed access road where it crosses through Wyndham Land Trust's property in Thompson. The Commission is concerned about the underlying depth of muck and loam and recommends test borings in the wetlands where the access road is proposed. (Thompson Inland Wetlands Commission comments dated June 19, 2012)

II. PROPOSED ROUTE

Interstate

38. The project would connect Card Street Substation, Lake Road Switching Station, National Grid's West Farnum Substation in North Smithfield, RI, and National Grid's Millbury Switching Station in Millbury, MA. The proposed transmission lines would also extend through but electrically bypass Killingly Substation and Narragansett Electric's Sherman Road Switching Station in Burrillville, RI. See Figure 1. (CL&P 1, Vol. 1, p. 1-2)

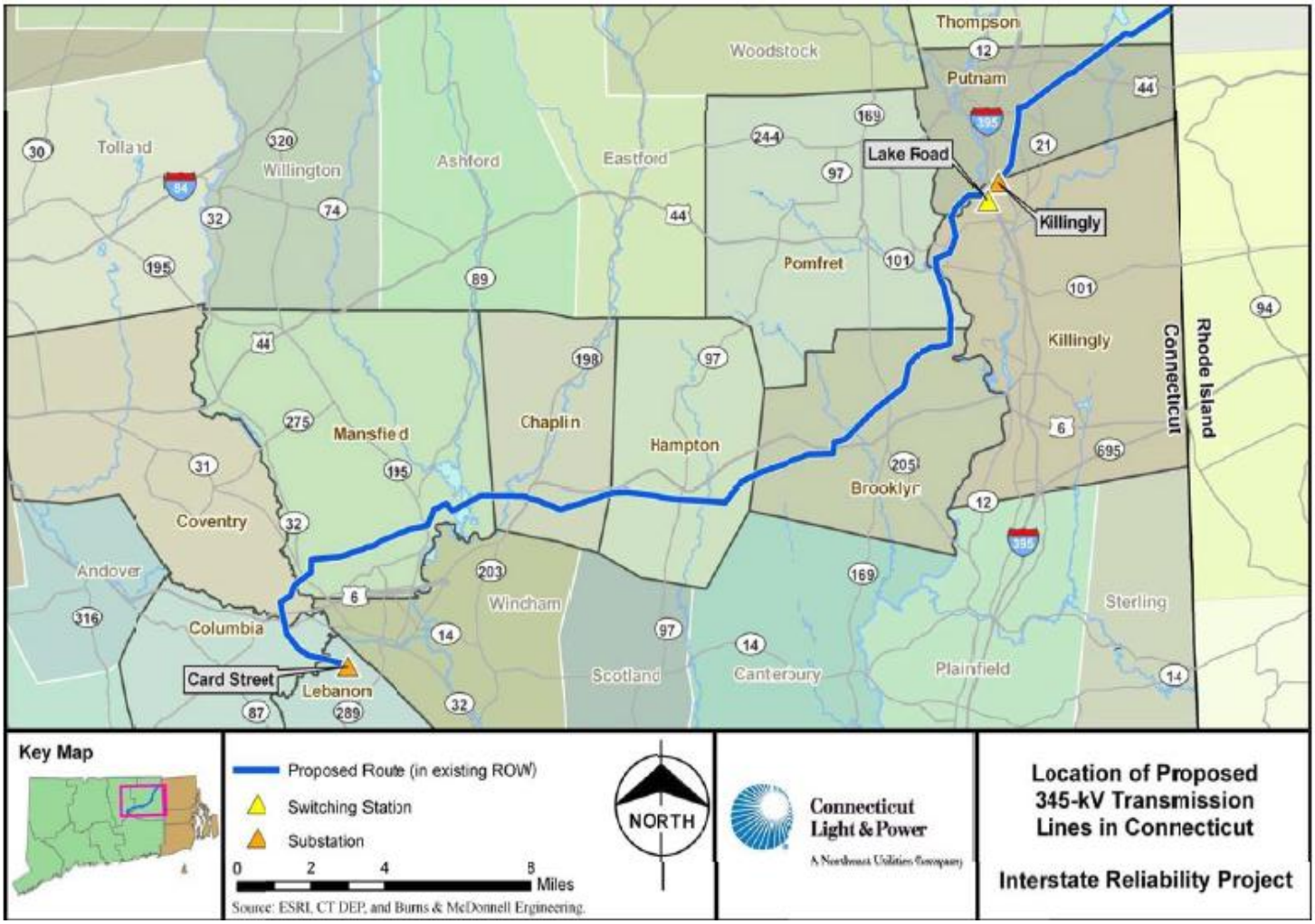
Figure 1. Entire Interstate within Massachusetts, Rhode Island, and Connecticut.



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

39. The Connecticut portion of Interstate would traverse 11 municipalities, including Lebanon, Columbia, Coventry, Mansfield, Chaplin, Hampton, Brooklyn, Pomfret, Killingly, Putnam and Thompson. See Figure 2. (CL&P 1, Vol. 1, p. ES-6)

Figure 2. Location of the Connecticut Portion of the Interstate Reliability Project.



(CL&P 1, Vol. 1, ES-4)

40. The Connecticut portion of the proposed project would be constructed, owned and operated by CL&P. CL&P would initially own the facilities and expects that ownership of some of the facilities would be transferred to UI after commencement of commercial operation. (CL&P 1, Vol. 1, p. 1-5; CL&P 17, p. 3)

41. The Narragansett Electric Company would own and operate the proposed Rhode Island facilities and New England Power Company would own and operate the Massachusetts facilities. Both Narragansett Electric Company and New England Power Company are wholly-owned subsidiaries of National Grid. The Rhode Island portion of the project is under the jurisdiction of the Rhode Island Energy Facility Siting Board. The Massachusetts portion of the project is under the jurisdiction of Massachusetts Energy Facilities Siting Board. (CL&P 1, Vol. 1, pp. 1-1, 1-5; CL&P 17, p. 3)

42. The Interstate application was filed with the Massachusetts Energy Facilities Siting Board on June 21, 2012 and with the Rhode Island Energy Facility Siting Board on July 19, 2012. (Tr. 7, p. 31)

43. The proposed overhead 345-kV transmission lines would be constructed adjacent to an existing 345-kV overhead transmission lines along existing CL&P ROW. The existing 345-kV electric transmission line was installed in the early 1970s. Some portions of the ROW also include other overhead transmission and distribution lines. (CL&P 1, Vol. 1, p. 1-7)

44. Approximately 35 miles of the proposed transmission lines would be installed within existing CL&P ROWs. The remaining portion of the route would require a ROW expansion through federally owned properties. (CL&P 1, Vol. 1, pp. 1-7, 10-1)

45. The total estimated project cost is $511 million. National Grid's facilities in Rhode Island and Massachusetts are expected to cost approximately $293 million and CL&P's Connecticut facilities are expected to cost approximately $218 million. (CL&P 17, p. 4)

46. The projected in-service date for the Project is December, 2015. (CL&P 16, p. 66)

III. NEED

Background

ISO-NE Authority

47. 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 33, FOF#25)

48. In the 1960s and 1970s, when the initial 345-kV loop was completed throughout New England from New York to Maine, the New England peak load was approximately 14,000 MW. The New England peak load in 2012 was approximately 29,000 MW and is forecasted in the ISO-NE Capacity, Energy, Loads, and Transmission report to be approximately 34,000 MW in 2022. (Tr. 7, pp. 56, 57)

49. The southern New England (SNE) 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 33, FOF #24)

50. On July 1, 1997, the Federal Energy Regulatory Commission (FERC) issued an order establishing the ISO-NE as the operator of the New England bulk power grid and transferring responsibilities previously held by the New England Power Pool. In June 2001, the FERC gave ISO-NE the authority to plan the regional transmission system. Official status as a Regional Transmission Organization (RTO) was granted to ISO-NE in March 2004, with ISO-NE beginning operation as an RTO in February 2005. (ISO-NE 2, p. 6)

51. ISO-NE's planning process is in compliance with the North American Electric Reliability Corporation (NERC) and Northeast Power Coordinating Council, Inc. (NPCC) Reliability Rules, which are included in its manuals and procedures. NERC oversees regional councils, including NPCC. NPCC oversees New York, New England, and parts of Canada. (ISO-NE 2, pp. 9, 10)

52. ISO-NE produces a yearly Regional System Plan (RSP), using it to announce the need for system improvements for reliability, when necessary. If the market does not respond with a viable project to address the reliability need, transmission owners such as CL&P and National Grid are required to construct the improvements, subject to obtaining required state approvals. (CL&P 16, p. 4)

Planning Criteria and Reliability Standards

53. 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 33, FOF #33; CL&P 1, Vol. 1, p. 2-5)

54. Failure to address known violations of mandatory 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 #33, FOF #28)

55. ISO-NE's reliability standards are designed to assure consistent system planning throughout New England. (ISO-NE 2, p. 10)

56. 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 # 33)

57. ISO-NE does not determine whether resource adequacy, that is, the amount and availability of 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 33, FOF #35)

58. 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 modeled to be out of service or otherwise unavailable. Potential causes of contingency events are weather; substation, transmission line or generator failure; contingencies occurring elsewhere on the electric system; other factors; or a combination of factors. (Council Admin. Notice 33, FOF #36; CL&P 1, Vol. 1, p. 2-3)

59. 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 event. N-1-1 designates the condition of the transmission system following the occurrence of a second contingency event, assuming that one element is already out of service. (Council Admin. Notice 33, FOF #37)

60. Contingencies are simulated in models for normal loads forecast for the future, extreme weather peak loads, inter-regional power transfers, and "reasonably stressed" conditions, which are generally considered to be the unavailability of generation proximate to load—often with multiple units being unavailable. (Council Admin. Notice 33, FOF #39)

61. Thermal overloads occur when transmission lines carry current above their design capacity, usually due to the occurrence of a contingency elsewhere on the system. When lines are carrying too much current, heat builds up and the lines sag beyond their recommended ground clearance limits or trip out-of-service. (ISO-NE 2, pp. 13, 14)

62. Voltage violations occur when power exceeds or fails to meet the systems voltage rating. High or low voltage on transmission lines can result in emergency activation of protective equipment, voltage spikes or collapse, and loss of load. (ISO-NE 2, p. 14)

63. If a simulation shows that transmission lines will overload and/or voltage will not be maintained within specified limits under one or more contingencies, the electric system is judged to be unreliable, and the system must be brought back into compliance within 30 minutes of a first contingency, so that it will be able to operate reliably in the event of a second contingency. (Council Admin. Notice 33, FOF #38)

64. Requiring the transmission system to operate effectively under such "reasonable stress" recognizes that generation units may be unavailable for many reasons. Events represented in the simulations serve as proxies for potential future events that cannot be defined or predicted, but that the system should be able to survive. (Council Admin. Notice 33, FOF #38, #39; CL&P 1, Vol. 1, pp. 2-3, 2-4)

65. Contingency modeling under "reasonably stressed" conditions is meant to test the strength of the system in general. Under ISO-NE Planning Procedure 5-3 section 5.2, "Reasonably stressed conditions are those severe load and generation system conditions which have a reasonable probability of actually occurring." (Council Admin. Notice 15; Council Admin Notice 33, FOF 42; Tr. 9, p. 29)

66. Planners design improvements to the system that address more than just the specific conditions and contingencies tested in power-flow simulations. (Council Admin. Notice 33, FOF #42)

67. Major unplanned outages of generating units have occurred in the electric industry. In Connecticut, for instance, outages involving thousands of MWs at a time have happened in 1996, 2003, and 2008. Millstone Unit 2, with its 882 MW capacity, was unavailable from July 3 to July 27, 2010. Forced system outages on July 22, 2011 resulted in 3,400 MW of reductions during an historic peak load. Most recently, from August 12, 2012 through August 23, 2012, Millstone 2 was unavailable due to high water temperatures in Long Island Sound. (CL&P 16, p. 14, 15; Council Admin. Notice 33, FOF # 40; ISO-NE 4, R. Civie-2)

Studies of Need for Interstate

68. In 2004, ISO-NE began a study to identify system deficiencies in the southern New England electric supply system, resulting in the *"Southern New England Transmission Reliability Report (SNETR) – Needs Analysis, January 2008."* An ISO-NE working group comprised of planners from ISO-NE, NU, and National Grid developed this *Needs Analysis*. As part of this initial report, the working group identified four separate but related projects to resolve deficiencies in the southern New England transmission system. The four are collectively known as the New England East-West Solution (NEEWS).
    a. The Greater Springfield Reliability Project (GSRP) and Manchester to Meekville Junction Project (MMP), was approved by the Council in Dockets No. 370 and Docket No. 370_MR.
    b. The Rhode Island Reliability Project. This project is not within the jurisdiction of the Council.
    c. The Central Connecticut Reliability Project is expected in the future.
    d. Interstate, which is the subject of this proceeding.

    (CL&P 16, pp. 5, 6, 43, 44)

69. NEEWS is a comprehensive, long-range regional plan for expansion that addresses electric transmission concerns throughout New England. (Council Admin. Notice #33, Opinion, p. 3)

70. Each of the projects that compose NEEWS, would address at least one identified system deficiency on its own, as well as working together with the remaining NEEWS projects to resolve region-wide issues. (CL&P 1, Vol. 1, p. 2-21)

71. In 2008, ISO-NE re-evaluated Interstate due to changed system conditions. (CL&P 16, pp. 3,4)

72. The 2008 re-analysis of the Interstate project was completed in 2011, when ISO-NE released its *New England East-West Solution (NEEWS) Interstate Reliability Project Component Updated Needs Assessment* in April 2011. The 2011 Updated Needs Report used 2015 and 2020 projected system conditions to analyze the ability of the southern New England transmission system to reliably serve load in western New England, eastern New England, Connecticut and Rhode Island. This report found widespread thermal and voltage violations under contingent conditions for the years studied, concluding that Interstate was still necessary. (CL&P 16, pp. 7, 21, 22)

73. Despite recording lower load forecasts in New England overall, the 2011 Needs Report showed that generation added on the west side of the New England Interface and generation lost on the east side had created a need to increase transfer capability from west to east. (CL&P 16, p. 21, 22)

74. After CL&P had filed its application for the Connecticut portion of Interstate with the Council, ISO-NE began another update to its needs assessments for all New England reliability projects, including Interstate. The new reassessment took into account the outcome of the Forward Capacity Auction #6—including renewable generation—which was held on April 2 and 3, 2012, as well as any approved changes to the New England electric system. ISO-NE also changed its modeling of energy-efficiency measures to account for future efficiency savings, as recommended by the New England States Commission on Energy (NESCOE), and used a 10-year forecast of predicted load growth beginning in 2012, rather than 2010, the year used in the 2011 analysis. (CL&P 16, p. 10; CL&P 30, pp. 6, 8)

75. In July, 2012, ISO-NE drafted a report on its reassessment entitled *"Follow-Up Analysis to the 2011 New England East-West Solution (NEEWS) Interstate Reliability Project Component Updated Needs Assessment"* (referred to as the 2012 Follow-Up Needs Analysis). This report found the needs of the electric system are similar to those found in 2011, within the 10-year planning horizon. (CL&P 30, pp. 1-2)

Needs in the Region and Connecticut

76. Interstate is designed to address the following needs identified by the working group:
    a. Reinforcement of the 345-kV system into West Farnum Substation in Rhode Island to address Rhode Island reliability needs.
    b. Increasing the transfer capability from western New England and Greater Rhode Island to eastern New England.
    c. Increasing the transfer capability from eastern New England and Greater Rhode Island to western New England.
    d. Increasing the transmission transfer capability into Connecticut.
    (CL&P 16, pp. 8, 9)

77. Interstate would resolve specific thermal and voltage violations due to limited transfer capabilities on the Card Street – Lake Road – West Farnum – Millbury corridor by:
    a. Building a new transmission line from Millbury to West Farnum, to provide greater import into eastern New England from resources in western New England and Greater Rhode Island.
    b. Providing a line into Card Street, via the route from West Farnum and Lake Road, to allow greater import into Connecticut and western New England from resources in eastern New England and Greater Rhode Island. (CL&P 32, p. 41; ISO-NE 2, p. 15)

78. Interstate 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, pp. 64, 109)

79. Interstate eliminates thermal overloads 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 by providing two new 345-kV lines into the West Farnum Substation. (CL&P 32, p. 41; Tr. 10, pp. 112, 117-119)

Regional Need for Reliable East-West Transfer Capability

80. Transmission facilities that reliably transfer power back and forth from one defined area to another are called "interfaces." (CL&P 16, p. 16)

81. System reliability is determined by whether the system is able to move power from one side of an interface, where supply is available, to the other side, where there is a demand. (CL&P 16, p. 16, 17)

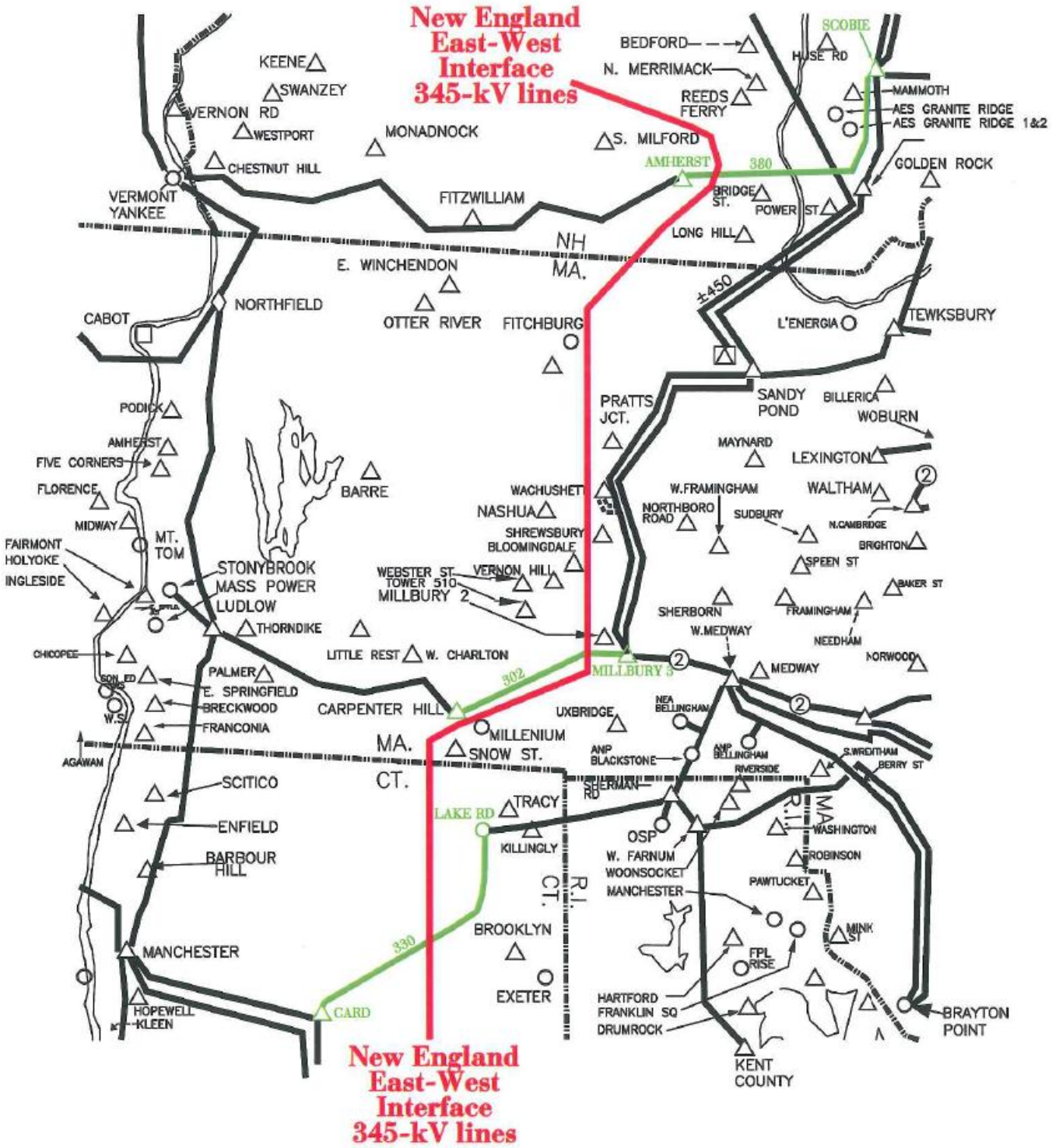
82. The New England East-West Interface (NEEWI) is key to regional transfer capability in New England. It roughly divides New England in half and separating the load centers of the Southeast Massachusetts Area/Boston Area and Connecticut. Refer to Figure 3 below. (CL&P 1, Vol. 1, pp. 2-13 through 2-16; CL&P 16, p. 18)

Figure 3. Approximate boundary of the New England East-West Interface.

(CL&P 1, Vol. 1, p. 2-14)

83. Three 345-kV transmission lines currently cross NEEWI, including the 380 Line in New Hampshire, the 302 Line in Massachusetts, and the 330 Line in Connecticut. Refer to Figure 4 below. (CL&P 10, R 4)

Figure 4. 345-kV Transmission lines currently crossing the New England East-West Interface.



(CL&P 10, R. 4)

84. During the mid-1980s and early 1990s, Connecticut was a net exporter of power, and the regional transmission system approached the limits of its reliability in terms of transfer capability across NEEWI from west to east. Beginning in the late 1990s, new generation was built in the east; also, Connecticut became a large net importer of electricity. During this period, the regional transmission system approached the limits of its reliability in terms of transfer capability at NEEWI from east to west. A constrained interface may prevent the delivery of power needed to serve load. (CL&P 1, Vol. 1, p. 2-15; CL&P 16, pp. 20-25; Tr. 7, p. 32)

85. As offshore wind is developed in eastern New England, it will increase the need for reliable transfer capabilities westward at NEEWI. (Tr. 4, pp. 101-103)

Need for Increased Transfer Capability into Connecticut

86. Currently, Connecticut continues to be a net importer of electricity and at times import levels approach the import transfer limit. (CL&P 16, p. 21)

87. Of the New England states, Connecticut has the least ability to import power to supplement internal supply resources. Even after the completion of the GSRP and MMP, the limit on Connecticut's import would be approximately 33 percent of its peak load under N-1 contingency events, while Massachusetts and Maine can import almost 50 percent of their peak load and New Hampshire, Vermont, and Rhode Island can import 100 percent of their peak load under N-1 contingency events. (CL&P 1, Vol. 1, ES-10; CL&P 16, pp. 39, 40)

88. The transfer capability across an interface is dependent upon the power flows that all transmission elements crossing the interface can carry without violating prescribed system stability limits, current carrying capability, or permissible ranges of voltage. Transfer capabilities show power flow that transmission elements can safely carry under normal conditions and under defined contingency conditions. The resulting transfer limits are always lower than the sum of the individual current carrying capacities of each transmission element making up the interface. Planners must design the system to withstand the potential contingent loss of any element of the interface, and the potential overlapping loss of a second element within 30 minutes of the first contingency event. (CL&P 1, Vol. 1, pp. 2-12, 2-13)

89. The average Connecticut import level for the period between June, 2007 and December, 2011 was 887 MW. During this period there were 1,220 hours when Connecticut import exceeded 2,000 MW and 128 hours when the import exceeded 2,500 MW. The highest recorded import level for this period was 2,977 MW, which occurred in the winter of 2008. (CL&P 9, R. 6)

90. The projected peak demand for Connecticut is 8,355 MW in 2015, 8,825 MW in 2020 and 9,263 MW in 2025. (CL&P 10, R. 24)

91. The ISO-NE Updated Needs Analysis included a number of generators in Connecticut—up to 1,100 MW—that may or may not retire in the near term. If these generators had been counted as retired, then the need situation in Connecticut could increase. The installation of 345-kV transmission lines gives more system flexibility to compensate for less generation. (Tr. 7, pp. 49, 50)

92. Increasing the transfer capability into Connecticut would support compliance with environmental regulations and allow Connecticut to achieve Renewable Portfolio Standards by importing renewable generation from New York and Canada. (CL&P 16, p. 40)

Lake Road Generating Station

93. The Lake Road Generating Station (Lake Road Station) is a power generation facility in Killingly, Connecticut, consisting of three natural-gas fueled combined cycle units with a summer capacity of approximately 750 MW. (CL&P Admin. Notice 26, p. 3)

94. When it was built in 2002, Lake Road Station was connected to the electric system through a new substation on the 345-kV line between Card Street and Sherman Road Substations, thereby creating the 330 Line (between Card Street and Lake Road) and the 347 Line (between Lake Road and Sherman Road). (CL&P Admin. Notice 26, p. 3)

95. In ISO-NE planning studies performed to date, a single contingency event forces power from Lake Road Station to flow out of Connecticut into Rhode Island. Therefore, ISO-NE determined Lake Road Station to be electrically outside of CT. (CL&P Admin. Notice 26, p. 7; CL&P 16, p. 41)

96. Operation of Interstate would allow Lake Road Station's power to flow into Connecticut as well as Rhode Island. Thus, Lake Road Station would no longer be isolated under a single contingency, and its capacity would 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 Admin. Notice 26, p. 7; CL&P 16, pp. 41, 42)

Schedule of Need

97. Interstate is designed to provide improved transmission transfer capability across the New England East-West Interface and into Connecticut throughout the ten-year ISO-NE planning horizon. (CL&P 10, R. 15)

98. The year of need for the Interstate project for Rhode Island is immediately, for transfer capability from western New England and Greater Rhode Island to eastern New England is 2011, for transfer capability from eastern New England and Greater Rhode Island to western New England is between 2017 and 2018, for transfer capability into Connecticut is between 2014 and 2015. (CL&P 16, p.8; Tr. 7, pp. 59,60; Tr. 7, p. 85; Tr. 9, pp. 123-27)

Project Alternatives to Interstate

99. In the working group studies for Interstate, planners investigated whether any project alternatives would meet the identified needs as reliably and cost effectively as the proposed project would meet them. (CL&P 1, Vol. 1, p. 2-21)

No Action Alternative

100. The No Action Alternative would result in no improvements being made to the electric system supplying Southern New England. This alternative was rejected because it would not bring the system into compliance with national and regional reliability standards and criteria. (CL&P 1, Vol. 1A, p. 12-1)

101. ISO-NE must ensure the project complies with NERC Transmission Planning Standards and ISO-NE Planning Standards, which dictate required tests on the performance of the system. (CL&P 1, Vol. 5, Ex. 4, pp. 2, 3)

102. Under the No Action Alternative, transmission constraints would remain on the transfer of power from east-to-west and west-to-east across the region. (CL&P 1, Vol. 1A, p. 12-1)

103. Thermal and voltage reliability criteria are currently violated in Rhode Island at existing load levels. The No Action Alternative would allow these violations to continue and possibly worsen. (CL&P 1, Vol. 1A, p. 12-1)

104. The No Action Alternative would not improve the Southern New England electrical system's long-term flexibility for efficient and reliable generation dispatch. (CL&P 1, Vol. 1A, p. 12-1)

System Alternatives

Transmission Alternatives

105. Transmission system alternatives were analyzed in phases. First, the ISO-NE Working Group identified five alternative transmission options that would meet the same threshold system performance requirements as Interstate. Second, the transmission owners involved—CL&P and National Grid—evaluated the options and selected a preferred option. Third, ISO-NE reevaluated the need for Interstate in 2010 and 2011. This reanalysis identified a need for a change to the original options that would allow for greater transfer capability from west to east across the New England East-West Interface. (CL&P 1, Vol. 1A, pp. 13-1 through 13-3)

106. The five options (refer to Figure 5 below) developed by the Working Group in its *2008 Options Analysis* were:
Option A – a new 345-kV transmission line extending from Millbury Switching Station in Millbury, MA to the West Farnum Substation in North Smithfield, RI, to Lake Road Switching Station in Killingly, CT, and finally to Card Street Substation in Lebanon, CT.
Option B – a new 345-kV transmission line extending from West Farnum Substation to Kent County Substation in Warwick, RI to Montville Substation in Montville, CT.
Option C – a new 345-kV transmission line extending from Millbury Switching Station to Carpenter Hill Substation in Charlton, MA to Manchester Substation in Manchester, CT. This option would also require a new 345-kV transmission line from Sherman Road Switching Station to West Farnum Substation.
Option D – a new 345-kV transmission line from Millbury Switching Station in Millbury, MA to Carpenter Hill Substation in Charlton, MA to Ludlow Substation in Ludlow, MA. This option would include a new 345-kV line from Sherman Road Switching Station to West Farnum Substation and reconductoring/rebuilds of an existing 345-kV line extending from Sherman Road to the Connecticut/Rhode Island border and from Ludlow Substation to Manchester Substation. An additional line included in this option has already been approved for the GSRP and is under construction.
Option E – a new 1,200 MW high-voltage direct-current transmission line extending from Millbury Switching Station to Southington Substation in Southington, CT. This option would also require a new 345-kV line from Sherman Road Switching Station to West Farnum Substation.
(CL&P 1, Vol. 1A, pp. 13-3, 13-4)

Figure 5. Options A, B, C-1, C-2, D, and E considered in the 2008 Options Analysis.

Figure continued on next page…

Interstate Option C-1

Interstate Option C-2

Interstate Option D

Interstate Option E

New 345-kV transmission line

Reconductoring/rebuild of existing 345-kV line

New 1,200 MW HVDC line.

(CL&P 1, Vol. 1A, p. 13-5)

107. CL&P and National Grid analyzed all five options. (CL&P 1, Vol. 1A, p. 13-4)

108. Option E was the first of the five options to be eliminated because it had limited possibilities for system integration, performance disadvantages, and excessive cost. Option B was eliminated because it would result in inferior system benefits and have a higher cost. Options A, C, and D were then compared in terms of thermal loading, voltage performance, and the capability to transfer power into Connecticut and western New England. (CL&P 1, Vol. 1A, p. 13-7)

109. Option C was determined to have two distinct routes, referred to as C-1 and C-2. Option C-1 was determined to be costly and difficult to construct. Option D was determined to be impractical. Option A and Option C-2 were then compared in detail because performance and cost were similar. Finally, the transmission owners chose Option A because it performed better, cost less, and traversed fewer environmentally-sensitive and densely populated areas. (CL&P 1, Vol. 1A, pp. 13-8, 13-9)

110. Following ISO-NE's 2011 Updated Needs Analysis, the Working Group reconsidered and redesigned the options. They eliminated Option B because it did not add a line into Massachusetts, which is needed to strengthen the transmission system into eastern New England. They found Option B to be more expensive than the alternative options. They determined Option E to be inferior to Options A and C-2 based on cost and inflexibility. Additionally, they eliminated Options C-1 and D from consideration because nothing in the updated analysis changed the previous determination to eliminate them. (CL&P 1, Vol. 1A, pp. 13-9, 13-10)

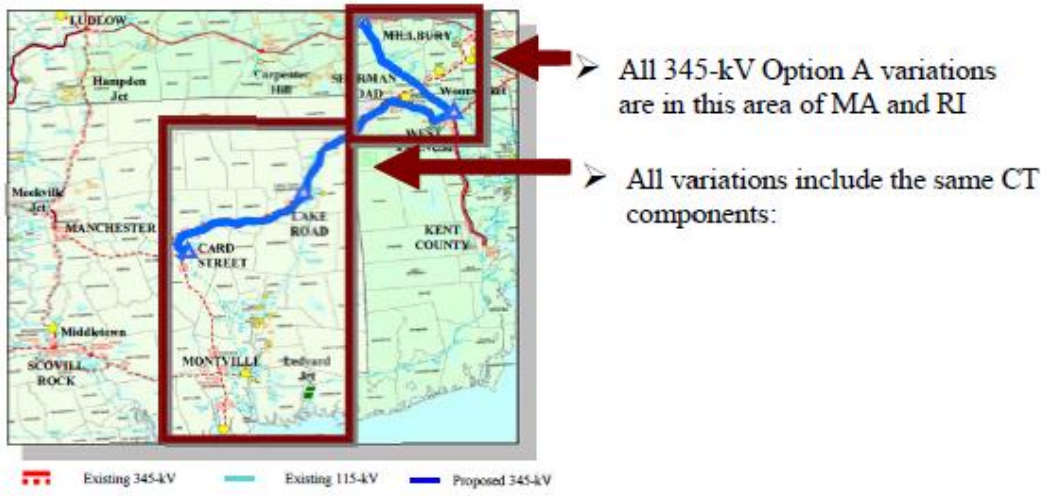
111. Options A and C-2 were redesigned in accordance with the updated needs analysis. For this redesign, Option C-2 was renamed Option C-2.1. Also, four separate variants of Option A were identified and labeled Option A-1 through A-4. (CL&P 1, Vol. 1A, p. 13-10)

112. Option C-2.1 would add a new 345-kV switchyard at Carpenter Hill to the original Option C-2 alternative. (CL&P 1, Vol. 1A, p. 13-11)

113. Each of the four A Options (refer to Figure 6 below) would have three common components:
    a. A new 345-kV transmission line extending from Card Street Substation to Lake Road Switching Station.
    b. A new 345-kV transmission line from West Farnum Substation to Lake Road Switching Station.
    c. A new 345-kV transmission line extending from Millbury Switching Station to either West Farnum Substation or Sherman Road Switching Station.

    (CL&P 1, Vol. 1A, p. 13-13)

Figure 6. The four "A" Options considered.



(CL&P 1, Vol. 1A, p. 13-13)

114. All of the A Options would be the same in Connecticut. The differences among them would lie in Rhode Island and Massachusetts. (CL&P 9, R. 10)

115. Option C-2.1 and all of the A Options were compared. All five examined options would provide electrical system performance that would meet the requirements identified by the NERC, NPCC and ISO-NE reliability standards and criteria. No option performed better than the others in terms of overall system performance. In the end, the Working Group found Option A-1 would provide the most flexibility. (CL&P 1, Vol. 1A, pp. 13-22, 13-23)

Non-Transmission Alternatives

116. Non-transmission alternatives (NTAs) were independently investigated by CL&P's consultant, ICF International, Inc. (ICF). ICF's report, entitled "Assessment of Non-Transmission Alternatives to the NEEWS Transmission Projects: Interstate Reliability Project" dated December 1, 2011, included studies modeling various scenarios for generation and demand-side resources that could plausibly be available within southern New England during the planning period of 5 to 10 years. (CL&P 1, Vol. 1A, p. 13-34; CL&P 1, Vol. 5, Ex. 5; CL&P 30, p. 2)

117. ICF investigated NTAs including central generation only, demand resources only, and a combination of generation and demand-side resources. Power-flow simulations were used to determine if a given NTA would meet the same need proposed to be met by Interstate. The deciding factor was the performance of the NTA in eliminating thermal violations. (CL&P 1, Vol. 1A, p. 13-34)

118. ICF reviewed the draft ISO-NE's 2012 Follow-Up Needs Analysis and found that without the Interstate project, there would be thermal overloads under contingency conditions in Southern New England and that the Interstate project would resolve these violations. (CL&P 31, pp. 4, 5)

Generation Resources

119. ICF referred to the New England Generation Interconnection Queue and found that a total of 2,850 MW of generation is listed. (CL&P 1, Vol. 1A, pp. 13-37, 13-38)

120. After running a study of the transmission system based on 2,850 MW of new generation resources during the planning period, ICF found many unresolved thermal reliability violations that would be addressed by Interstate. (CL&P 1, Vol. 1A, p. 13-38, 13-39)

Demand Resources

121. There are "passive" and "active" demand resources. Passive demand resources save electric energy use and are in place at all times. Passive resources include energy efficiency measures distributed generation, which are customer-owned generators that reduce demand for utility-supplied power. Active demand resources decrease electricity use at peak demand times by offering incentives to customers for reducing consumption. (CL&P 1, Vol. 1A, p. 13-36)

122. ICF accounted for all the demand resources available using those procured through the ISO Forward Capacity Auction process. (CL&P 1, Vol. 1A, p. 13-36)

123. The critical load level (CLL) marks the point at which demand on the system in MW is above the level where thermal reliability violations begin to occur. To keep the system below the CLL, demand reduction for 2015 would have to be 3,400 MW, which is 15% of the peak load predicted for that year. For 2020, the demand reduction would have to be 5,300 MW, which is 22% of the 2020 predicted peak load. (CL&P 1, Vol. 1A, pp. 13-34 through 13-36)

Combination of Demand Resources and Generation

124. ICF analyzed a combination of generation and demand resources. First, passive demand resources were assumed available. Then, generation was added in an attempt to address remaining violations. (CL&P 1, Vol. 1A, pp. 13-40, 13-41)

125. Power-flow studies of the combined generation and passive demand resources showed that several thermal violations remained. (CL&P 1, Vol. 1A, p. 13-41)

126. The NTA study then added in potentially available active demand resources. The study found this addition could not solve the system violations. (CL&P 1, Vol. 1A, p. 13-45)

IV. INTERSTATE ROUTE AND DESIGN

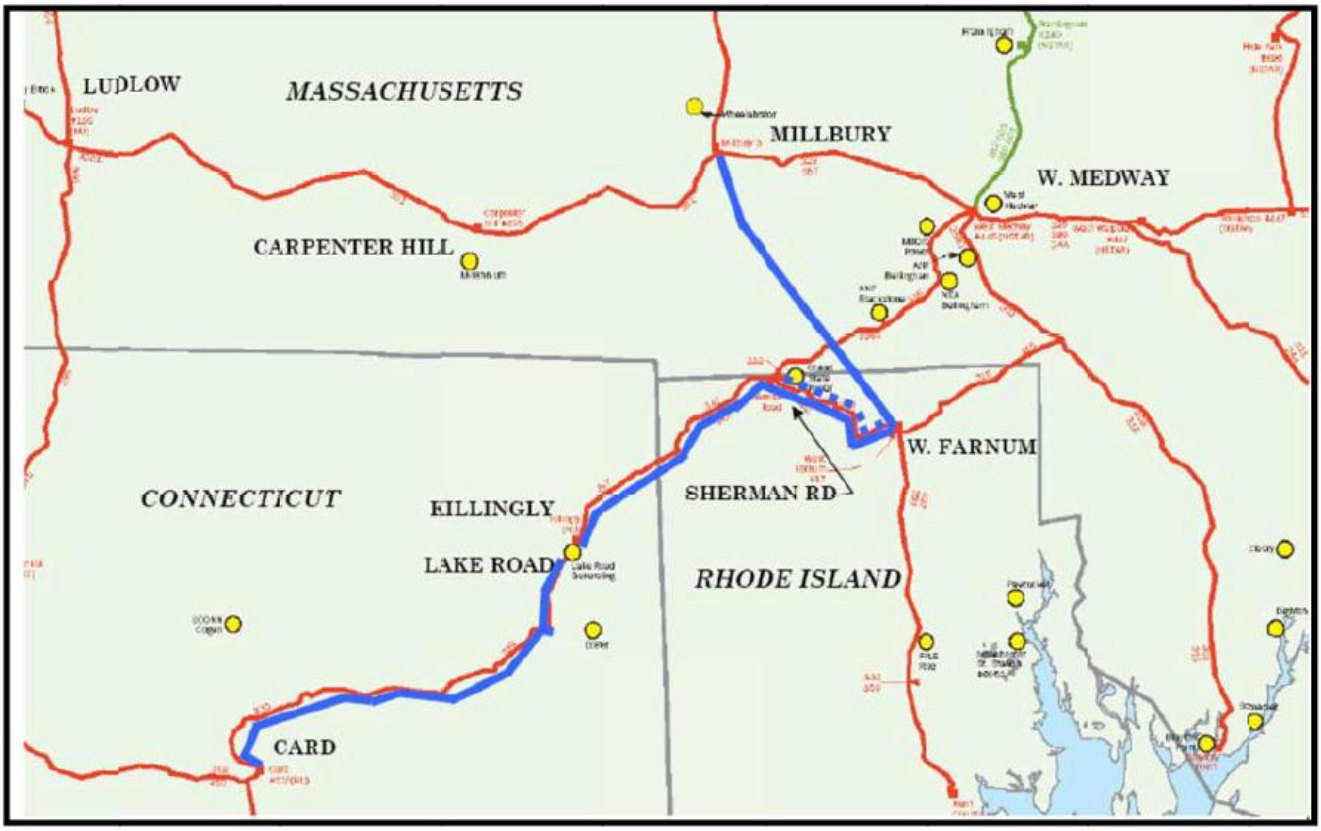
Overhead In-Right-of-Way

Interstate

127. The Connecticut portion of Interstate would run between Card Street Substation in Lebanon, Lake Road Switching Station in Killingly and the Connecticut/Rhode Island border in Thompson – approximately 36.8 miles. Nearly all would be located within an existing CL&P transmission ROW. (CL&P 1, Vol. 1, pp. 1-2, 3-2, 3-3)

128. The proposed 345-kV transmission lines would be installed adjacent to an existing 345-kV line (#330) from Card Street Substation to Lake Road Switching Station, then would follow another existing 345-kV line (#3348) from Lake Road Switching Station to Killingly Substation. From Killingly Substation to the Connecticut/Rhode Island border the proposed transmission line would follow a third existing 345-kV line (#347). Refer to Figure 7 below. (CL&P 1, Vol. 1, p. 3-2)

Figure 7. Map identifying existing transmission lines along project route.



Existing 345-kV Lines
New 345-kV line Millbury-West Farnum-Lake Road-Card Street
Reconductor and rebuild 345-kV line from Sherman Road to West Farnum

Note: For readability, Figure 2-9 shows the proposed new lines slightly offset from existing lines. The new 345-kV lines would actually be aligned along and within existing CL&P and National Grid ROWs.
(CL&P 1, Vol. 1, p. 2-35)

129. The proposed transmission line would also share the ROW with an existing 69-kV line (#800/900) between Card Street Substation and Babcock Hill Junction in Coventry, and with an existing 115-kV line (#1505 and #1607) between Day Street Junction and Killingly Substation. (CL&P 1, Vol. 1, p. 3-2)

130. The proposed transmission line would be designated as the 3271 Line between Card Street Substation and Lake Road Switching Station, and as the 341 Line between Lake Road Switching Station and the Connecticut/Rhode Island border. The 341 Line would continue to West Farnum Substation in Rhode Island. (CL&P 1, Vol. 1, p. 3-2)

131. The conductors for the new 345-kV overhead line would consist of three bundles of two 1,590-kcmil aluminum conductors with a steel core support (ACSS). Two overhead lightning shield wires that contain optical glass fibers (for communications purposes) would be installed above the 3271 Line between Card Street Substation and Lake Road Switching Station. Above the 341 Line from Lake Road Switching Station to the Connecticut/Rhode Island border, there will be one overhead lightning shield wire and one optical glass fiber installed. (CL&P 1, Vol. 1, p. 3-3)

132. The existing 345-kV lines along the ROW that would be shared with the proposed project are installed mostly on steel or wood-pole laminated H-Frame structures. Most of the existing H-frame structures have two poles where the lines are going straight ("tangent" structures). Three-pole structures or guyed structures are used wherever the line turns sharply ("angle" structures), as the line needs extra strength at these turning-points. Angle structures are typically guyed unless in residential yards, cultivated farmland, wetlands or locations too close to other structures with guy lines. (CL&P 1, Vol. 1, pp. 3-3, 3-4; CL&P 17, p. 7)

133. The proposed supports for the new lines, including angle structures, would typically be 85 feet in height. (CL&P 1, Vol. 1, p. 3-4)

134. Since the proposed lines are to be built alongside existing lines, the project design started by matching new structure locations with existing ones. The new structure locations were then evaluated to account for other factors, including potential environmental effects. Structures that would impact environmental resources were adjusted where feasible. Of 57 original structure locations that would have been in wetlands, 33 were shifted to upland locations. (CL&P 1, Vol. 1, pp. 3-8, 3-9)

135. The Windham Airport in Willimantic is approximately 3,700 feet southeast of the proposed project. The Danielson Airport in Killingly is approximately 2,800 feet east of the proposed project. The Federal Aviation Administration (FAA) has issued a Notice of Presumed Hazard (NPH) for five existing and seven proposed structures near Windham Airport; and seven existing and ten proposed structures near Danielson Airport. An NPH designation means that the structures could potentially interfere with flight safety and would require some mitigating measure. (CL&P 1, Vol. 1, pp. 3-6, 3-7)

136. CL&P proposes to coordinate with the FAA to mitigate potential hazards of the existing line to flight safety through modifications to adjacent structures of the proposed line. Potential modifications include height adjustments, marking and/or lighting of structures or marking the proposed shield wires. (CL&P 1, Vol. 1, p. 3-7, 6-68)

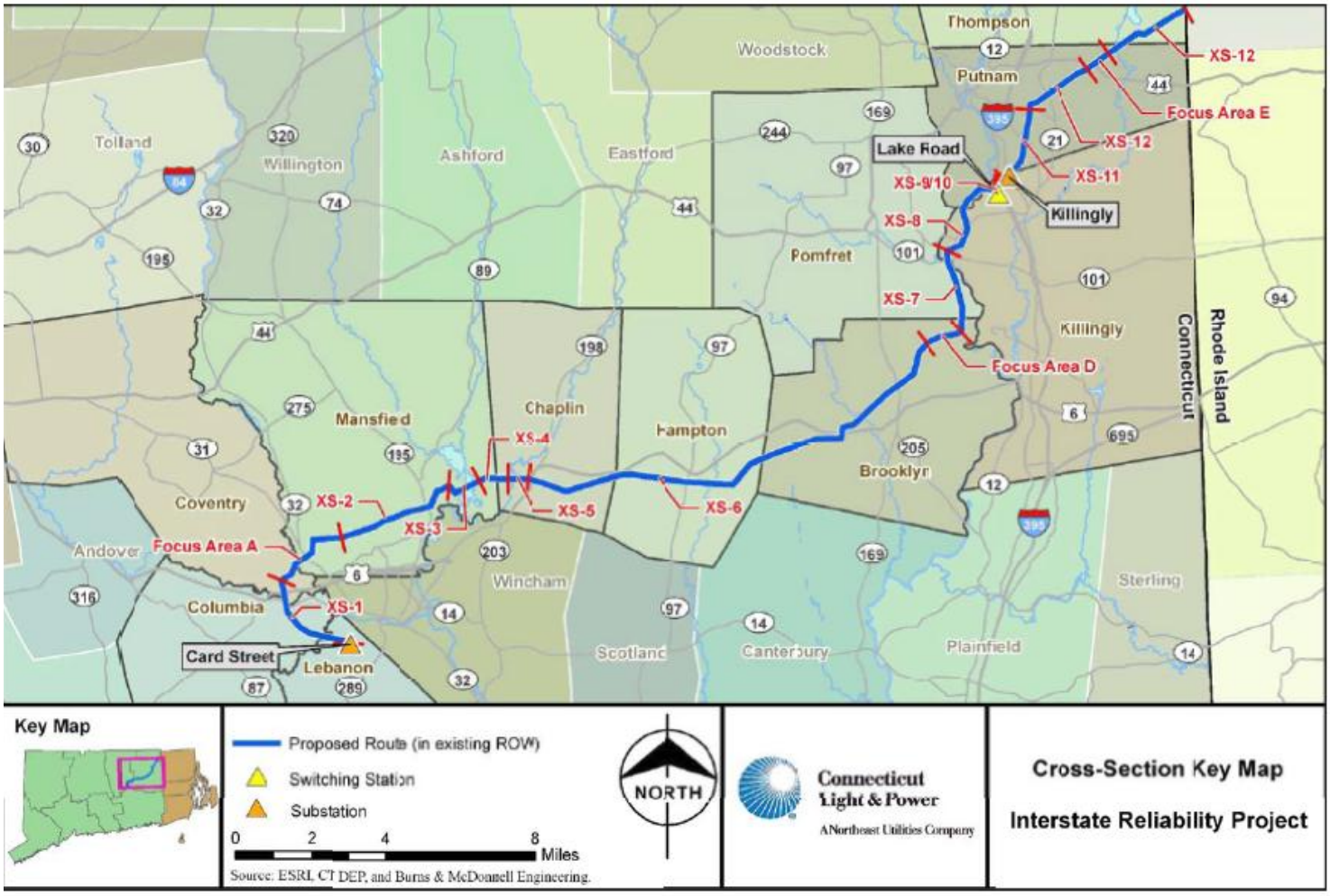
137. Currently, the FAA directs the use of low intensity steady-state lights on transmission structures that require lighting. (Tr. 6, p. 125)

138. CL&P made an agreement with the Highland Ridge Golf Range, owned by Richard Cheney, to use a single 125-foot monopole with vertically-configured conductors at structure No. 39. This would mitigate impacts to the golf range without adding cost to the project, as the vertically-configured pole would replace two delta-configured poles. (CL&P 24; Tr. 6, pp. 16, 17)

Segment Descriptions

139. CL&P project designers have divided the line into 12 different segments of the ROW, shown below in Figure 8. Within these 12 are five subsections labeled "focus areas" (A-E) where special designs were considered per the Council's EMF Best Management Practices Guidelines (EMF BMP). In three of the BMP focus areas, the proposed overhead line configuration is not H-frame. All cross-sections are shown in Appendix A. (CL&P 1, Vol. 1, p. 3-13)

Figure 8. Cross-sections within the Connecticut portion of Interstate.



(CL&P 1, Vol. 1, Appendix 3A, p. 3A-1)

140. Segment 1 is a 2.8 mile section from Card Street Substation to Babcock Hill Junction extending along the existing ROW in the towns of Lebanon, Columbia and Coventry. Along Segment 1, the proposed line would be aligned between the existing 330 Line and the existing 800/900 Line and would be installed on H-frame structures. (CL&P 1, Vol. 1, p. 3-13)

141. Segment 2 includes a 2.3-mile section designated as Focus Area A extending from Babcock Hill Junction to east of Highland Road along the existing ROW in the towns of Coventry and Mansfield. The BMP proposal includes the installation of a delta configuration. (See detailed discussion of Focus Areas in Chapter VI). (CL&P 1, Vol. 1, p. 3-14)

142. In addition to Focus Area A, Segment 2 includes a 3.3-mile section from Highland Road to Mansfield Hollow State Park in Mansfield. This segment would include the installation of H-frame structures parallel to the existing 330 Line. (CL&P 1, Vol. 1, p. 3-14)

143. Segment 3 is a one-mile section from Mansfield Hollow State Park to Bassetts Bridge Road. This segment includes a 0.9-mile section extending through federally-owned properties of Mansfield Hollow State Park, Mansfield Lake, and the Mansfield Hollow Wildlife Management Area (WMA), which has an existing 150-foot wide ROW. To allow for adequate separation distances between the existing transmission lines and the proposed lines, CL&P proposes to expand the ROW. The remaining 0.1-mile section of this segment is currently 300 feet wide. (See Mansfield Hollow Configuration Findings). (CL&P 1, Vol. 1, pp. 3-14, 3-15)

144. Segment 4 is a 0.8 mile section from Bassetts Bridge Road to Shuba Lane in Mansfield and Chaplin. The proposed line would be installed on H-frame structures. (CL&P 1, Vol. 1, p. 3-15)

145. Segment 5 consists of a 0.5-mile section from Shuba Lane through another portion of Mansfield Hollow WMA to Willimantic Road in Chaplin. The entire segment is through federally-owned property and has a ROW width of 150 feet. To allow for adequate separation distances between the existing transmission lines and the proposed lines, CL&P proposes to expand the ROW in this area. (See Mansfield Hollow Configuration Findings). (CL&P 1, Vol. 1, p. 3-15)

146. Segment 6 would extend along a 12.6 mile section of the ROW from Willimantic Road in Chaplin, through Hampton, to near White Brook, west of Church Street in Brooklyn. The proposed lines would be installed parallel to the existing 330 Line on H-frame structures. (CL&P 1, Vol. 1, p. 3-16)

147. Focus Area D (near Day Street Junction) is a one-mile section of Segment 6 that includes a BMP delta-configured line extending from west of Church Street to Day Street Junction in Brooklyn. The proposed line would be installed parallel to the existing 330 Line. (CL&P 1, Vol. 1, p. 3-16)

148. Segment 7 is a 2.3-mile section of the ROW extending from Day Street Junction to Hartford Turnpike in Brooklyn, Pomfret and Killingly. The proposed line would be installed on H-frame structures west of and parallel to the existing 330 Line. (CL&P 1, Vol. 1, p. 3-16)

149. Segment 8 is a 2.6-mile section of the ROW extending from Hartford Turnpike to Lake Road Junction in Killingly and Putnam. The new line would be supported by H-frame structures aligned west of and parallel to the existing 330 Line. (CL&P 1, Vol. 1, pp. 3-16, 3-17)

150. Segment 9 is a 0.2-mile section of the ROW extending from Lake Road Junction to Lake Road Switching Station in Killingly. In this segment the proposed locations of two new 345-kV lines would be between the existing 330 Line and 3348 Line. Both new 345-kV lines would be installed in vertical configurations on steel monopoles. (CL&P 1, Vol. 1, p. 3-17)

151. Segment 10 is a 0.7 mile segment of the ROW extending from Lake Road Junction to Killingly Substation. The proposed 345-kV line would be installed on H-frame structures between the existing 345-kV line and two existing 115-kV lines. (CL&P 1, Vol. 1, p. 3-17)

152. Segment 11 is a 1.7-mile segment of the ROW extending from Killingly Substation to Heritage Road in Killingly and Putnam. The proposed line would be installed on H-frame structures aligned parallel to the existing 347 Line. (CL&P 1, Vol. 1, p. 3-17)

153. Segment 12 consists of a 4.5-mile section extending from Heritage Road in Putnam to the Connecticut/Rhode Island border in Thompson. Excluding the section adjacent to Elvira Heights Court in Putnam, the proposed line would be installed on H-frame structures parallel to the existing 347 Line. (CL&P 1, Vol. 1, p. 3-18)

154. Focus Area E is a section of Segment 12 consisting of 0.6 miles near Route 44 and Elvira Heights Court in Putnam. The BMP design would place both the new and existing lines on structures in a delta configuration. (CL&P 1, Vol. 1, p. 3-18)

Substations and Switching Station

Card Street Substation

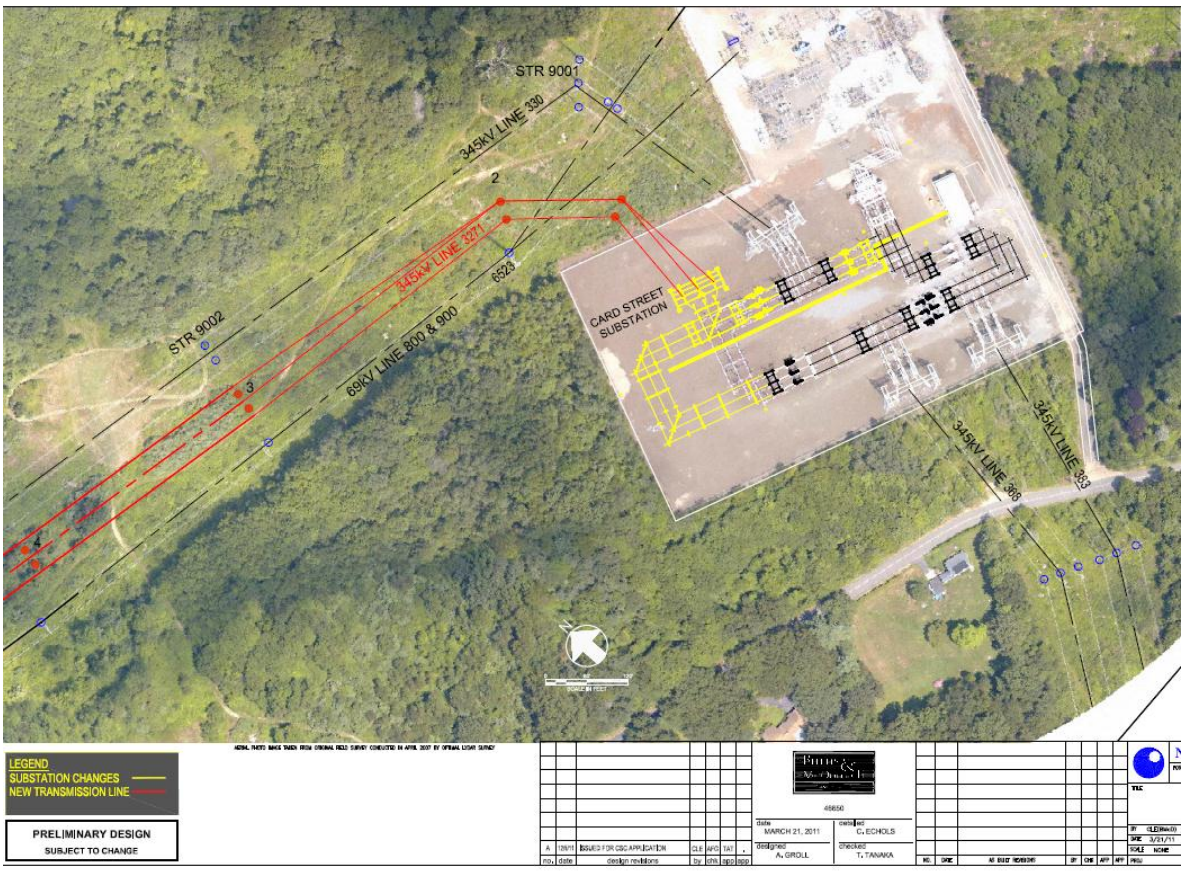
155. Card Street Substation is located on 10 acres of a 150-acre CL&P-owned parcel in Lebanon. The proposed modifications to the substation would be contained within the existing fence line. Refer to Figure 9 below. (CL&P 1, Vol. 1, p. 3-21)

156. Land uses near Card Street Substation include rural residences, forest and transmission line ROWs. The closest residences are approximately 400 feet from Card Street Substation. (CL&P 1, Vol. 1, p. 5-102, 5-103)

157. Access into Card Street Substation is via Card Street on the south side of the property. (CL&P 1, Vol. 1, p. 5-102)

158. The proposed modifications to the Card Street Substation include:
    a. Expansion of the existing three-position 345-kV ring bus to a four-position ring bus with one new 345-kV transmission line-terminal position (for the new 3271 Line), for a total of four 345-kV transmission line terminal positions.
    b. Installation of three new 345-kV circuit breakers, one new 345-kV transmission line terminal structure approximately 110 feet in height, and four lightning masts approximately 110 feet in height.
    c. Installation of four disconnect switches, 435 linear feet of bus, 500 feet of control-cable trench, six Capacitance Coupled Voltage Transformers (CCVT), and one wave trap.
    d. Installation new protection and control equipment within the existing relay/control enclosure. (CL&P 1, Vol. 1, p. 3-21)

Figure 9. Diagram of Card Street Substation modifications.



(CL&P 1, Vol. 7, Ex. 1)

Lake Road Switching Station

159. Lake Road Switching Station interconnects the 330 Line and the 3348 Line at Lake Road Generating Station in the northwestern portion of Killingly. The switching station is adjacent to the generating station. The proposed modifications at the switching station include the addition of two new transmission line terminal positions to support the two new proposed 345-kV lines; Lake Road to Card Street (3271 Line) and Lake Road to West Farnum (341 Line) by completing the existing partial switchyard bay and building a new partial bay. The existing 330 Line to Card Street Substation would be moved to the new partial bay. The new Interstate line at Card Street would be installed in the former 330 Line position with new relays. Refer to Figure 10 below. (CL&P 1, Vol. 1, p. 3-22)

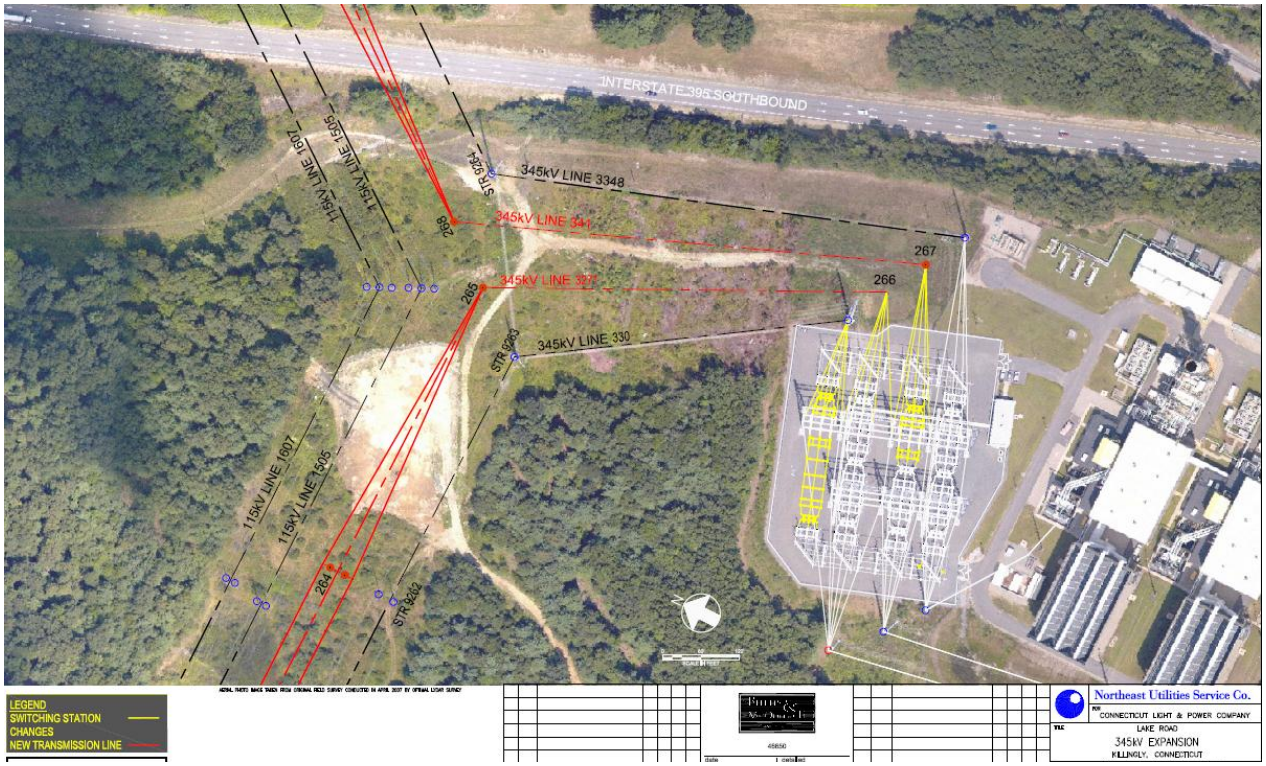
160. Land uses in the area of Lake Road Switching Station include commercial/industrial facilities, transportation ROWs (I-395), and CL&P's transmission line ROWs. (CL&P 1, Vol. 1, p. 5-105)

161. The nearest residentially zoned area to Lake Road Switching Station is approximately 0.25 miles southeast. (CL&P 1, Vol. 1, p. 5-106)

162. Louisa Veins Drive, Old Trolley Road, and Lake Road would likely be the primary roads used to access Lake Road Switching Station during construction activities. (CL&P 1, Vol. 1, p. 6-77)

163. CL&P proposes the installation of:
    a. Three 345-kV circuit breakers, six 345-kV disconnect switches, 170 feet of bus, six surge arresters, 10 CCVTs, four potential transformers, and two wave traps.
    b. New protection and control equipment within the existing relay/control enclosure.
    (CL&P 1, Vol. 1, p. 3-22)

Figure 10. Diagram of proposed modifications to Lake Road Switching Station.



(CL&P 1, Vol. 7, Ex. 2)

Killingly Substation

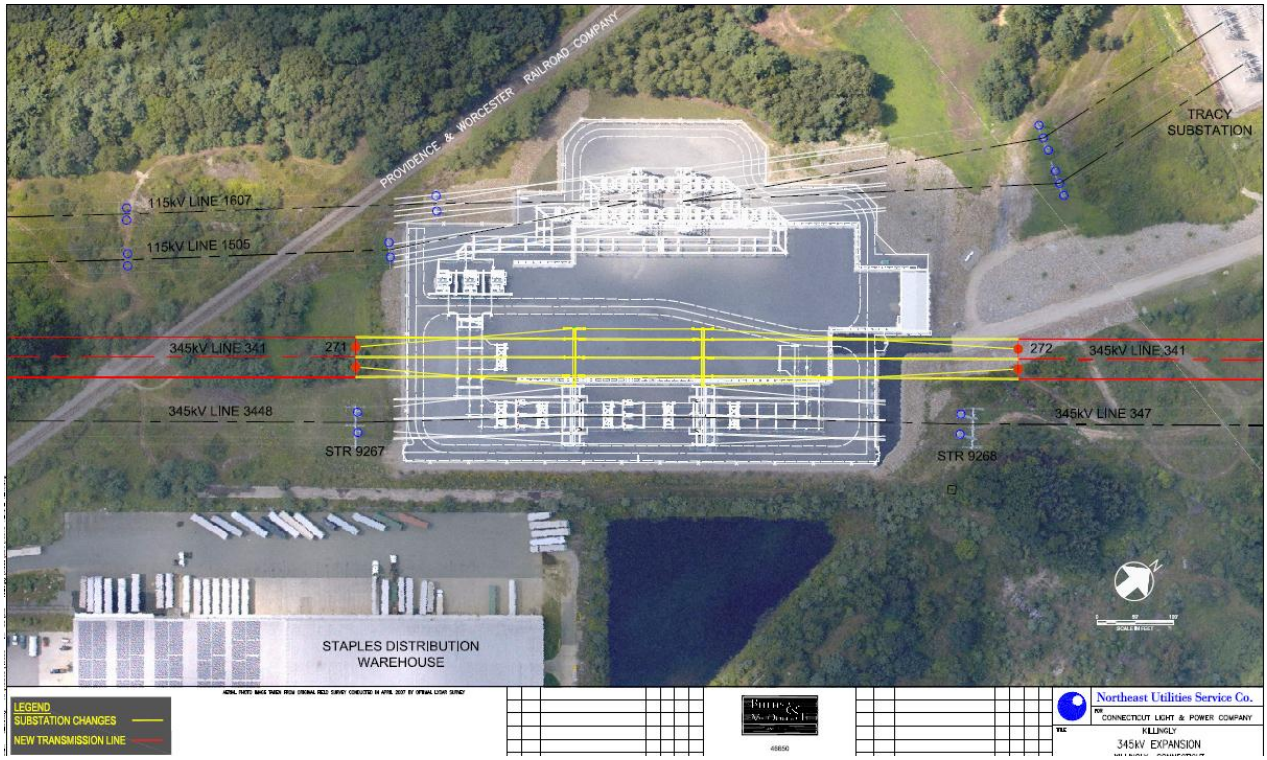
164. Killingly Substation interconnects the 3348 and 347 Lines with an autotransformer that supplies a 115-kV switchyard, and four 115-kV circuits. The substation is located on CL&P-owned land in the northern portion of Killingly, northeast of Lake Road Switching Station. The proposed 345-kV transmission line would traverse through Killingly Substation but would not electrically connect to it. Refer to Figure 11 below. (CL&P 1, Vol. 1, p. 3-22)

165. Killingly Substation is within an industrially zoned area. Land uses near the substation include another CL&P substation, Interstate 395, commercial and industrial facilities, undeveloped forest, railroad ROW and electric transmission line ROW. The nearest residence is approximately 700 feet east of the substation, on the west side of Tracy Road. (CL&P 1, Vol. 1, pp. 5-107,109)

166. Killingly Substation is accessed via Park Road/Tracy Road on the north side of the site. (CL&P 1, Vol. 1, p. 5-110)

167. As part of the proposed project, CL&P proposes to install two new 345-kV transmission line terminal structures at Killingly Substation. The proposed structures would be approximately 110 feet high and similar in appearance to the two existing line termination structures. The proposed additions to the substation would be within the fenced in area and would not require any expansion. (CL&P 1, Vol. 1, pp. 3-22, 3-23)

Figure 11. Diagram of proposed modifications to Killingly Substation.



(CL&P 1, Vol. 7, Ex. 3)

General Project Construction Activities

168. Construction of the proposed project would require temporary storage areas, staging areas, and crane pads. CL&P prefers to locate storage and staging areas in the vicinity of the ROW; however, they may not be immediately adjacent to ROWs. CL&P would attempt to locate storage and staging areas on CL&P-owned property where possible. If CL&P-property is not available or suitable for storage or staging areas, CL&P would investigate the use of areas that have been previously developed or vacant land. Staging and storage sites would be identified during the D&M Plan for the proposed project or CL&P would submit them separately to the Council for approval prior to use. (CL&P 1, Vol. 1, pp. 4-5 through 4-7)

169. Temporary storage areas require approximately two to five acres and are used to temporarily store construction materials, equipment, supplies, mobile construction offices, parking of personal vehicles of construction crew members, parking construction vehicles and equipment, and performing minor maintenance on construction equipment. (CL&P 1, Vol. 1, pp. 4-6, 4-7)

170. Storage areas are typically moved as construction progresses along the ROW. Following use as a storage area, the land would be restored to pre-construction conditions, pursuant to the use agreement with the property owner. (CL&P 1, Vol. 1, pp. 4-6, 4-8)

171. Staging areas typically require less than two acres and are used for temporarily stockpiling materials for transmission line construction, such as erosion and sedimentation control materials, and for temporarily stockpiling materials removed from the ROW during construction. Staging areas could be within or off the ROW. As construction progresses, staging areas would be relocated to be near construction work. (CL&P 1, Vol. 1, pp. 4-6, 4-7)

172. Crane pads are located at each transmission structure location and are the necessary work areas to stage structure components for final on-site assembly. The crane pad is typically a 100-foot by 100-foot area that provides a safe, level work base for the construction equipment used to erect the transmission structure. (CL&P 1, Vol. 1, p. 4-7)

173. The construction of a crane pad includes the removal of vegetation, grading to create a level area, removal of the topsoil and layering of a filter fabric and rock base. A roller is typically used to flatten and compact the pad. In wetland areas, removable timber mats may be used to allow water to flow beneath the pad. As an alternative to timber mats, a large rock base may be used to allow water flow with smaller rock layered on top and a layer of gravel intermixed with soil on top of that. (CL&P 1, Vol. 1, p. 4-8)

174. Crane pads are typically removed following construction and the area would be restored to pre-construction grade to the extent practical and consistent with CL&P's ROW maintenance program. (CL&P 1, Vol. 1, p. 4-8)

175. Construction field offices would be located in existing commercial facilities where feasible. If there is no commercial facility available, trailers, portable sanitary facilities and associated parking would be located, optimally on CL&P-owned property. Following construction, trailers and equipment would be removed and the area would be restored. (CL&P 1, Vol. 1, p. 4-9)

176. The average distance between 345-kV transmission line structures is approximately 575 feet; however, the distance may range from less than 200 feet to over 1,000 feet depending on the presence of geographic and environmental features. (CL&P 9, R. 20)

177. Where a 345-kV line must cross an existing distribution line, the 345-kV structures might have to be taller to maintain a 48-foot clearance between the lowest conductor and the distribution line. To avoid increasing the 345-kV structure height, the distribution line in conflict could be installed underground. This would allow the 345-kV structure height to be reduced by approximately 20 feet and save about the same cost per structure. (Tr. 4, pp. 45-51)

178. Wherever blasting is needed for construction, a certified blasting contractor would develop a controlled drilling and blasting plan in compliance with state and local regulations. (CL&P 1, Vol. 1, p. 4-21)

179. Based on initial reviews, there are several small obstructions, including sheds, fences, debris piles, and pools within the ROW. These obstructions are a potential safety concern. CL&P would review the entire route prior to the commencement of construction to determine if the obstructions would have to be removed for safe construction and operation of the transmission lines. (CL&P 9, R. 22)

180. Pulling sites for the installation of conductors and shield wires would be located at one to three mile intervals along the route. Helicopters may also be used for installation of the pulling lines. (CL&P 1, Vol. 1, p. 4-22)

181. Following construction of the proposed project, construction debris and temporary access roads would be removed, final grading of areas affected by construction would occur and the site would be stabilized using revegetation or other measures. (CL&P 1, Vol. 1, p. 4-23)

182. All construction work would be in accordance with applicable national, electric utility industry, state, and if practical, local codes. (CL&P 17, p. 82)

183. Construction would typically occur during daytime hours (between 7:00 a.m. to 7:00 p.m.). Work hour specifications would be included in the D&M Plan for this docket, if approved. (CL&P 1, Vol. 1, p. 6-72)

184. CL&P has established a toll-free telephone number, an email address, and a website related to the proposed project, which would continue to be used and updated during construction of the project. CL&P would also notify the community prior to the start of construction and continue notification of activities through the end of construction, this includes residents or businesses adjacent to the project ROW and those that may be visually or audibly affected by construction. (CL&P 10, R. 14)

185. Construction of both the proposed transmission lines and the modifications to the substations and switching station are planned to occur during the 2014-2015 construction period. (CL&P 1, Vol. 1, p. 8-1; CL&P 17, pp. 18-19)

Clearing For Construction

186. One of the first steps in the construction process is ROW preparation, which includes vegetation removal and establishment of erosion and sedimentation controls. (CL&P 1, Vol. 1, p. 4-9)

187. Temporary erosion and sedimentation (E&S) controls would be installed prior to and/or during vegetation clearing in compliance with the *2002 Connecticut Guidelines for Soil Erosion and Sedimentation Control* and NU's "*Best Management Practices Manual: Construction and Maintenance Environmental Requirements for Connecticut*." Temporary controls include silt fence, hay/straw bales, and filter socks to be used during any construction that involves soil disturbance. (CL&P 1, Vol. 1, p. 4-9)

188. Additional E&S controls may be used following vegetation removal to demarcate limits of work within environmentally sensitive areas. (CL&P 1, Vol. 1, p. 4-10, 4-12)

189. On portions of the ROW where the proposed line would be adjacent to the existing 345-kV line and supported on H-frame structures, the ROW would require an additional approximately 90 feet of new vegetation removal and management. In areas where the proposed line would be constructed on a delta configured structure, approximately 70 feet of additional vegetation removal would be required. (CL&P 1, Vol. 1, p. 4-13)

190. During construction, tall-growing, woody species would be removed from the areas of the ROW near the proposed lines. (CL&P 1, Vol. 1, p. 4-14)

191. CL&P would coordinate with property owners regarding disposition and use of the trees to be removed along the ROW. CL&P would leave firewood and timber portions of the trees on the landowner's property if requested. The wood would be left stacked in upland areas on the edge of the vegetatively managed portions of the ROW. (CL&P 1, Vol. 1, pp. 4-16, 4-17)

192. CL&P would mechanically remove vegetation from the proposed cleared portions of the ROW. Special attention would be given to clearing in wetland areas or along stream banks. (see Chapter V). (CL&P 1, Vol. 1, p. 4-16)

Clearing for ROW Maintenance

193. Vegetation management within the ROW is typically performed every four years, while side-trimming of vegetation encroaching on the edge of the managed portion of the ROW occurs every ten years. (CL&P 1, Vol. 1, p. 4-38)

194. If a "hazard" tree (one that is weak, broken, decaying, or infested) is found on or off-ROW that could threaten the integrity of the transmission lines it would be removed or pruned as necessary. CL&P's ability to remove these trees in off-ROW areas is predicated on the language in the easement agreement. If the language does not give CL&P permission to remove hazard trees from outside of the easement area, the company would seek permission from the property owner. CL&P generally notifies the underlying property owner of tree removals regardless of the location of the tree. (CL&P 1, Vol. 1, p. 4-17; CL&P 9, R. 2; Tr. 5, p. 30)

Access Roads

195. Access roads currently exist along the ROW to reach existing transmission line structures but additional temporary and permanent access roads and improvements to existing access roads would be necessary to enable the safe passage of construction equipment. (CL&P 1, Vol. 1, p. 3-11)

196. In areas where terrain and the presence of environmental features make linear construction of an on-ROW access road difficult, off-ROW roads would be constructed. Off-ROW access roads would typically use public roads or access roads across private property. (CL&P 1, Vol. 1, p. 4-19)

197. The maximum grade on a typical access road would be approximately 10 percent for heavy equipment. (Tr. 4, p. 141)

V. ENVIRONMENT

Land Uses

198. Land uses in the region traversed by the proposed line consist of forest lands, agricultural areas, recreational areas, transportation corridors, and residential, commercial, and industrial developments. (CL&P 1, Vol. 1, p. 5-55)

199. The existing CL&P ROWs where the proposed new 345-kV transmission lines would be built includes existing 345-kV transmission lines that were developed in the early 1970s. (CL&P 1, Vol. 1, p. 1-7)

Landforms

200. Topography along the proposed line is characterized by hills and valleys with elevations ranging from approximately 210 feet National Geodetic Vertical Datum (NGVD) to approximately 600 feet NGVD. The proposed line would not traverse any traprock ridge or amphibolite ridge and would generally not parallel ridgelines. (CL&P 1, Vol. 1, pp. 5-4, 5-5)

201. The depth to bedrock along the proposed route generally exceeds 60 inches, however, some stones and boulders are present on the surface in most places and bedrock is often present along steep hill slopes and stream cuts. (CL&P 1, Vol. 1, pp. 4-21, 4-32, 5-6, 6-7)

202. The proposed line would cross two drumlins (an elongated hill composed of glacial drift). Both drumlins are in Mansfield, one along Highland Road, and the other approximately 2,000 feet west of Storrs Road (Route 195). (CL&P 1, Vol. 1, pp. 5-6, 5-7)

203. Construction of the proposed 345-kV transmission lines would result in minor, localized changes in elevation at locations where grading and filling is required, for example at crane pad locations or along access roads that must be improved or developed to allow the safe passage and operation of construction equipment. Elevation changes at crane pad locations are typically temporary as crane pads are removed following construction. Similarly, temporary access roads would be removed and restored, representing a short-term change in grade. However, in locations where permanent access roads must be maintained for construction and operation of the transmission lines, long-term but localized elevation changes would result. Details will be included at the D&M phase if the project is approved. (CL&P 1, Vol. 1, pp. 4-21, 4-25, 4-26, 6-1, 6-4; CL&P 18, pp. 29-30)

Soils/Agriculture

204. The CL&P easements within which the proposed line would be located contain approximately 24 acres of "Prime Farmland" soils and approximately 30 acres of soils that are "Farmlands of Statewide Importance." Most of the prime farmland soils along the proposed route occur in Pomfret (9.4 acres), Hampton (4.6 acres) and Columbia (4.5 acres). The CL&P easement through Putnam traverses approximately 12 acres of soils that are considered to be farmlands of statewide importance. (CL&P 1, Vol. 1, p. 5-8)

205. The Prime Farmland and "Farmlands of Statewide Importance" designations are made by the US Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). Prime Farmland soils are those used for producing food, feed, forage, fiber, and oilseed crops. Farmlands of Statewide Importance soils are almost prime farmland, and could be as economically valuable if properly treated and managed. (CL&P 1, Vol. 1, p. 5-7)

206. The Party Edward Hill Bullard owns the property comprising 57 Shuba Lane in Chaplin, which is crossed by the existing and proposed transmission lines. Mr. Bullard's property is a hayfield and an adjoining overgrown field under restoration. Mr. Bullard asked that excess subsoil from excavations be disposed of off-site and that the agricultural property is restored to pre-construction conditions and seeded. Mr. Bullard has also requested reasonable reimbursement for lost crops during the construction process. (Bullard 1; Tr. 5, pp. Tr. 10, p. 13)

207. CL&P would work with landowners of agricultural property to identify active farmland and to assess protection of the agricultural soils. More detailed solutions would be presented in the D&M Plan for Interstate, if approved. (CL&P 17, p. 39; Tr. 5, p. 91)

208. If construction of the proposed line were to occur in an agricultural area during growing season and the underlying property owner had a right to cultivate specified in the easement language, then CL&P would compensate the landowner for lost crops. (Tr. 4, p. 137)

209. Typically, on an agricultural property, the contractor would remove the topsoil and stockpile it temporarily away from the construction area. Construction activities would then be performed on subsoil. Following construction, the crane pad and access road would be removed, the soil would be decompacted, and the topsoil would be spread over the areas from which it was removed. (Tr. 5, pp. 91, 92)

Water Resources

Waterbodies

210. The proposed route is within the Thames River drainage basin, which includes the Natchaug River, Shetucket River, Willimantic River, Quinebaug River, and Fivemile River. (CL&P 1, Vol. 1, p. 5-11)

211. The proposed line would cross the Quinebaug River three times, in Killingly, Pomfret and Putnam. (CL&P 1, Vol. 1, p. 5-13)

212. The proposed line would cross 104 watercourses, including 54 perennial lakes, streams, or rivers and 50 intermittent watercourses. Culverts already exist at 12 of these water crossings: five at perennial streams and seven at intermittent watercourses. (CL&P 1, Vol. 1, pp. 5-12, 5-13)

213. Existing access roads along the ROW associated with the proposed route include 14 permanent culverts across 12 watercourses. Some temporary and some permanent access roads would be required across smaller streams along the proposed route. (CL&P 1, Vol. 1, pp. 6-12 through 6-14)

214. CL&P estimates that 41 new temporary or permanent culverts would be required across 39 streams, including two culverts proposed at two stream crossings (an un-named intermittent stream in the Town of Hampton, and White Brook in the Town of Brooklyn). The 39 streams with proposed culverts include 20 at perennial watercourses and 19 at intermittent watercourses. (CL&P 1, Vol. 1, pp. 6-12 through 6-14)

215. The proposed line traverses state-designated stream channel encroachment lines (SCEL) associated with the Willimantic River. There are currently two 345-kV transmission structures located within the Willimantic River SCEL. No new permanent structures would be located riverward of the state-designated SCELs; however, forest vegetation would be removed along both sides of the SCEL. (CL&P 1, Vol. 1, p. 5-24; CL&P 18, p. 37)

216. Temporary and permanent impacts to floodplains would occur at locations along the proposed route within the designated 100-year Federal Emergency Management Agency (FEMA) flood zones. The proposed project would include 36 new structures to be located within the FEMA-designated floodplains of 14 waterbodies. Additionally, permanent access roads would be located within the 100-year floodplain affecting less than 0.5 acres. (CL&P 1, Vol. 1, pp. 6-27 to 6-29; CL&P 18, p. 37)

217. Along the proposed route, four existing 345-kV transmission structures are located within the 100-year floodplain associated with Mansfield Hollow Lake and five existing 345-kV transmission structures associated with the Natchaug River in Mansfield Hollow WMA in Chaplin. (CL&P 1, Vol. 1, p. 5-23)

218. The proposed project would include the installation of three new 345-kV structures within the 100-year floodplain of Mansfield Hollow Lake. (CL&P 1, Vol. 1, p. 6-28)

219. Permanent effects on floodplains may also occur as a result of the installation of new access roads or improvement of existing access roads. Fewer than 0.5 acres of permanent access roads would be located within floodplains. (CL&P 1, Vol. 1, p. 6-28)

220. Of the 54 perennial water crossings, 13 span lakes or ponds, including an approximately 600-foot span across Mansfield Hollow Lake in Mansfield and an approximately 800-foot span across Lester Williams Pond in Brooklyn. The additional unnamed ponds or lakes include four in Chaplin, one in Hampton, four in Brooklyn, and two in Putnam. (CL&P 1, Vol. 1, p. 5-13)

221. None of the watercourses that would be crossed are considered navigable pursuant to the Rivers and Harbors Act. All of them are presently spanned by the existing electric transmission lines. (CL&P 1, Vol. 1, p. 5-13)

222. None of the rivers crossed by the proposed line are designated as a National Wild and Scenic River under the National Wild and Scenic Rivers Act. (CL&P 1, Vol. 1, p. 5-14)

223. CL&P would limit vegetation clearing along the ROW at watercourse crossings to the extent practical. As feasible, vegetation removal near streams would preserve desirable vegetation within a 25-foot-wide undisturbed riparian zone adjacent to either stream bank to allow for habitat, shading, bank stabilization, and erosion/sedimentation control. (CL&P 1, Vol. 1, p. 6-13)

Aquifer Protection Areas

224. The groundwater quality along most of the proposed route is classified as "GA," which is suitable for drinking without treatment. (CL&P 1, Vol. 1, p. 5-19)

225. The Towns of Coventry, Mansfield, Brooklyn, Killingly, Putnam, and Thompson have designated aquifer protection areas. Of nine Aquifer Protection Areas, the proposed line crosses approximately 3.3 acres of the Thompson Aquifer Protection Area in Putnam. While no new structures are proposed to be located within the aquifer protection area, three new structures are proposed to be located adjacent to the eastern edge of the Aquifer Protection Area. The other Aquifer Protection Areas are at least 1.7 miles from the proposed line. (CL&P 1, Vol. 1, pp. 5-20, 6-25)

226. Construction of the proposed project is not expected to result in adverse impacts on groundwater resources or public water supplies. Groundwater encountered during excavations for structure foundations would be pumped from the area and discharged in accordance with applicable local and state requirements. If shallow groundwater were encountered during construction, dewatering would be performed in accordance with applicable permit conditions and best management practices. (CL&P 1, Vol. 1, pp. 4-35, 6-26)

Wetlands

227. Connecticut wetlands are defined solely on the basis of hydric, alluvial or floodplain soils: hydric soils also are one of the three parameters used to define federal jurisdictional wetlands. State-designated wetlands on the ROW account for approximately 271 acres, of which approximately 242 acres are also federally-designated wetlands assuming an 11-acre ROW expansion on federal lands. (CL&P 1, Vol. 1, pp. 5-9, 5-18)

228. CL&P has designed the transmission line to place new structures outside of wetlands where possible. Due to design limitations, the foundations of 19 proposed structures would be located within wetland areas, resulting in less than 0.1 acres of permanent fill. (CL&P 1, Vol. 1, p. 6-2; CL&P 18, p. 28)

229. Of the 36.8 miles in the proposed route, 7 miles would extend across federal or state wetlands (approximately 6.8 miles are both federal and state wetlands and an additional 0.2 miles are solely state designated wetlands). (CL&P 1, Vol. 1, p. 5-19)

230. In the ROW of the proposed route from Card Street Substation to the Connecticut/Rhode Island border, 47 existing 345-kV structures are located in wetland areas. (CL&P 1, Vol. 1, p. 5-18)

231. There are 227 wetlands within the CL&P ROW and Mansfield Hollow expansion area along which the proposed route would be aligned, 222 of which are also classified as federal jurisdictional wetlands. (CL&P 1, Vol. 1, pp. 5-14, 5-15)

232. Of the 227 wetlands within CL&P's ROW along the proposed route, 62 contain vernal pools, and 26 contain amphibian breeding habitats. Vernal pools are small bodies of standing fresh water that persist from spring through summer and are generally dry for the remainder of the growing season. Several of the large wetland systems along the ROW contain multiple vernal pool and/or amphibian breeding habitat areas. Therefore, there are a total of 88 vernal pools and 29 amphibian breeding habitats along the CL&P ROW. Of the 88 vernal pools, six are located off the CL&P ROWs. (CL&P 1, Vol. 1, pp. 5-32; 5-34, 5-35; CL&P 18, p. 19)

233. Most of the 88 vernal pools located along the CL&P ROW are within five towns: 19 in Mansfield, 19 in Brooklyn, 15 in Putnam, 14 in Chaplin, and 13 in Hampton. Most of the 29 amphibian breeding habitats are found along the CL&P ROW in three towns: seven in Chaplin, six in Hampton, and six in Brooklyn. (CL&P 1, Vol. 1, p. 5-35)

234. Of the vernal pools present on CL&P's ROW, 59 are located in whole or in part along portions of the transmission ROW that are presently managed. Ten of these are traversed by or are immediately adjacent to CL&P's existing on-ROW access roads. (CL&P 18, p. 19)

235. Of 29 amphibian breeding habitats within or adjacent to CL&P's ROW, 20 are wholly or partially along managed portions of the ROW. Existing on-ROW access roads cross seven amphibian breeding habitat areas. (CL&P 18, p. 19)

236. Along the CL&P ROW of the proposed route, four existing 345-kV transmission structures are currently located within amphibian breeding habitat. (CL&P 1, Vol. 1, pp. 5-35, 5-36)

237. CL&P would have to submit a framework for compensatory wetland mitigation for the 401 Water Quality Certificate permit from DEEP. DEEP prefers that wetland mitigation be conducted at a single large parcel rather than multiple smaller mitigation sites. (DEEP comments June 21, 2012, p. 4)

238. The compensatory mitigation plan would include three basic categories of impacts related to water resources: 1) areas where permanent fill would be required for a structure or access road; 2) temporary wetland impacts from temporary access roads or a crane pad at a pulling location that would be removed after construction; 3) secondary impacts where clearing would convert forested wetlands to scrub-shrub wetlands or emergent marsh. (Tr 4, pp. 87, 88)

239. Construction of the proposed project would result in permanent wetland impacts associated with the placement of structures, guy anchors and access roads in wetlands. (CL&P 1, Vol. 1, p. 6-10, p. 6-19; CL&P 18, pp. 34-35)

240. Temporary wetland impacts associated with construction of the proposed project include the placement of timber mats for access roads and crane pads, the placement of rock fill for access roads or crane pads, the installation of grounding systems underground near structures, and the placement of temporary poles used for wire stringing over roadways and other features. (CL&P 1, Vol. 1, p. 6-10; CL&P 18, pp. 34-35)

241. Total impacts to water resources are 1.1 acres of permanent effects, 35.1 acres of temporary effects. Secondary impacts of clearing forested vegetation amount to approximately 38 acres of wetlands. In addition to the 38 acres of secondary vegetation impacts, 12 acres of forested wetland that are included in permanent and temporary effects would require vegetation removal. A total of approximately 50 acres of forested wetland vegetation would be removed along the ROW. (CL&P 18, pp. 35, 36)

242. CL&P proposes to implement mitigation measures to minimize impact on water resources, including use of temporary erosion and sedimentation controls, on-ROW restoration, and wetland compensation/mitigation. Other than tree removal within forested wetlands, structure placement within wetlands, and permanent access road expansions or development across wetlands or watercourses, most impact to water resources would be short-term and localized. Tree removal within forested wetlands for the purpose of maintaining safe distances between vegetation and the transmission line conductors would have the effect of converting the existing wetland habitat to scrub-shrub or emergent wetlands. (CL&P 1, Vol. 1, p. 6-8)

Vegetation

243. The entire ROW on which the proposed line would travel encompasses approximately 1,391 acres. Approximately 498 acres are presently forested (upland and wetland), and approximately 893 acres are open old-field, scrub-shrub, agricultural, or other non-forested lands, including the currently-managed portion of the ROW. (CL&P 1, Vol. 1, p. 5-27; CL&P 18, p. 15)

244. Along the existing ROW between Card Street Substation, Lake Road, and the Connecticut/Rhode Island border, CL&P currently manages the vegetation on an average of 150 feet of the typical 300-foot ROW with one existing line, and more than 150 feet where the ROW is wider and supports more than one line. The proposed project would require the vegetative management of an additional 70 to 90 feet of the ROW. (CL&P 1, Vol. 1, pp. 4-11 through 4-15; 6-30)

245. The construction of the proposed project would convert approximately 218 acres of upland forest and approximately 50 acres of forested wetlands to scrub/shrub lands. (CL&P 1, Vol. 1, pp. 6-58, 6-59; CL&P 18, p. 38)

246. The proposed project would require the removal of approximately 56,000 trees with an average diameter at breast height (dbh) of five inches or greater. (CL&P 1, Vol. 1, pp. 4-14; 6-31)

247. Typically, all tall-growing tree species would be removed from the conductor zones on the ROWs, while low-growing tree species and taller shrub species would be retained. The conductor zones include the area directly beneath the conductors extending 15 feet outward from the outermost conductors. (CL&P 1, Vol. 1, p. 6-34)

248. CL&P would follow all federal and state requirements in the use of herbicide applications for the maintenance of vegetation within the ROW. CL&P follows a setback distance of ten feet from water within which herbicides are not used for controlling brush. (CL&P 9, R. 18)

249. CL&P expects to be required to develop an Invasive Species Control Plan for the project following consultation with the United States Army Corps of Engineers, CT DEEP, and other agencies. The plan would identify measures for controlling invasive plants listed on the Connecticut Invasive Plant List – October 2011. In wetland areas, invasive plant species would be monitored and controlled on a four-year cycle following the completion of construction of Interstate. In upland areas, certain invasive plants would be controlled during routine vegetation management, which also occurs once every four years. (CL&P 1, Vol. 1, p. 4-38; CL&P 9, R. 19; CL&P 15, R. 40; CL&P 23)

Wildlife

250. Construction of the proposed project would alter wildlife habitat along the ROW both temporarily and permanently, and may cause disturbance, displacement, or mortality of wildlife. Removal of vegetative cover would displace wildlife, reduce cover, nesting, and foraging habitat for some species. (CL&P 1, Vol. 1, p. 6-35)

251. The widening of the maintained portion of CL&P's ROW would result in the conversion of 273 acres of forested habitat to open field and scrub-shrub habitat. The open field and shrubland created would benefit many wildlife species that are currently declining in Connecticut and the region, specifically bird species. The value of this habitat would be maximized if herbicide applications and clearing activities occurred between mid-September and the beginning of April, which is typically the non-nesting season. (DEEP comments dated June 21, 2012, p. 2)

252. The perennial streams near the proposed line provide habitat for various fish species. DEEP provides trout fishing opportunities by stocking publicly-accessible portions of certain rivers. Stocked streams that would be crossed by the proposed line include: Tenmile River, Hop River, Willimantic River, Natchaug River, Merrick Brook, the Little River, Blackwell Brook, White Brook, Quinebaug River, and the Fivemile River. Also, in the fall, the Shetucket River is stocked with large Atlantic salmon. (CL&P 1, Vol. 1, pp. 5-30, 5-31)

253. The Little River is proposed for wild trout management in which wild trout populations are sustained through catch-and-release angling. The Natchaug River and the Shetucket River are designated as trophy trout areas and are stocked with larger trout. (CL&P 1, Vol. 1, pp. 5-30, 5-31)

254. The proposed project is expected to have minor, if any, impact to fisheries along the project route. All major waterbodies would be spanned by the 345-kV transmission lines. Small perennial streams would be culverted or spanned with temporary bridges, as described under "Water Resources." (CL&P 1, Vol. 1, p. 6-37)

255. Obligate vernal pool species include wood frog, eastern spadefoot toad, spotted salamander, Jefferson salamander, marbled salamander, and fairy shrimp. (CL&P 1, Vol. 1, pp. 5-32, 5-33)

256. The proposed line would cross or be near 88 vernal pools and 29 other areas determined to function as amphibian breeding habitats. Species commonly found during field surveys near the proposed line include spotted salamander, marbled salamander, wood frog, spring peeper, and fairy shrimp. (CL&P 1, Vol. 1, p. 6-38)

257. Construction activities would have the most impact on amphibian species that over-winter in uplands and migrate to wetland habitats to breed, such as wood frog, spotted salamander and, marbled salamander. These amphibian species generally migrate to the wetlands between March and April. Migration of the marbled salamander which typically migrates from late summer through early fall. (CL&P 1, Vol. 1, pp. 6-39, 6-40)

258. Although CL&P attempted to locate structures and access roads outside of vernal pools or amphibian breeding habitat, some are located in larger wetland systems that contain these breeding areas. However, the structures would be located outside of the specific vernal pool areas of the larger wetland complexes. (CL&P 1, Vol. 1, p. 6-40; CL&P 15, R. 30)

259. CL&P would make an effort to adhere to seasonal windows for tree clearing in or near vernal pools and other amphibian breeding habitats, where feasible. The appropriate erosion and sedimentation controls would be installed to limit sediment deposition into amphibian breeding areas. The use of temporary timber mats for access roads near amphibian breeding areas would be considered rather than permanent gravel roads. Long-term measures would be incorporated into the ROW vegetation management program to protect amphibian breeding habitats. (CL&P 1, Vol. 1, p. 6-41; CL&P 15, R. 30)

Birds

260. CL&P conducted a baseline bird study for the proposed project. The study identified 146 bird species as potentially occurring near the proposed line. (CL&P 1, Vol. 1, p. 5-36 through 5-38)

261. Open old field and shrubland is becoming scarcer in Connecticut due to farmland reverting back to forestland. Managed electric transmission line ROWs provide maintained open area and shrubland, thereby increasing regional avian habitat diversity. (CL&P 1, Vol. 1, p. 5-36 through 5-37)

262. The typical nesting season for most breeding birds found in the project area is between May 1 and July 31. Vegetation removal within the nesting period could result in the loss of a breeding season for those species. (CL&P 1, Vol. 1, p. 6-42)

263. The construction of the proposed project would result in a net long-term loss of approximately 268 acres of woodland habitat for forest-dwelling bird species. However, since most of the nearby habitat is forest, there is existing alternative habitat for these species. (CL&P 1, Vol. 1, p. 6-43; CL&P 18, p. 38)

Threatened, Endangered, or Special Concern Species

264. There are no known federally-listed threatened or endangered species along the proposed route. The New England cottontail, which is a federal candidate species, is known to occur in Lebanon. The United States Fish and Wildlife Service recommends preservation of scrub-shrub habitat, which is suited to the cottontail, along the project ROW. (CL&P 1, Vol. 1, pp. 5-39, 5-40, 6-44, 6-45)

265. In the vicinity of the proposed line, 29 state-listed species were identified as potentially occurring. None are plants. There are five butterfly species, 12 moth species, seven species of birds, one turtle species, two snake species, an aquatic snail and an aquatic dragonfly. Based on additional information obtained using CL&P's recent (January 2012) data-sharing agreement with CT DEEP, fewer of these state-listed species may inhabit areas that overlap with the proposed route. (CL&P 1, Vol. 1, pp. 5-40 through 5-43; CL&P 18, pp. 20-22)

266. DEEP's Natural Diversity Data Base (NDDB) staff recommended:
    a. Surveys to determine the presence/absence of state-listed bird, butterfly, and moth species, including host-plant surveys for the butterflies and moths.
    b. Surveys for wood turtles, Eastern ribbon snakes, and Eastern hognose snakes are not required but specific mitigation measures should be implemented during construction to ensure the well-being of such animals if encountered.
    c. Field surveys for the aquatic snail are not required, but deployment and maintenance of erosion and sedimentation controls should be in place during construction.
    d. CL&P coordinate with DEEP to identify mitigation measures to avoid or minimize adverse effects to the aquatic dragonfly species.

    (CL&P 1, Vol. 1, pp. 5-41, 6-51, 6-52)

267. CL&P consulted the USFWS and NDDB for listed species near the proposed line. No federally-listed bird species are present. NDDB indicated the presence of habitat for six state-listed bird species. CL&P commissioned field studies in 2008 to determine further evidence as to the presence/absence of these species, and evidence was found for two of the six, plus one additional species. (CL&P 1, Vol. 1, pp. 5-38, 5-39, 5-41)

268. The American kestrel and Eastern meadowlark are state-listed bird species identified as potentially occurring in the ROW that were observed during field surveys. The brown thrasher, a state-listed bird species of special concern, that was not expected to occur within the project area, was also observed. (CL&P 1, Vol. 1, p. 5-50)

269. Potential mitigation includes planning vegetation removal outside of the breeding bird season and identifying and avoiding active nest sites for rare bird species within the construction area. (CL&P 1, Vol. 1, p. 6-49)

270. A great blue heron rookery was identified within and adjacent to a portion of CL&P's existing ROW in Thompson. Great blue herons gather at rookeries during breeding season, from March through August. (CL&P 1, Vol. 1, p. 5-51)

271. During 2008 to 2009, CL&P performed the recommended surveys for state-listed butterflies and moths (Lepidoptera). As a result of this survey, two state-protected invertebrate species were found near the Interstate route: a butterfly species, the Persius duskywing (*Erynnis persius*), and buck moth (*Hemileuca maia*). (CL&P 1, Vol. 1, pp. 5-41, 5-44)

272. In 2010, recommended surveys were performed to assess plant community types known to host state-listed Lepidoptera. The five community/host plant types identified are bluestem grassland, low-bush blueberry, scrub oak, wild indigo, and bluestem-scrub oak-low-bush blueberry mosaic. (CL&P 1, Vol. 1, p. 5-44)

273. CL&P intends to minimize the footprint of its project as much as feasible to reduce potential impact to butterfly and moth habitats, while maintaining that even if such habitat were damaged during construction, it would recolonize naturally afterwards. The construction of the project and management of the ROWs in shrubland would benefit Lepidoptera, most of which are found in shrubland areas similar to those on the managed portions of CL&P's ROWs. (CL&P 1, Vol. 1, pp. 6-54, 6-55)

274. In general, CL&P would protect host-plant communities by installing exclusion fencing, such as snow fencing. If exclusion were not feasible, mitigation would include:
    a. Avoiding permanent impact to important vegetative areas to the extent practicable;
    b. Limiting construction improvements to existing dirt access roads;
    c. Developing and implementing a *Vegetation Management Plan* to reduce potential colonization by invasive species and promote the growth of native host plant species; and
    d. Performing additional rare species surveys along certain areas of the ROWs.

    (CL&P 1, Vol. 1, pp. 6-55, 6-56)

275. A population of wild indigo was identified growing adjacent to existing access roads along the ROW in the project area. This plant species is an important host for the rare frosted elfin and Persius duskywing, both of which potentially occur along the ROWs. CL&P would take specific steps to limit impacts to the wild indigo populations to the extent practical. (CL&P 1, Vol. 1, p. 6-56)

276. Wood turtles were identified as potentially occurring near the proposed line in Pomfret. (CL&P 1, Vol. 1, p. 5-51)

277. The wood turtle typically over-winters in moving water bodies, tucked into root masses. Typical wood turtle hibernation is from November 1 through April 1. Construction activities are not expected to impact wood turtles during hibernation; however, individual turtles could be affected during foraging. (CL&P 1, Vol. 1, p. 6-49, 6-50)

278. DEEP has previously stated a preference for construction within wood turtle habitat during its dormant period. If construction must be done during the wood turtle's active period, the following mitigation guidelines would apply.
    a. Initial ROW vegetation removal would minimize the removal of low-growth vegetation in areas adjacent to rivers/streams documented to support wood turtles.
    b. Erosion and sedimentation controls would be used to minimize the deposition of sediment into wetland areas and to preclude wood turtles from accessing active construction areas.
    c. Construction contractors would be able to identify wood turtles and know the proper handling and care procedures if one is encountered. Also, a DEEP-approved turtle monitor would be present during construction in wood turtle habitats. If found, wood turtles would be removed from the active area and placed in the direction they were moving.

    (CL&P 1, Vol. 1, p. 6-50)

279. The eastern hognose snake and eastern ribbon snake were identified as potentially occurring near the proposed line in Mansfield and Putnam, respectively. During the field surveys, eastern ribbon snakes were observed in Chaplin, Hampton and Killingly. (CL&P 1, Vol. 1, pp. 5-51, 5-52)

280. The eastern hognose snake prefers woodlands and fields with well-drained sandy/gravelly soil. The snake is typically dormant from November 1 through April 1. Construction of the proposed project may temporarily displace the species from its habitat and potentially result in mortality of an individual; however, there is suitable habitat near the project area. DEEP expressed a preference for construction to occur during the snake's dormant period. If construction does not occur during the dormant period, the following mitigation guidelines would apply.
    a. Construction contractors trained to identify the snakes, properly handle and care for the snakes if encountered.
    b. A DEEP-approved snake monitor would be present during construction. Any hognose snakes that are encountered would be removed from the active workspace.
    (CL&P 1, Vol. 1, pp. 6-52, 6-53)

281. The eastern ribbon snake prefers habitats near shallow water with dense herbaceous and shrubby vegetation. Construction of the proposed project could affect the eastern ribbon snake through individual mortality, or displacement. Impact to the species would be minimized through the proper installation of temporary equipment bridges across watercourses, the preservation of vegetation within the riparian zone along the ROW, and the installation of erosion and sedimentation controls. (CL&P 1, Vol. 1, p. 6-53)

282. DEEP recommends that construction activities be within the dormant period for the eastern ribbon snake from November 1 through April 1. If construction does not occur during the dormant period, the following mitigation guidelines would apply.
    a. Construction contractors trained to identify the snakes, and properly handle and care for the snakes if encountered.
    b. A DEEP-approved snake monitor would be present during construction. Any ribbon snakes that are encountered would be removed from the active work area.

    (CL&P 1, Vol. 1, p. 6-54)

283. An aquatic snail and the moustached clubtail dragonfly, also aquatic, were identified as potentially occurring near the proposed line. (CL&P 1, Vol. 1, p. 5-52)

284. The aquatic snail is vulnerable to significant changes in water elevation and changes in water quality. The project would not involve any in-water work in aquatic snail habitat and thus would not directly affect the snail. However, the species could be negatively impacted from erosion and sedimentation into the snail habitat. Potential effects would be minimized by maintaining as much vegetation as possible along the ROWs in riparian zones and installing the appropriate erosion and sedimentation controls. (CL&P 1, Vol. 1, p. 6-51)

285. The moustached clubtail dragonfly could be affected by a reduction in water quality through direct disturbance or sedimentation into the watercourse. Potential mitigation may include avoiding or minimizing construction within the species' habitat, maintaining vegetation as feasible within riparian zones, and use of soil erosion and sedimentation controls. (CL&P 1, Vol. 1, pp. 6-51, 6-52)

Air Quality

286. All ambient background air concentrations are lower than the National Ambient Air Quality Standards for all pollutants and averaging periods in New London, Tolland and Windham counties. (CL&P 1, Vol. 1, p. 5-92 through 5-96)

287. During construction, local air quality may be temporarily affected from fugitive dust and vehicular emissions from construction. To minimize air quality effects during construction, access roads and other areas would be watered to suppress dust. Additionally, crushed stone aprons at access road entrances to public roads would be installed to minimize tracking of soil onto the road. Construction vehicles would be properly maintained and idling time of diesel equipment would be minimized. (CL&P 1, Vol. 1, p. 6-71)

Noise

288. Construction-related noise emissions are expected to occur from operation of construction equipment, truck traffic, earth-moving vehicles and equipment, jackhammers, and structure erection equipment (cranes). (CL&P 1, Vol. 1, p. 6-72)

289. Additionally, construction related noise, installation of access roads and crane pads, and construction equipment movement would disturb or displace mobile wildlife species. (CL&P 1, Vol. 1, p. 6-35)

290. Construction-related noise would be localized and temporary. (CL&P 1, Vol. 1, pp. 6-35, 6-72)

291. Operation of the proposed transmission lines could emit audible noise under certain weather, typically during inclement weather, conditions causing corona on the line conductors or hardware. (CL&P 1, Vol. 1, pp. 6-73, 6-74)

292. Corona noise can range from inaudible levels in fair-weather conditions to barely audible levels in dry snow or light fog conditions to distinctly audible in rain or wet snow conditions. This noise also diminishes quickly with distance from the line. (CL&P 1, Vol. 1, p. 6-73)

293. The highest noise emission levels would come from the use of implosive conductor connectors. CL&P would not propose the use of implosive connectors where homes or buildings are within 300 feet. CL&P would notify the nearby community of construction activities, such as the use of implosive connectors, prior to commencement of the activity. (CL&P 10, R. 14)

Recreation

294. Recreational areas along the existing and proposed transmission line ROW include Mansfield Hollow State Park, Mansfield Hollow WMA, the Natchaug State Forest, and recreational trails. Impact to these recreational areas would be short-term and only during construction. (CL&P 1, Vol. 1, pp. 5-71 through 5-73, 6-61)

295. CL&P does not allow the use of all-terrain vehicles on its property. On property where CL&P has an easement, it must receive landowner approval prior to installing barricades to discourage unwarranted access onto and use of its ROWs. (CL&P 1, Vol. 1, pp. 4-25, 4-26, 6-66)

Visibility on Reserved/Protected Land, Recreational Property

296. Visual impacts along the most of the route would be minimized by making the new structures match the existing ones as closely as possible in placement and in structure type. (CL&P 1, Vol. 1, p. 6-63; Tr. 6, pp.70-72)

Lebanon

297. The 0.6 mile section of the proposed route that extends through northeastern Lebanon is predominantly forest with some rural residences. The proposed transmission line would be within CL&P's existing ROW, between two existing overhead transmission lines. The proposed line also crosses the Airline State Park Trail, which is a recreational trail. The nearest historic site is the Bridge over Tenmile River, which is 3,000 feet southwest of the proposed crossing of the river. (CL&P 1, Vol. 1, pp. 5-58, 5-59)

298. At the Airline Trail crossing in Lebanon, the proposed transmission line would be in the middle of the existing ROW. The proposed project does not require the removal of forested vegetation in this area. Long views of the transmission line are limited due to bends in the trail. (CL&P 1, Vol. 1, pp. 6-63, 6-64)

Columbia

299. The land use near the 1.7 mile section of the proposed line that extends through the northeastern portion of Columbia is a mix of forest, rural residences and agricultural land. The nearest historic site is the Tenmile Mill located approximately 1,000 feet south of the proposed line. Three privately-owned open space parcels near the proposed line include a parcel approximately 0.6 miles north of the proposed line near the Windham/Columbia border; Potter Meadow, which is a 34-acre property owned by Joshua's Tract Conservation and Land Trust near the Willimantic and Tenmile Rivers and is approximately 0.2 miles north of the proposed line; and one parcel approximately 0.5 miles east of the proposed line south of Willimantic Road. (CL&P 1, Vol. 1, pp. 5-59, 5-60)

Coventry

300. The land around the 1.2 mile section of the proposed line that extends through the southwestern corner of Coventry are predominantly rural residences, agricultural and forest. From the Coventry/Columbia border to Babcock Hill Junction, the proposed transmission line would be placed between the existing 330 Line and 69-kV double-circuit lines. From Babcock Hill Junction, the proposed line heads north-northeast within the existing ROW and would be within a currently unmanaged portion of the ROW parallel to the existing 330 Line. (CL&P 1, Vol. 1, p. 5-60)

301. The proposed line would cross the Hop River State Park Trail just north of the Hop River crossing at the Columbia/Coventry town line. (CL&P 1, Vol. 1, pp. 5-61, 5-72)

302. The transmission line ROW crosses the Hop River Trail perpendicularly. Views of the transmission structures are limited due to bends in the trail, except in the vicinity of the crossing. Most views of the transmission lines at the trail crossing are to the south. The proposed transmission lines would be located in the middle of the existing ROW. Visibility of the proposed transmission lines would be similar to that of the existing transmission lines. (CL&P 1, Vol. 1, p. 6-64)

Mansfield

303. The area around the 6.4 mile section of the proposed line that would cross the southern portion of Mansfield is predominantly forest with some rural residences and intermixed agricultural land. In Mansfield, the proposed line would extend for approximately one-mile through Mansfield Hollow State Park, across Mansfield Hollow Lake, and through Mansfield Hollow WMA. The proposed transmission line would be within a currently unmanaged portion of the ROW adjacent to the existing 330 Line. Across one mile of federally-owned land, CL&P proposes to aquire additional easement from the USACE to expand the ROW by 25 feet (2.6 acres) to allow the development of the new 345-kV transmission line adjacent to the existing 330 Line. (CL&P 1, Vol. 1, p. 5-61; CL&P 18, p. 23, Table LFM-3 revised)

304. Within Mansfield, the proposed line would cross the Highland Ridge Driving Range, the west branch of the Nipmuck Trail, the Mansfield Hollow Dam Levee Trail, the Red Trail, and the eastern branch of the Nipmuck Trail. (CL&P 1, Vol. 1, pp. 5-61, 5-62)

305. Visibility of the ROW is limited along the Nipmuck Trail West Branch due to topography and dense forest, except for the area where the trail and ROW cross. At the ROW crossing of the Nipmuck Trail East Branch in the Mansfield Hollow WMA, east of Mansfield Lake, there are views of the ROW from across the lake but the existing transmission line structures are not visible from most of the trail because of topography and dense forest vegetation. (CL&P 1, Vol. 1, p. 6-64)

306. Scenic vistas are identified at Mansfield Hollow Lake, including two along the southeastern portion of the lake (approximately 400 feet east of the proposed route), and two at Bassetts Bridge (approximately 2,000 feet north of the proposed route). Two scenic vistas are identified north of Pleasant Valley Road (approximately 2,500 feet and 3,000 feet south of the proposed route). One scenic vista was identified along Stearns Road approximately 1,500 feet north of the proposed route). One scenic vista was identified at Wolf Rock approximately 3,000 feet north of the proposed route and one along Storrs Road approximately 2,000 feet north of the proposed route. The existing 345-kV transmission structures are visible from areas within Mansfield Hollow State Park and WMA in Mansfield. The proposed structures would also be visible. (CL&P 1, Vol. 1, pp. 5-62, 6-64, 6-65)

307. Five other viewpoints were identified in the vicinity of the proposed line through Mansfield, including Saw Brook Lane, Mountain Road, the northwest corner of Mansfield Hollow Lake, the Levee Trail, and the portion of Bassetts Bridge Road that crosses Mansfield Hollow Lake. The existing and proposed transmission line structures would not be visible from Saw Brook Lane. From the crest of Mountain Road the existing and proposed transmission line structures are visible above the tree line. From the vista on the northwest corner of Mansfield Hollow Lake, off Route 89, there is no view of the existing or proposed transmission line structures. From the Levee Trail, some of the existing structures are visible and the proposed transmission line structures would not significantly increase visibility. The portion of Bassetts Bridge Road that crosses Mansfield Hollow Lake has view of the tops of some existing transmission line structures. (CL&P 1, Vol. 1, p. 6-65)

308. Joshua's Tract Conservation and Historic Trust, Inc. owns several parcels of open space lands, one of which, Winfred Acres, is located approximately 800 feet southeast of the proposed line. Other nearby parcels owned by the Trust include Wolf Rock Nature Preserve located about 0.2 miles north of the proposed line and the Pond Lot located approximately 0.3 miles north of the proposed line. (CL&P 1, Vol. 1, p. 5-62)

Chaplin

309. The area around the 3.3 mile section of the proposed line in the southern portion of Chaplin consists of forest and rural residences. Within Chaplin, the proposed line would cross approximately 0.5 miles of federal land in the Mansfield Hollow WMA, the Natchaug State Forest and approximately 2,900 feet of land owned by the Fin, Fur, and Feather Club, Inc. In addition, the northern section of the Airline State Park Trail is approximately 200 feet south of the proposed line for approximately 0.8 miles. Across the 0.5 miles of federally-owned land, CL&P proposes to acquire additional easement from USACE to expand the ROW by 35 feet (2.2 acres) to allow the development of the new 345-kV transmission line adjacent to the existing 330 Line. (CL&P 1, Vol. 1, p. 5-63; CL&P 18, p. 23, Table LFM-3 revised)

310. In Chaplin, visibility of the existing ROW from the Airline Trail is variable. Dense deciduous vegetation on both sides of the trail limits views of the transmission lines. The proposed transmission line would be located on the north side of the ROW, which is farther from the trail. Therefore, views of the proposed transmission lines are not expected to differ from existing views. Across the WMA in Chaplin, the proposed transmission line structures and wider vegetatively managed ROW would not be visible to the general public since there is no easy public access to this area. (CL&P 1, Vol. 1, pp. 6-64, 6-65)

Hampton

311. In the area near the 4.3 mile section of the proposed line in south-central Hampton, land use is predominantly undeveloped forest with scattered agricultural land and rural residences. The proposed line would cross the Airline State Park Trail and Bigelow Howard Valley Fish and Game Club. The James L. Goodwin State Forest is approximately 1,200 feet north of the proposed line. Pine Acres Lake is over 3,000 feet north of the proposed line. (CL&P 1, Vol. 1, pp. 5-63, 5-64)

312. The proposed line would span the Airline Trail as it extends through a rock cut. Views of the existing and proposed structures are expected only at the trail crossing. (CL&P 1, Vol. 1, p. 6-64)

313. A town-designated scenic vista is south of the existing ROW near Parker Road and Route 97. The proposed line would also cross Route 97, which was identified by the Quinebaug-Shetucket Heritage Corridor, Inc. as a scenic rural driving route. (CL&P 1, Vol. 1, p. 5-64)

314. The CL&P ROW is not visible from the scenic vista in Hampton because it is located downhill and is buffered by forest. The proposed transmission line structures would not increase the visibility to that area. (CL&P 1, Vol. 1, p. 6-65)

Brooklyn

315. The area around the approximately 7.2 mile section of the proposed line in Brooklyn is predominantly undeveloped forest, rural residences and agricultural land. The proposed transmission line would be aligned within the existing ROW, north or west of the existing 330 Line. (CL&P 1, Vol. 1, p. 5-64)

316. In Brooklyn, the proposed and existing ROW would cross Route 169, a National Scenic Byway. There are three town-designated scenic vistas near the proposed line: Tatnic Hill, Gray Mare Hill, and off Barrett Hill Road. (CL&P 1, Vol. 1, pp. 5-64, 5-65)

317. There are currently views of the transmission line ROW from Route 169. Most of the views are limited to the area near the crossing. CL&P designed the proposed transmission line to install the new structures in alignment with the existing structures and to maintain similar conductor heights. (CL&P 1, Vol. 1, p. 6-65)

318. The ROW is not visible form the scenic vista off Tatnic Hill Road due to a forested buffer. The ROW would not be visible from a scenic vista off Barrett Hill Road because the ROW is located at the bottom of the hill and there is a forested buffer providing screening. There are limited views of the ROW from a scenic vista in the Gray Mare Hill area due to topography and vegetation. (CL&P 1, Vol. 1, pp. 6-65, 6-66)

319. The proposed line would cross the Milo Appley Conservation Showcase property adjacent to the Eastern Connecticut Conservation District, which includes several trails near the ROW. The route would also cross a portion of the Wolf Den Land Trust's White Brook Sanctuary property and CL&P-owned land that abuts the Quinebaug River and includes public hiking and recreational trails. (CL&P 1, Vol. 1, p. 5-65)

320. The Quinebaug River Trails are on CL&P-owned land north of Day Street. Portions of the Quinebaug River Trails extend near or beneath CL&P's ROW near Day Street Junction. The existing and proposed 345-kV transmission line structures would be visible from various locations along the trails. (CL&P 1, Vol. 1, p. 6-66)

Pomfret

321. The area around the 1.7 mile section of the proposed line that extends through Pomfret includes agricultural, open field/shrub, and forested areas. The proposed line also would be west of and parallel to the Quinebaug River. The town has created a canoe/kayak boat and parking area on CL&P's property on the river at Killingly Road. (CL&P 1, Vol. 1, p. 5-65)

Killingly and Putnam

322. The proposed line would cross the Quinebaug River into Killingly, then cross the river twice more each time crossing town boundaries between Killingly and Putnam. The route would extend from the Pomfret/Killingly border, approximately 1.9 miles northeast through Killingly then cross the Quinebaug River for the second time to be in Putnam. The route would then extend through Putnam for approximately 0.8 miles then cross the river for the third time to be in Killingly. The route would then extend through the northwestern corner of Killingly for approximately 1.1 miles then continue northeast into Putnam for approximately 4.9 miles. (CL&P 1, Vol. 1, p. 5-66)

323. Through Killingly and Putnam to Killingly Substation, the proposed line would be aligned in the middle of the existing ROW between the existing 345-kV line and two existing 115-kV lines or between two 345-kV lines. The proposed transmission line would be in the center of the existing ROW, west of and adjacent to the existing 345-kV line through the remainder of Killingly and through Putnam to Heritage Road. (CL&P 1, Vol. 1, p. 5-66)

324. Land use in the area of the proposed route through Killingly and Putnam are predominantly forest and agricultural with some rural residences and commercial/industrial land. (CL&P 1, Vol. 1, pp. 5-66, 5-67)

325. The proposed line extends near several parcels conserved by the Wyndham Land Trust, Inc., including within 500 feet of Dunn Preserve, a 32-acre property accessible from Lake Road, in Killingly and within 200 feet of Chaffee Preserve, a 29-acre parcel accessible from Route 44 in Putnam. (CL&P 1, Vol. 1, p. 5-67)

326. The proposed line would follow several town-designated "greenbelt" protection areas in Putnam. These areas are characterized by streams, wetlands, floodplains. (CL&P 1, Vol. 1, p. 5-67)

Thompson

327. In the area around the 1.9 mile section of the proposed line that would extend through Thompson, the land use is predominantly forest with some rural residences. Quaddick State Park is approximately 0.8 miles north of the ROW along the east shore of the southern portion of Quaddick Reservoir. Quaddick State Forest is approximately one mile north of the proposed line near the northern portion of Quaddick Reservoir. (CL&P 1, Vol. 1, p. 5-68)

328. CL&P's ROW traverses a portion of Barker Preserve, which is land owned and managed by Wyndham Land Trust. (CL&P 1, Vol. 1, p. 5-68)

329. The proposed line would cross a portion of Lower Pond, which has been designated as one of the state's best examples of Atlantic white cedar swamp. (CL&P 1, Vol. 1, p. 5-68)

330. The proposed line would traverse approximately 1,800 feet of Tamler Preserve, which is owned and managed by Wyndham Land Trust. (CL&P 1, Vol. 1, p. 5-68)

Historic and Cultural Areas

331. CL&P commissioned cultural resource consultants to perform research regarding recorded historic and archaeological resources in the project vicinity; to identify the sensitivity of the project ROWs for finding unrecorded sites; and to conduct field investigations of the project ROWs. Field reconnaissance was coordinated with representatives of Native American Tribes. CL&P would continue to coordinate with the State Historic Preservation Office and to conduct studies to assess whether any sites found within the ROWs are potentially eligible for the National Register of Historic Places (NRHP) or the State Register of Historic Places (SRHP). (CL&P 1, Vol. 1, pp. 5-85 through 5-92; 6-68 through 6-71, Vol.3; CL&P 18, pp. 25-26, 49)

332. Five known Native American archaeological sites are within one mile of the proposed line. One site, located in Pomfret, was determined as not eligible for the NRHP. The remaining four archaeological sites are in Mansfield and each have insufficient reported data to make a determination of eligibility for the NRHP. (CL&P 1, Vol. 1, p. 5-88)

333. There are 21 significant above-ground historic architectural resources within approximately 0.25 miles of the proposed line, some of which are within historic districts. The resources include:
    a. In Coventry - Flanders Road Bridge
    b. In Mansfield – Three cemeteries, Mansfield Hollow Historic District, Mansfield Hollow Dam, Mansfield Center Historic District, and Mansfield Center Cemetery
    c. In Chaplin – The Chewink Cemetery and Old Cemetery
    d. In Hampton – South Cemetery
    e. In Brooklyn – Brooklyn Green Historic District
    f. In Killingly – Rogers Village
    g. In Putnam – Munyan Cemetery

    (CL&P 1, Vol. 1, p. 5-90)

334. The proposed project is not expected to have an adverse visual impact on the 21 significant historic architectural resources that are within 0.25 miles of the proposed line. (CL&P 1, Vol. 1, p. 6-70; CL&P 18, p. 25)

335. Field investigations that CL&P conducted along the project ROWs in 2010 identified approximately 115 Native American archaeological sites, seven Euro-American sites, and five unidentified human-built stone piles, walls, or rings. These sites are being reviewed for eligibility for listing on the NRHP/SRHP. (CL&P 1, Vol. 1, p. 5-91; CL&P 18, p. 26)

336. CL&P would conduct additional archaeological reconnaissance investigations during the project planning stage and coordinate with the Connecticut SHPO, Native American tribes, the USACE and the Quinebaug-Shetucket Rivers Valley National Heritage Corridor, Inc. (CL&P 1, Vol. 1, pp. 6-69, 6-70; CL&P 18, pp. 25-26, 49)

337. CL&P would avoid sites eligible for the NRHP/SRHP where possible. If avoidance is not possible, mitigation measures would be developed for review and approval by the Connecticut SHPO. (CL&P 1, Vol. 1, p. 6-70; CL&P 18, p. 49)

Substations/Switching Station

Card Street Substation

338. The predominant vegetation in the area of Card Street Substation is upland forest, open field/shrub land and forested wetland. Card Street Substation occupies 10 acres of a 150-acre site owned by CL&P in the Town of Lebanon. (CL&P 1, Vol. 1, pp. 5-100, 5-101)

339. Three wetlands exist on CL&P's Card Street Substation property, the nearest of which is 100 feet from the existing substation fence line. Temporary erosion and sedimentation controls would be installed during construction to minimize the potential for off-site sedimentation into nearby water resources. Also, spill prevention, control, and countermeasure procedures would be in place during construction to minimize inadvertent spills or leaks from construction equipment. Operation of substation equipment would not affect the nearby wetlands. (CL&P 1, Vol. 1, pp. 4-36, 5-100, 6-75, 6-76; CL&P 1, Vol. 1, p. 2)

340. There are no known federally or state-listed vegetation or wildlife species in the immediate area of Card Street Substation. While the New England cottontail, which is a federal candidate species, has habitat in Lebanon, prefers early successional forest habitat with a dense shrub layer, which is the type of habitat being managed on the substation property and the surrounding area. (CL&P 1, Vol. 1, pp. 5-101, 5-102, 5-103, 6-44)

341. There is one Native American archaeological site within one mile of Card Street Substation. Since the proposed substation modifications would be within the existing fence line, there would not be adverse effects to cultural resources. (CL&P 1, Vol. 1, p. 5-102, 6-78)

Lake Road Switching Station

342. The predominant vegetation type near Lake Road Switching Station is upland forest and open field/shrub land. The Lake Road Switching Station is located on an approximately three-acre site within the Lake Road Generating Station. (CL&P 1, Vol. 1, pp. 5-103, 5-105)

343. There are no water resources within 200 feet of Lake Road Switching Station. There is an approximately 0.6-acre storm-water detention basin south of the Switching Station and west of Lake Road Generating Station. (CL&P 1, Vol. 1, p. 5-105)

344. No federally-listed species are known to occur in the vicinity of Lake Road Switching Station. Two state-listed moth species are known to occur, the barrens metarranthis moth (*Metarranthis apiciaria*) and the slender clearwing (*Hemaris gracilis*). Both species were identified along CL&P's ROW, 1,000 feet northwest of the switching station. The proposed modifications to the switching station are not expected to impact these species. (CL&P 1, Vol. 1, p. 5-105)

345. No significant historic resources are known to occur within 0.25 miles of Lake Road Switching Station. (CL&P 1, Vol. 1, p. 5-106)

Killingly Substation

346. No water resources are located within 200 feet of Killingly Substation. An approximately 1.3-acre storm-water detention basin is located on an adjacent property along the east side of the substation. Temporary erosion and sedimentation controls would be installed during construction to minimize the potential for off-site sedimentation into nearby water resources. Also, spill prevention, control, and countermeasure procedures would be in place during construction to minimize inadvertent spills or leaks from construction equipment. Operation of substation equipment would not affect the nearby wetlands. (CL&P 1, Vol. 1, pp. 5-108, 6-76)

347. Killingly Substation is located in an area that may contain state-listed invertebrate species of moths and butterflies. CL&P consultants observed these species during field surveys of the ROWs, however; the species where found in the ROWs and the substation would not be suitable habitat for these species. (CL&P 1, Vol. 1, p. 5-109)

348. Tracey Road Trail, which is a one-mile paved walking/biking trail, is located on the east side of Tracey Road between Attawaugan Crossing Road and the Killingly/Putnam border. Intervening vegetation and topography screen Killingly Substation from the trail. (CL&P 1, Vol. 1, p. 5-109)

349. No significant historic resources are known to occur within 0.25 miles of the substation. The modifications to Killingly Substation would be on previously disturbed, developed portions of the site that are not sensitive for the location of archaeological resources. (CL&P 1, Vol. 1, p. 5-110)

350. The proposed equipment additions at Killingly Substation would not increase noise emissions from the substation. (CL&P 1, Vol. 1, p. 5-110)

General Project Substation and Switching Station Information

351. No blasting is expected. If bedrock is encountered during construction, mechanical methods would be used to install foundations. (CL&P 1, Vol. 1, pp. 6-74, 6-75)

352. Construction activities would conform to an *Erosion and Sedimentation Control Plan* that would be in conformance with the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control* and CT DEEP storm water regulatory requirements. During construction, excess soil resulting from modifications would typically be removed. Additionally, construction activities would be sequenced to minimize the amount of time that soils are exposed. Also, disturbed areas at substations under construction would be stabilized with crushed stone. (CL&P 1, Vol. 1, p. 6-75)

353. None of the proposed substation modifications are expected to be visible from any designated scenic or recreational resources. (CL&P 1, Vol. 1, p. 6-76)

354. Fire/smoke detection systems are already in place in the relay and control enclosures at Killingly Substation and Lake Road Switching Station. If fire or smoke is detected, the detection systems would automatically activate an alarm at the Connecticut Valley Electric Exchange (CONVEX), and system operators would take the appropriate action. (CL&P 1, Vol. 1, p. 4-39)

VI. ELECTRIC AND MAGNETIC FIELDS

General

355. 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 33, FOF # 281; CL&P 1, Vol. 1, pp. 7-2, 7-3)

356. EF is produced whenever voltage is applied to electrical conductors and equipment. Electric fields are typically measured in units of kilovolts/meter. As the weight of scientific evidence indicates that exposure to electric fields, beyond levels traditionally established for safety, does not cause adverse health effects, and as safety concerns for electric fields are sufficiently addressed by adherence to the National Electrical Safety Code, as amended, health concerns regarding Electric and Magnetic Fields (EMF) focus on MF rather than EF. (Council Admin. Notice 33, FOF #282; CL&P 1, Vol. 1, p. 7-2)

357. MF is produced by the flow of electric currents. The magnetic field 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. Magnetic fields are typically measured in units of milligauss (mG). (Council Admin. Notice 33, FOF #282; CL&P 1, Vol. 1, p. 7-3)

358. The Council has developed its *"Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Lines in Connecticut"* (EMF BMPs) to address concerns regarding potential health risks from exposure to EMF from transmission lines. The document presents scientific knowledge about health risks, outlines the Council's policy of prudent avoidance, and describes a wide range of best-practice MF management designs. (Council Admin. Notice 23; CL&P 1, Vol. 1, Appendix 7A)

359. International health and safety agencies, including the World Health Organization (WHO), the International Agency for Research on Cancer (IARC), the IEEE International Committee for Electromagnetic Safety (ICES), 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. (Council Admin. Notice 33, FOF #284; CL&P 1, Vol. 1, Appendix 7D, p. 8; CL&P 17, p. 82)

360. Both the ICNIRP and ICES have attempted to advise on quantitative guidelines for mG limits protective of health, but have been able to do so only by extrapolation from research not directly related to health: by this method, the maximum exposure advised by ICES is 9,040 mG, and the maximum exposure advised by the ICNIRP has been increased to 2,000 mG in its most recent guidelines. 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 33, FOF #284; CL&P 1, Vol. 1, Appendix 7D, p. 8; CL&P 17, p. 82)

361. Since 2007, there have been at least eight different reviews of the scientific evidence related to health effects associated with EMF exposure. Recent studies do not provide evidence to alter the conclusions of the World Health Organization's 2007 status report on EMF. Some areas of interest have been closed, determining that there is no association between certain types of cancer and EMF exposure. Other areas, such as childhood leukemia, are still being studied and cannot be completely ruled out. Since both childhood leukemia and long-term EMF exposure are rare, it is difficult to identify a large enough population of children with both disease and exposure for a conclusive study of association. (CL&P 1, Vol. 1, Appendix 7D; Tr. 4, pp. 73-75; DEEP Comments dated June 21, 2012)

Statutory Facilities

362. Pursuant to CGS Section 16-50p(i), CL&P identified "Statutory Facilities," such as private or public schools, licensed child day-care facilities, licensed youth camps, public playgrounds and residential areas. (CL&P 1, Vol. 1, pp. 5-69, 5-70)

363. The proposed line would be within 500 feet of one private school and two private day care facilities. Two other private day care facilities have closed.
    a. Mount Hope Montessori School, Bassetts Bridge Road, Mansfield
    b. Green Dragon Day Care, Bassetts Bridge Road, Mansfield
    c. Susan Kirkonnell Day Care, Hickory Lane, Brooklyn
    d. Jacqueline Ben, Church Street, Brooklyn (closed)
    e. Come Play with Me Day Care, Storrs Road, Mansfield (closed)

    (CL&P 1, Vol. 1, p. 5-70, 7B-21; CL&P 17, p. 74; Tr. 7, p. 13)

364. There are no known youth camps or public playgrounds adjacent to the proposed line. (CL&P 1, Vol. 1, p. 5-70)

365. There are several groups of homes near the proposed line. CL&P has identified these as "focus areas" for the purpose of compliance with the Council's EMF BMPs. (CL&P 1, Vol. 1, pp. 5-70, 5-71, Appendix 7B, pp. 7B-4 through 7B-7)

366. Consistent with the Council's EMF BMPs, CL&P began with a "base" design of the proposed project that includes "no-cost" magnetic field management features. CL&P then added in potential designs that are "low-cost" magnetic field management features at five locations along the project route. The five locations with potential low-cost magnetic field management designs are sections of the route that are near public or private schools, licensed child day care facilities, licensed youth camps, public playgrounds or near an area that the Council may determine to be a residential area. (CL&P 1, Vol. 1, p. 7-8)

367. Consistent with the Council's EMF BMPs, CL&P's low-cost design recommendation aimed to reduce magnetic field levels at the edges of the ROWs along the project route by more than 15 percent, while spending no more than four percent of the estimated project cost using the base line design. (CL&P 1, Vol. 1, p. 7-8)

368. Locating a new transmission line on an existing ROW, adjacent to an existing transmission line, allows for phasing the conductors of the new line resulting in partial cancellation of magnetic fields from each of the two lines. CL&P designed the proposed project for best phasing of line currents in the same direction to reduce magnetic fields at no cost. For the section of the project between Card Street Substation and Lake Road Switching Station, the currents on the proposed 345-kV lines would be very similar to the currents on the existing 345-kV line, which allows for the best reduction in MF. (CL&P 17, p. 49; Tr. 4, pp. 90, 91)

Method of Calculating EF and MF

369. EF is stable over time. MF, however, varies depending on power supply and demand within the state and surrounding region. Predictions can only be made based on a set of particular assumptions. (CL&P 1, Vol. 1, pp. 7-10, 7-11)

370. A typical bottom conductor height of 35 feet above the ground is assumed for calculations of EMF levels from a 345-kV line. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-13)

371. The system was modeled to reflect anticipated conditions in 2015, which is the expected last year before the project would be operational, referred to as pre-Interstate. This modeling included changes to the system previously approved by ISO-NE with in-service dates prior to 2015. The post-Interstate calculations of magnetic fields relied on system modeling of power flows for 2020, with all lines in service, referred to as post-NEEWS. The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project. (CL&P 1, Vol. 1, pp. 7-11, 7-12; CL&P 15, R. 34)

372. The power-flow models yielding currents for MF calculations are run using: annual peak load (APL), from ISO-NE's projected 90/10 system peak loads in 2012 and estimated peak loads for 2020 using ISO-NE's projected 90/10 level in 2019 scaled to 2020; peak daily average loads (PDAL) for a 24-hour period, assumed at 80% of the hourly peak load; and annual average loads (AAL) using a 60% annual load factor for the New England Transmission System, each reduced by an amount of forecasted passive demand resources. (CL&P 1, Vol. 1, pp. 7-12, 7-13)

EMF BMPs Base Design

373. CL&P's proposed transmission line uses an H-frame base design configuration, except along four segments of the route. The four segments include one segment within Mansfield Hollow, where the existing transmission line consists of a delta configuration and the proposed configuration is vertical; and in three of the five focus areas (Focus Areas A, D and E) where CL&P proposes other 345-kV line configuration to comply with the Council's EMF BMPs. In two of the identified focus areas (Focus Areas B and C) CL&P proposes the base design H-frame configuration of the proposed conductors. (CL&P 1, Vol. 1, pp. 7-16, 7-17, 7-45)

374. CL&P's MF modeling was conservative, assuming power-flow dispatches that would result in unusually high power flows over the 345-kV circuits between Connecticut and Rhode Island. (CL&P 1, Vol. 1, p. 7-14)

375. CL&P calculated MF levels for each of the focus areas along the proposed project route. The calculations include a pre-project AAL case for 2015; and a post-project AAL case for 2020 for the proposed and each alternative line configuration. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-16)

376. The estimated cost of the Connecticut portion of Interstate, including substation costs, is $213.7 million, assuming the base-line design overhead on H-frame structures, no-cost MF mitigation features, and an 11-acre ROW expansion on federally-owned property in the Mansfield Hollow area. The Council's EMF BMP guidelines suggest a "budget" of four percent for special low-cost MF mitigation designs near statutory facilities can be added to total project costs. CL&P calculated this budget to be four percent of $213.7 million, or about an $8.5 million addition. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-2)

377. The cost of implementing the EMF BMP designs for Focus Areas A, D, and E is approximately $8.4 million. This uses most of the $8.5 million budget mentioned in FOF #376. (CL&P 1, Vol. 1, Appendix 7B, pp. 7B2, 7B-33)

378. The additional costs of the EMF BMP designs are expected to be borne solely by Connecticut consumers. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-33)

EMF BMPs Design Considerations for Focus Areas

Focus Area A

379. Focus Area A is a 2.3 mile section of the ROW in Coventry and Mansfield between structures 9028 and 9048 of the existing 330 Line. This is an area where there are homes near each side of the ROW along crossing streets. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-6)

380. Within the 2.3 mile Focus Area A there are four road crossings with a total of five homes immediately adjacent to the north edge of the ROW and five homes immediately adjacent to the south edge of the ROW. (DEEP comments dated June 21, 2012, p. 7; CL&P 28b, p. 7)

381. AAL MF and cost calculations for the section of ROW associated with Focus Area A are:

Configuration	Max. level on ROW* (mG)	MF Level at north edge (mG)	MF % change-north edge	MF Level at South edge (mG)	MF % change-south edge	% cost increase**	Cost of 2.3-mile section ($)	Incremental increase in cost ($)
Pre-Interstate	140.5	4.6	-	28.0	-	-	-	-
Base design	146.9	7.2	+57%	18.4	-34%	-	$10,320,459.	-
H-Frame +20’	131.2	6.8	+48%	18.2	-35%	0.6%	$11,616,544.	$1,296,085.
Delta	143.6	5.2	+13%	20.6	-26%	1.3%	$13,040,737.	$2,720,278.
Delta +20’	133.4	5.4	+17%	20.2	-28%	1.9%	$14,467,025.	$4,146,566.
Vertical	101.5	5.8	+26%	24.3	-13%	1.4%	$13,418,505.	$3,098,046.
Vertical +20’	105.8	4.6	0%	25.5	-9%	2.0%	$14,680,935.	$4,360,476.
Split phase	127.1	3.1	-33%	23.8	-15%	4.2%	$19,358,355.	$9,037,896.

(CL&P 1, Vol. 1, Appendix 7B, pp. 7B-16, 7B-18)
*Typical location on the ROW for maximum magnetic field levels is directly underneath the conductors, midspan between the structures.
**The total project percent cost increase resulting from design modification.

382. AAL MF at nearby residences in Focus Area A are calculated as:

	Distance to nearest ROW edge (ft)	2015 pre-Interstate case	2020 post-NEEWs* base design	2020 post-NEEWS* delta design
Homes North of ROW	4	4.4 mG	6.7 mG	4.9 mG
Homes South of ROW	5	25.2 mG	16.2 mG	18.3 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.
(CL&P 1, Vol. 1, p. 7-11, 7-12, Appendix 7B, p. 7B-20)

383. If an EMF BMP design is chosen, CL&P’s preference in Focus Area A is the delta configuration, which yields the greatest reduction of MF levels on the north/west edge of the ROW and the least increase of MF levels on the south/east edge of the ROW. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-26)

Focus Area B

384. Focus Area B is a 0.9 mile section of the ROW in Mansfield between structures 9070 and 9078 of the existing 330 Line. In this section, the ROW is near the Green Dragon Day Care and the Mount Hope Montessori School--both statutory facilities. A second home day care facility, “Come Play with Me” Day Care was located within this Focus Area but is no longer a licensed facility. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-6; CL&P 17, p. 74)

385. AAL MF and cost calculations for the section ROW associated with Focus Area B are:

Configuration	Max. level on ROW* (mG)	MF Level at north edge (mG)	MF % change-north edge	MF Level at South edge (mG)	MF % change-south edge	% cost increase**	Cost of 0.9-mile section ($)	Incremental increase in cost ($)
Pre-Interstate	140.5	4.6	-	28.0	-	-	-	-
Base design	146.9	7.2	+57%	18.4	-34%	-	$3,879,199.	-
H-Frame +20’	131.2	6.8	+48%	18.2	-35%	0.2%	$4,386,589.	$507,390.
Delta	143.6	5.2	+13%	20.6	-26%	0.5%	$4,942,327.	$1,063,128.
Delta +20’	133.4	5.4	+17%	20.2	-28%	0.8%	$5,504,342.	$1,625,143.
Vertical	101.5	5.8	+26%	24.3	-13%	0.5%	$4,995,001.	$1,115,802.
Vertical +20’	105.8	4.6	0%	25.5	-9%	0.8%	$5,581,315.	$1,702,116.
Split phase	127.1	3.1	-33%	23.8	-15%	1.7%	$7,559,719.	$3,680,520.

(CL&P 1, Vol. 1, Appendix 7B, pp. 7B-16, 7B-18)
*Typical location on the ROW for maximum magnetic field levels is directly underneath the conductors, midspan between the structures.
**The total project percent cost increase resulting from design modification

386. AAL MF calculations at the nearest corners of statutory facilities within Focus Area B are:

	Distance to nearest edge of ROW (ft)	2015 pre-Interstate case	2020 post-NEEWS* base design	2020 post-NEEWS* delta design
Mount Hope Montessori School	137	1.7 mG	1.2 mG	1.4 mG
Green Dragon Day Care	196	2.7 mG	0.9 mG	1.7 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.
(CL&P 1, Vol. 1, p. 7-11, 7-12, Appendix 7B, p. 7B-20)

387. Magnetic field levels at Mount Hope Montessori School were calculated to be lower after operation of the proposed project than they are currently. See findings under Cross-Section 2 below beginning with Finding # 415. (Tr. 4, p. 116; Tr. 5, pp. 107, 113)

388. The school property was appraised at approximately $650,000. The cost to build a new school is estimated at approximately $2,000,000. (Tr. 4, p. 116; Tr. 5, pp. 107, 113)

389. CL&P could install vegetation between the Mount Hope Montessori School and the CL&P ROW for visual screening. (Tr. 6, p. 15)

390. If an EMF BMP design is chosen in Focus Area B, CL&P's preference is the base-design H-frame configuration. The H-frame design would result in the lowest MF levels at the nearby statutory facilities in comparison to the delta configuration. The proposed project constructed on H-frame structures would also result in lower MF levels than the pre-Interstate calculations. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-27)

Focus Area C

391. Focus Area C is a 0.4-mile section of the ROW immediately adjacent to Focus Area B in Mansfield between structures 9078 and 9081 of the 330 Line. Along this section, the ROW crosses the Hawthorne Lane cul-de-sac residential development. In 2008, the property owners on Hawthorne Lane initiated negotiations with CL&P to shift a section of the existing ROW to the south and construct existing and proposed lines in a vertical configuration, thereby moving the existing and proposed transmission lines farther from most of the homes in this development, preserving an existing tree screen between the homes and the transmission lines, and eliminating an angle in the existing ROW. The Hawthorne Lane Alternative would require new easements from each landowner to CL&P without purchase and the release of a conservation easement from the Town of Mansfield. The conductors would span the Hawthorne Lane roadway, and a forested wetland system that contains three vernal pools. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-6, 7B-29, 7B-30; CL&P 17, pp. 31, 32, Attachment CCM-8)

392. If an EMF BMP design were chosen for Focus Area C, CL&P's preference is a base design H-frame line configuration. MF levels from a line with the base design H-frames are calculated to be lower at the nearest homes than the 2015 pre-Interstate MF levels. Due to property owner requests, CL&P nonetheless investigated a shift of the ROW to the south over Hawthorne Lane and designing the proposed and existing lines in a vertical configurations. This is referred to as the Hawthorne Lane Alternative. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-27)

393. AAL MF and cost calculations associated for the section of ROW associated with Focus Area C are:

Configuration	**Max. level on ROW* (mG)**	**MF Level at north edge (mG)**	**MF % change-north edge**	**MF Level at South edge (mG)**	**MF % change-south edge**	**% cost increase****	**Cost of 0.4-mile section ($)**	**Incremental increase in cost ($)**
Pre-Interstate	140.5	4.6	-	28.0	-	-	-	-
Base design	146.9	7.2	+57%	18.4	-34%	-	$3,311,244.	-
H-Frame +20’	131.2	6.8	+48%	18.2	-35%	0.1%	$3,561,195.	$249,951.
Delta	143.6	5.2	+13%	20.6	-26%	0%	$3,414,870.	$103,626.
Delta +20’	133.4	5.4	+17%	20.2	-28%	0.2%	$3,687,898.	$376,654.
Vertical	101.5	5.8	+26%	24.3	-13%	0.1%	$3,471,144.	$159,900.
Vertical +20’	105.8	4.6	0%	25.5	-9%	0.3%	$3,846,612.	$535,368.
Split phase	127.1	3.1	-33%	23.8	-15%	1.2%	$5,941,222.	$2,629,978.
Vertical configuration of two lines on relocated ROW***	80.2	2.0	-57%	22.9	-18%	0.8%	$5,084,530	$1,773,286.

(CL&P 1, Vol. 1, Appendix 7B, pp. 7B-16, 7B-18)

*Typical location on the ROW for maximum magnetic field levels is directly underneath the conductors, midspan between the structures.

**The total project percent cost increase resulting from design modification.

***north and south ROW edges are not the same as other configuration alternatives.

394. AAL MF at nearby residences in Focus Area C are calculated as:

	Distance to nearest ROW edge (ft)	2015 pre-Interstate case	2020 post-NEEWs* base design	2020 post-NEEWS* delta design
Homes North of ROW	70	2.6 mG	2.5 mG	2.3 mG
Homes South of ROW	240	2.0 mG	0.6 mG	1.2 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, pp. 7-11, 7-12, Appendix 7B, p. 7B-20)

395. With the Hawthorne Lane Alternative ROW shift, the AAL MF level calculations are:

	Distance to nearest ROW edge (ft) with ROW shift	2020 post-NEEWS* (Hawthorne Lane Alternative)
Homes North of ROW	125	0.5
Homes South of ROW	185	1.0

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, pp. 7-11, 7-12; CL&P 17, p. 55)

396. The Hawthorne Lane Alternative has an estimated incremental cost of $1.8 million. Outages of the existing line and temporary line structures are needed to construct it. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-28; CL&P 17, p. 30; Tr. 10, p. 132)

397. At the close of the proceeding record, the Hawthorne Lane property owners were unable to obtain the necessary mortgage subordination commitments to enable the ROW shift to be made. The property owner's attorney reported to CL&P that application packages requesting the outstanding mortgage subordinations had been submitted, and were pending. (Tr. 10, pp. 135, 136)

Focus Area D

398. Focus Area D is a one-mile section of the ROW in Brooklyn between structures 9210 and 9219 of the existing 330 Line. In this focus area, there is one home-based child day care facility and a number of homes along Darby Road and Meadowbrook Drive. (CL&P 1, Vol. 1, Appendix 7B, pp. 7B-6, 7B-7; Tr. 7, p. 13)

399. AAL MF and cost calculations for the section of ROW associated with Focus Area D are:

Configuration	Max. level on ROW* (mG)	MF Level at north edge (mG)	MF % change-north edge	MF Level at South edge (mG)	MF % change-south edge	% cost increase**	Cost of 1-mile section ($)	Incremental increase in cost ($)
Pre-Interstate	140.5	4.6	-	28.0	-	-	-	-
Base design	146.9	7.2	+57%	18.4	-34%	-	$5,118,233.	-
H-Frame +20’	131.2	6.8	+48%	18.2	-35%	0.3%	$5,764,942.	$646,719.
Delta	143.6	5.2	+13%	20.6	-26%	0.7%	$6,529,045.	$1,410,812.
Delta +20’	133.4	5.4	+17%	20.2	-28%	1.0%	$7,278,072.	$2,159,839.
Vertical	101.5	5.8	+26%	24.3	-13%	0.7%	$6,579,640.	$1,461,407.
Vertical +20’	105.8	4.6	0%	25.5	-9%	1.0%	$7,244,063.	$2,125,830.
Split phase	127.1	3.1	-33%	23.8	-15%	2.1%	$9,686,516.	$4,568,343.

(CL&P 1, Vol. 1, Appendix 7B, pp. 7B-16, 7B-19)

*Typical location on the ROW for maximum magnetic field levels is directly underneath the conductors, midspan between the structures.

**The total project percent cost increase resulting from design modification.

400. AAL MF at the nearby statutory facility in Focus Area D are calculated as:

	Distance to nearest ROW edge (ft)	2015 pre-Interstate case	2020 post-NEEWs* base design	2020 post-NEEWS* delta design
Susan Kirconnell Day Care	497	0.4 mG	0.1 mG	0.3 mG
Home North of ROW	11	4.2 mG	5.9 mG	4.5 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, Appendix 7B, p. 7B-21; Tr. 7, p. 13)

401. CL&P’s EMF BMP design preference in Focus Area D is the delta line configuration, which would reduce MF levels on the northern ROW edge (where more homes are located) by more than 15 percent and cost less than the vertical or split-phase line configurations. For further findings related to Focus Area D, see under Cross-Section 6 BMP. (CL&P 1, Vol. 1, Appendix 7B, pp. 7B-30, 7B-31)

Focus Area E

402. Focus Area E is a 0.6 mile section of the ROW in Putnam between structures 9305 and 9310 of the existing 347 Line. This section of the ROW crosses the rear portion of residential properties on Elvira Heights. There are 15 homes within 400 feet of the ROW, the nearest of which is about 115 feet from the southeast ROW edge. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-7)

403. AAL MF and cost calculations for the section of ROW associated with Focus Area E are:

Configuration	Max. level on ROW* (mG)	MF Level at north edge (mG)	MF % change-north edge	MF Level at South edge (mG)	MF % change-south edge	% cost increase**	Cost of 0.6-mile section ($)	Incremental increase in cost ($)
Pre-Interstate	36.1	1.2	-	7.2	-	-	-	-
Base design	146.9	2.2	+83%	20.4	+183%	-	$3,141,826.	-
H-Frame +20’	131.2	2.5	+108%	20.4	+183%	0.1 %	$3,411,990.	$270,164.
Delta	143.6	3.3	+175%	21.2	+194%	0.3%	$3,779,466.	$637,640.
Delta +20’	133.4	3.5	+192%	21.0	+192%	0.4%	$4,014,011.	$872,185.
Vertical	101.5	3.3	+175%	21.6	+200%	0.6%	$4,433,135.	$1,291,309.
Vertical +20’	105.8	3.1	+158%	21.9	+204%	0.8%	$4,861,558.	$1,719,732.
Split phase	127.1	3.3	+175%	21.7	+201%	1.6%	$6,472,509.	$3,330,683.
Vertical for existing and proposed	61	1.7	+42%	12.9	+80%	2.9%	$9,396,201.	$6,254,375.
Delta for existing and proposed	73.2	1.8	+50%	13.3	+85%	2.0%	$7,415,909.	$4,274,083.
H-frame with 45-foot westward shift of existing and proposed	112.7	4.1	+242%	8.8	+22%	3.3%	$10,202,048.	$7,060,222.
Vertical for existing and proposed with both shifted to center of ROW	59.5	2.9	+142%	6.3	-12.5%	3.4%	$10,305,500.	$7,163,674.

(CL&P 1, Vol. 1, Appendix 7B, pp. 7B-22, 7B-24)

*Typical location on the ROW for maximum magnetic field levels is directly underneath the conductors, midspan between the structures.

**The total project percent cost increase resulting from design modification.

404. The CL&P-preferred EMF BMP design for Focus Area E would have mixed environmental effects, including:
   a. A decrease in the amount of upland and wetland forest removal on the north edge of the ROW.
   b. An increase in the amount of vegetation disturbance along the ROW due to the construction of two transmission lines.
   c. An increase in temporary and permanent effects to wetlands and watercourses.

   (CL&P 1, Vol. 1, Appendix 7B, pp. 7B-32)

405. CL&P prefers not to shift line alignments within the ROW nor to rebuild the existing line as a delta or vertical configuration because of the expense and need for line outages; however, this is the only practical EMF BMP alternative. Therefore, CL&P's preferred EMF BMP option for Focus Area E is to construct the existing and proposed line in a delta line configuration with no alignment shifts. For further findings on Focus Area E see under Cross-Section 12 BMP. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-32)

406. The existing H-frame lines are screened from the homes on Elvira Heights by forest vegetation. Taller steel poles would likely be visible above the tree line from Elvira Heights. (DEEP comments dated June 21, 2012, p. 8)

407. The cost of implementing the EMF BMP designs for Focus Areas E is approximately $4.3 million. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-33)

Base-Design EMF Calculations

Cross-Section 1

408. Cross Section 1 (XS-1) extends 2.8 miles between Card Street Substation and Babcock Hill Junction. The ROW is 350 feet in width and currently contains a 345-kV transmission line and a double-circuit 69-kV transmission line. (CL&P 1, Vol. 1, p. 7-17)

409. MF and EF measurements taken from a location within XS-1 near 4 Scalise Drive in Columbia at the southwest edge of the ROW produced values of 5.8 mG for MF, and 0.005 kV/m for EF. The measurement location at the edge of the ROW is approximately 190 feet from the centerline of the proposed transmission line. (CL&P 1, Vol. 1, p. 7-17)

410. In XS-1, the proposed 345-kV transmission line would be installed on H-frame structures, between the existing 69-kV transmission line and the existing 345-kV H-frame line. AAL MF calculations at the edges of the ROW are:

	West/South edge of ROW	East/North Edge of ROW
XS-1 (Pre-Interstate 2015 case)	7.6 mG	28.2 mG
XS-1 (Post-NEEWS* 2020 case)	5.8 mG	18.7 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, pp. 7-11, 7-12, 7-18, 7-19)

Cross-Section 2 BMP

411. Cross-Section 2 BMP (XS-2 BMP) extends 2.8 miles between Babcock Hill Junction and the vicinity of Highland Road. This surrounding area is known as Focus Area A. The ROW is 300 feet in width and currently contains an existing 345-kV transmission line. There is a collection of homes near this segment of the ROW. (CL&P 1, Vol. 1, pp. 7-19, 7-45)

412. CL&P took MF and EF measurements for this cross section near a home at the northwest edge of the ROW at 164 Stafford Road in Mansfield. MF was measured at 8.2 mG and EF was measured at 0.017 kV/m at a distance of 150 feet from the proposed transmission line location. (CL&P 1, Vol. 1, p. 7-19)

413. In XS-2 BMP, the proposed 345-kV line would be constructed on steel pole structures with conductors in a delta configuration to be located to the north/west of the existing structure. AAL MF calculations at the edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-2 BMP (Pre-Interstate 2015 case)	4.6 mG	28.0 mG
XS-2 BMP (Post-NEEWS* 2020 case)	5.2 mG	20.6 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, p. 7-19)

414. The cost of implementing the alternative configuration identified in XS-2 BMP would be an additional $2,720,300 or 1.3 percent over the base-design cost of the project. (CL&P 1, Vol. 1, p. 7-46)

.

Cross-Section 2

415. Cross-Section 2 (XS-2) extends 3.3 miles within Mansfield from the vicinity of Highland Road to Mansfield Hollow State Park. The ROW is 300 feet wide and currently contains an existing 345-kV transmission line. Two focus areas, one with a home day care facility and a school, and one including a collection of homes are near the ROW in XS-2. (CL&P 1, Vol. 1, p. 7-21; CL&P 17, p. 74)

416. Measurements were taken at the edge of the ROW near the Green Dragon home day care and the Mount Hope Montessori School, both on Bassetts Bridge Road in Mansfield. At the home day care, MF was measured at 28.4 mG and EF at 0.007 kV/m at 160 feet from the centerline of the proposed transmission line. At the school, MF was measured at 6.6 mG and EF at 0.107 kV/m at 150 feet from the centerline of the proposed transmission line. (CL&P 1, Vol. 1, p. 7-21)

417. In XS-2, the proposed 345-kV line would be constructed on H-frame structures to the west/north of the existing transmission lines. AAL MF calculations at the edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-2 (Pre-Interstate 2015 case)	4.6 mG	28.0 mG
XS-2 (Post-NEEWS* 2020 case)	7.2 mG	18.4 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, p. 7-22)

Cross-Section 3

418. Cross-Section 3 (XS-3) extends about one mile through federally-owned property of Mansfield Hollow State Park, Mansfield Hollow Lake, and the Mansfield Hollow WMA. The ROW is 150 feet wide in XS-3. The existing transmission line structures in this segment are steel pole with conductors in a delta configuration. (CL&P 1, Vol. 1, p. 7-23)

419. In XS-3, the proposed 345-kV line would be constructed in a vertical configuration to the west/north of the existing transmission line. Calculations at the edges of ROW assumed a 150-foot wide ROW in 2015 and a 175-foot ROW in 2020, with all of the expansion on the north side. AAL MF calculations at the proposed edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-3 (Pre-Interstate 2015 case)	21.9 mG	24.7 mG
XS-3 (Post-NEEWS* 2020 case)	38.1 mG	26.4 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project

(CL&P 1, Vol. 1, pp. 7-24, 10-36)

Cross-Section 4

420. Cross-Section 4 (XS-4) extends 0.8 miles between Bassetts Bridge Road and Shuba Lane. The ROW is 300 feet wide and currently contains an existing 345-kV transmission line. (CL&P 1, Vol. 1, p. 7-25)

421. The proposed transmission line would be installed on H-frame structures to the west/north of the existing 345-kV line. AAL MF calculations at the edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-4 (Pre-Interstate 2015 case)	4.6 mG	28.0 mG
XS-4 (Post-NEEWS* 2020 case)	7.2 mG	18.4 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, pp. 7-25, 7-26)

Cross-Section 5

422. Cross-Section 5 (XS-5) extends 0.5 miles along a 150-foot wide ROW through federally-owned land of the Mansfield Hollow WMA in Chaplin. The ROW currently contains an existing 345-kV transmission line on H-frame structures. (CL&P 1, Vol. 1, p. 7-26)

423. CL&P proposes to construct the 345-kV transmission line in a vertical configuration. To accommodate the construction of vertical structures, CL&P proposes an approximately 185-foot wide ROW on the federal property. (CL&P 1, Vol. 1, p. 7-26)

424. The proposed transmission line would be installed on vertical structures to the west/north of the existing 345-kV line. Calculations at the edges of the ROW assumed a 150-foot ROW width in 2015 and a 185-foot width in 2020, with all of the expansion on the north side. AAL MF calculations at the edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-5 (Pre-Interstate 2015 case)	35.2 mG	35.2 mG
XS-5 (Post-NEEWS* 2020 case)	42.7 mG	31.8 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, p. 7-27, p. 10-36)

Cross-Section 6

425. Cross-Section 6 (XS-6) extends 12.6 miles on the ROW between Willimantic Road and Day Street Junction. The existing ROW in XS-6 is 300 feet and currently consists of one 345-kV transmission line. (CL&P 1, Vol. 1, p. 7-28)

426. The proposed transmission line would be located on H-frame structures to the west/north of the existing transmission line. AAL MF calculations at the edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-6 (Pre-Interstate 2015 case)	4.6 mG	28.0 mG
XS-6 (Post-NEEWS* 2020 case)	7.2 mG	18.4 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, p. 7-29)

Cross-Section 6 BMP

427. Cross-Section 6 BMP (XS-6 BMP) extends one mile from west of Church Street to Day Street Junction in Brooklyn. This surrounding area is known as Focus Area D. The existing ROW is 300 feet wide and consists of an existing 345-kV transmission line. A home day care facility and several homes are located near XS-6 BMP. (CL&P 1, Vol. 1, pp. 7-29, 7-45; Tr. 7, p. 13)

428. Measurements were taken at the edge of the ROW near a residence at 350 Church Street in Brooklyn. MF was measured at 8.1 mG and EF at 0.053 kV/m at 145 feet from the centerline of the proposed transmission line. (CL&P 1, Vol. 1, p. 7-30)

429. The proposed 345-kV line would be constructed on steel monopoles in a delta configuration on the west/north side of the ROW. AAL MF calculations at the edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-6 BMP (Pre-Interstate 2015 case)	4.6 mG	28.0 mG
XS-6 BMP (Post-NEEWS* 2020 case)	5.2 mG	20.6 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, p. 7-31)

430. The cost of implementing the alternative configuration identified in XS-6 BMP would be an additional $1,410,800 or 0.7 percent above the base design cost of the project. (CL&P 1, Vol. 1, p. 7-46)

Cross-Section 7

431. Cross-Section 7 (XS-7), extends 2.3 miles between Day Street Junction and Hartford Turnpike. The ROW is 360 feet wide and currently consists of a 345-kV transmission line, and two 115-kV transmission lines. (CL&P 1, Vol. 1, p. 7-32)

432. The proposed 345-kV transmission line would be installed on H-frame structures on the west/south side of the ROW. AAL MF calculations at the edges of the ROW are:

	West/South edge of ROW	East/North Edge of ROW
XS-7 (Pre-Interstate 2015 case)	6.4 mG	16.6 mG
XS-7 (Post-NEEWS* 2020 case)	20.0 mG	18.7 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, p. 7-33)

Cross-Section 8

433. Cross-Section 8 (XS-8) extends 2.6 miles between Hartford Turnpike and Lake Road Junction. The ROW is 360 feet wide and currently consists of one 345-kV transmission line and two 115-kV transmission lines. (CL&P 1, Vol. 1, pp. 7-33, 7-34)

434. The proposed 345-kV transmission line would be positioned in between the two existing 115-kV lines and the one 345-kV line. AAL MF calculations at the edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-8 (Pre-Interstate 2015 case)	15.1 mG	27.1 mG
XS-8 (Post-NEEWS* 2020 case)	19.3 mG	17.6 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, p. 7-35)

Cross-Section 9

435. Cross-Section 9 (XS-9) extends 0.2 miles between Lake Road Junction and Lake Road Switching Station. The ROW is 250 feet wide and currently contains two existing 345-kV lines supported by steel monopoles. (CL&P 1, Vol. 1, p. 7-35)

436. The proposed 345-kV transmission lines would be installed on two steel monopoles with the conductors in a vertical configuration. The new lines would be between the two existing transmission lines. AAL MF calculations at the edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-9 (Pre-Interstate 2015 case)	9.7 mG	34.3 mG
XS-9 (Post-NEEWS* 2020 case)	20.8 mG	19.9 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, p. 7-36)

Cross-Section 10

437. Cross-Section 10 (XS-10) extends 0.7 miles between Lake Road Junction and Killingly Substation. The ROW is 400 feet wide and currently contains one 345-kV transmission line and two 115-kV transmission lines all on H-frame structures. (CL&P 1, Vol. 1, p. 7-37)

438. The proposed 345-kV transmission line would be installed on H-frame structures in between the existing 345-kV line and the 115-kV lines. AAL MF calculations at the edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-10 (Pre-Interstate 2015 case)	17.0 mG	5.1 mG
XS-10 (Post-NEEWS* 2020 case)	16.7 mG	11.2 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, p. 7-38)

Cross-Section 11

439. Cross-Section 11 (XS-11) extends 1.7 miles between the Killingly Substation and Heritage Road in Putnam. The existing ROW is 340 feet wide and consists of an existing 345-kV transmission line and a double-circuit 23-kV distribution line. (CL&P 1, Vol. 1, p. 7-39)

440. The proposed 345-kV line would be installed on H-frame structures in between the existing 345-kV line and the existing distribution line. AAL MF calculations at the edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-11 (Pre-Interstate 2015 case)	2.5 mG	7.2 mG
XS-11 (Post-NEEWS* 2020 case)	2.5 mG	20.4 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, p. 7-40)

Cross-Section 12

441. Cross-Section 12 (XS-12) extends 4.5 miles between Heritage Road in Putnam and the Connecticut/Rhode Island border in Thompson, excluding the Elvira Heights area in Putnam. The ROW is 300 feet wide and currently consists of one 345-kV transmission line. (CL&P 1, Vol. 1, p. 7-41)

442. The proposed 345-kV transmission line would be installed on H-frame structures to the west/north of the existing 345-kV line. AAL MF calculations at the edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-12 (Pre-Interstate 2015 case)	1.2 mG	7.2 mG
XS-12 (Post-NEEWS* 2020 case)	2.2 mG	20.4 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.

(CL&P 1, Vol. 1, p. 7-42)

Cross-Section 12 BMP

443. Cross-Section 12 BMP (XS-12 BMP) extends 0.6 miles from immediately south of Route 44 and parallel to the Elvira Heights residential subdivision in Putnam. This is referred to as Focus Area E. The ROW is 300 feet wide and currently contains one existing 345-kV transmission line supported on H-frame structures. While no statutory facilities exist in this area, there are a collection of residences along Elvira Heights Court. This is referred to as Focus Area E. (CL&P 1, Vol. 1, p. 7-43)

444. Measurements of existing conditions were taken at the southeast edge of the ROW near 12 Elvira Heights in Putnam. MF was measured at 25.4 mG, while EF measurements were not collected due to vegetative shielding of the electric field at this location. The distance from the centerline of the proposed transmission line to the measuring location at the edge of the ROW is 155 feet. (CL&P 1, Vol. 1, p. 7-43)

445. CL&P's EMF BMP preference includes reconstructing the existing 345-kV line, changing the structures from H-frame to steel monopoles with conductors in a delta configuration. The proposed new 345-kV transmission line would also be constructed on steel monopoles with a delta configuration. AAL MF calculations at the edges of the ROW are:

	West/North edge of ROW	East/South Edge of ROW
XS-12 BMP (Pre-Interstate 2015 case)	1.2 mG	7.2 mG
XS-12 BMP (Post-NEEWS* 2020 case)	1.8 mG	13.3 mG

* The 2020 post-NEEWS model include the Rhode Island Reliability Project, the Greater Springfield Reliability Project, the Manchester to Meekville Junction Project, Interstate, and a potential future Central Connecticut Reliability Project.
(CL&P 1, Vol. 1, p. 7-44)

446. The cost of implementing the alternative configuration identified in XS-12 BMP would be an additional $4,274,000, or 2.0 percent above the base-design cost of the project. (CL&P 1, Vol. 1, p. 7-46)

447. CL&P does not recommend the construction of XS-12 BMP alternative because of increased cost and environmental impacts compared to the XS-12 base-design. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-32; Tr. 10, pp. 139-141)

VII. ALTERNATE ROUTES AND DESIGNS FOR 345 kV FACILITIES

448. Within Connecticut, CL&P identified and compared various kinds of alternatives, for both route and design, to the proposed new 345-kV transmission lines that would extend between Card Street Substation and Lake Road Switching Station and from Lake Road Switching Station to the National Grid-owned portion of the transmission line at the Connecticut/Rhode Island border. When considering these alternatives CL&P took into consideration technical feasibility, minimizing adverse environmental, cultural, economic effects, and cost. (CL&P 1, Vol. 1A, p. 14-1)

Proposed Alternatives Under Negotiation

Mansfield Hollow Configurations

449. The proposed transmission line would be aligned along existing ROWs across two segments of federally-owned property in the Mansfield Hollow portion of Mansfield and Chaplin. These two segments total 1.4 miles, including 0.9 miles through Mansfield Hollow State Park in Mansfield (Segment 1) and 0.5 miles across the Mansfield Hollow WMA in Chaplin (Segment 2). (CL&P 1, Vol. 1, pp. 1-10, 1-11, pp. 10-1, 10-5)

450. The federal government, through the USACE, took control of the Mansfield Hollow property for flood control purposes. USACE leases most of the property to DEEP, which manages the property as a state park and wildlife management area. (Tr. 6, pp. 55, 56)

451. The existing transmission line is centered within a 150-foot wide ROW through Mansfield Hollow, leaving inadequate space in the remaining portion of the easement for the construction of a new transmission line adjacent to the existing line with proper conductor separation. To expand the easement, CL&P must negotiate with two offices within the USACE. The real estate branch consults with the environmental evaluation branch, which analyzes the potential environmental impacts of the easement expansion request to confirm its consistency with the National Environmental Policy Act (NEPA). After this internal consultation, the USACE will render a final decision on CL&P's request. (CL&P 1, Vol. 1, p. 1-11, pp. 10-27 through 10-29; Appendix 10B; CL&P 15, R. 38; CL&P 17, pp. 26-27Tr. 6, p. 56)

452. In Segment 1, the existing transmission line is supported on monopoles with a delta configuration and an average height of 115 feet above ground level (agl). In Segment 2, the existing transmission line is supported on wood-pole H-frame structures with an average height of 75 feet agl. (CL&P 1, Vol. 1, p. 10-7)

453. Vegetation is maintained as scrub-shrub growth over approximately 100 feet of the ROW width in Segment 1 and approximately 140 feet of the ROW width in Segment 2. (CL&P 1, Vol. 1, p. 10-7)

454. CL&P identified three configuration options for the installation of the proposed transmission line through the federally-owned properties.
    a. The "no ROW expansion" option would be used if the USACE does not grant a conveyance for additional easement rights. This option would include the installation of the existing and proposed transmission lines using vertical conductor configurations and taller monopole structures.
    b. The "Minimal ROW expansion" option limits the expansion of the additional easement to approximately 4.8 acres by using taller monopole structures to support the proposed transmission line within both Segment 1 and Segment 2. This option would require a 25-foot easement width expansion in Segment 1 and a 35-foot easement width expansion in Segment 2.
    c. The "11-acre Expansion" option would expand the easement by 55 feet (approximately 5.8 acres) in Segment 1 and 85 feet (approximately 5.2 acres) in Segment 2. In this case, CL&P would construct the new transmission line on structures that generally match the existing structures.
    (CL&P 1, Vol. 1, pp. 10-3, 10-4; CL&P 17, pp. 27-28)

455. CL&P has adopted the 4.8-acre Minimal ROW Expansion as the preferred option for the configuration of the new line across federal lands. (CL&P 15, R. 38)

456. In early 2012, the USACE indicated a preference for the 4.8-acre Minimal ROW Expansion option. DEEP also indicated a preference for the Minimal ROW Expansion option. (DEEP comments dated June 21, 2012; CL&P 15, R. 38)

457. CL&P proposes either that the Council simply approve the proposed route over federally-owned properties, postponing judgment on a specific line configuration until the D&M Plan, or that the Council approve the Minimal ROW Expansion option. (CL&P 15, R. 38)

458. If the Council were to approve a transmission line configuration through Mansfield Hollow that differs from what the USACE approves, CL&P would have to request that this docket proceeding be reopened and the configuration be amended to match that approved by the USACE. (Tr. 6, p. 73)

No ROW Expansion

459. All proposed construction would occur within the existing 150-foot ROW, including access roads and construction staging areas. (CL&P 1, Vol. 1, p. 10-13)

460. Along Segment 1, the existing 330 Line is supported on five steel-pole delta structures and one steel-pole vertical structure that are between 106 and 137 feet high. These six existing structures would be removed and the 330 Line would be reconstructed near the southern ROW edge on six taller steel monopoles that range from 130 to 160 feet. The proposed 3271 Line would be installed on steel-monopole structures ranging in height from 130 feet to 155 feet. (CL&P 1, Vol. 1, pp. 10-13 to 10-15)

461. Along Segment 2, the existing 330 Line, which is supported by five H-frame structures ranging in height from 73 to 81 feet, would be removed. The reconstructed 330 Line would be supported by steel-monopoles ranging in height from 110 to 130 feet. The proposed 3271 Line would be constructed on steel-monopoles ranging in height from 115 to 135 feet. (CL&P 1, Vol. 1, p. 10-14 to 10-15)

462. The transfer of the 330 Line to new structures would require day outages of the lines for multiple days. (CL&P 1, Vol. 1, p 10-17)

463. Construction of the proposed 345-kV line and reconstruction of the existing 330 Line would involve detailed construction sequencing and would adversely affect environmental resources in the ROW. Most vegetation within the entire 150-foot wide corridor would have to be removed. Following construction, the entire ROW width would be maintained as scrub-shrub. (CL&P 1, Vol. 1, pp. 10-16 to 10-17, Appendix 10A)

464. Installation of the taller structures for the No ROW Expansion option may result in greater visual impact on locations near Mansfield Hollow State Park. However, the existing transmission line structures are visible now, so any added impact would be incremental only. (CL&P 1, Vol. 1, p. 10-21)

465. The No ROW Expansion option would take longer to construct than the proposed configuration, which would potentially lengthen the duration of temporary nuisance effects on recreational users of the state park and WMA. (CL&P 1, Vol. 1, p. 10-22)

466. The cost of the No ROW Expansion Option is approximately $28.5 million. (CL&P 1, Vol. 1, p. 10-26)

Minimal ROW Expansion Option

467. The Minimal ROW Expansion Option includes the existing 330 Line remaining in place and the proposed 3271 Line being installed on monopoles in a vertical configuration in both Segment 1 and Segment 2. This option would require approximately 4.8 acres of additional easement from the USACE. (CL&P 1, Vol. 1, p. 10-27)

468. The proposed 345-kV line would be installed near the northern edge of the expanded ROW. New structures would range in height from 130 feet to 155 feet in Segment 1 and from 115 feet to 135 feet in Segment 2. (CL&P 1, Vol. 1, pp. 10-28, 10-29)

469. In Segment 1, vegetation in approximately 150 feet of the expanded 175-foot ROW would be managed as scrub-shrub vegetation. Vegetation along the existing southern ROW edge would not be affected. In Segment 2, 180 feet of the expanded 185-foot ROW would be maintained as scrub-shrub vegetation. The five-foot area of undisturbed vegetation would be along the southern ROW edge. (CL&P 1, Vol. 1, p. 10-30)

470. There are no temporary or permanent (fill) wetland effects expected for Segment 1. In Segment 2, there would be 0.3 acres of temporary wetland effects and less than 0.1 acres of permanent fill. Overall, there would be 7.5 acres of vegetation removal in Segment 1, all in upland areas. There would be 5.6 acres of vegetation removal in Segment 2, including 2.1 acres in wetland areas and 3.5 acres in upland areas. (CL&P 18, Table LFM-3 revised)

471. Two vernal pools would be potentially affected in Segment 2. (CL&P 18, Table LFM-3 revised)

472. Taking into consideration field constructability reviews and assumptions performed in 2012, along Segment 2 in Chaplin the Minimal ROW Expansion Option would result in approximately one acre of temporary wetland impacts. (CL&P 18, pp. 54-55)

473. The vertically-configured structures installed for the Minimal ROW Expansion Option would be up to 43 feet taller than the existing structures in Segment 1 and up to 59 feet taller than the existing structures in Segment 2. As with the No ROW Expansion Option, the Minimal ROW Expansion Option may have greater visibility than the existing and proposed (11-acre Expansion) configuration due to increased height and the use of different structure types. However, the increased visual impact would be incremental because the existing structures, especially in Segment 1, are visible from Mansfield Hollow State Park and WMA. (CL&P 1, Vol. 1, p. 10-33; CL&P 18, LFM-3 revised)

474. Currently, the USACE prefers the Minimal ROW Expansion Option on the federal property. (CL&P 15, R. 38; Tr. 4, p. 53)

475. The cost of the Minimal ROW Expansion Option is approximately $14.3 million. (CL&P 1, Vol. 1, p. 10-29)

11-acre ROW Expansion Option

476. The 11-acre ROW Expansion Option would allow for the construction of the proposed transmission line on structures that generally match existing structures, thereby minimizing incremental visual impact. (CL&P 1, Vol. 1, p, 10-38)

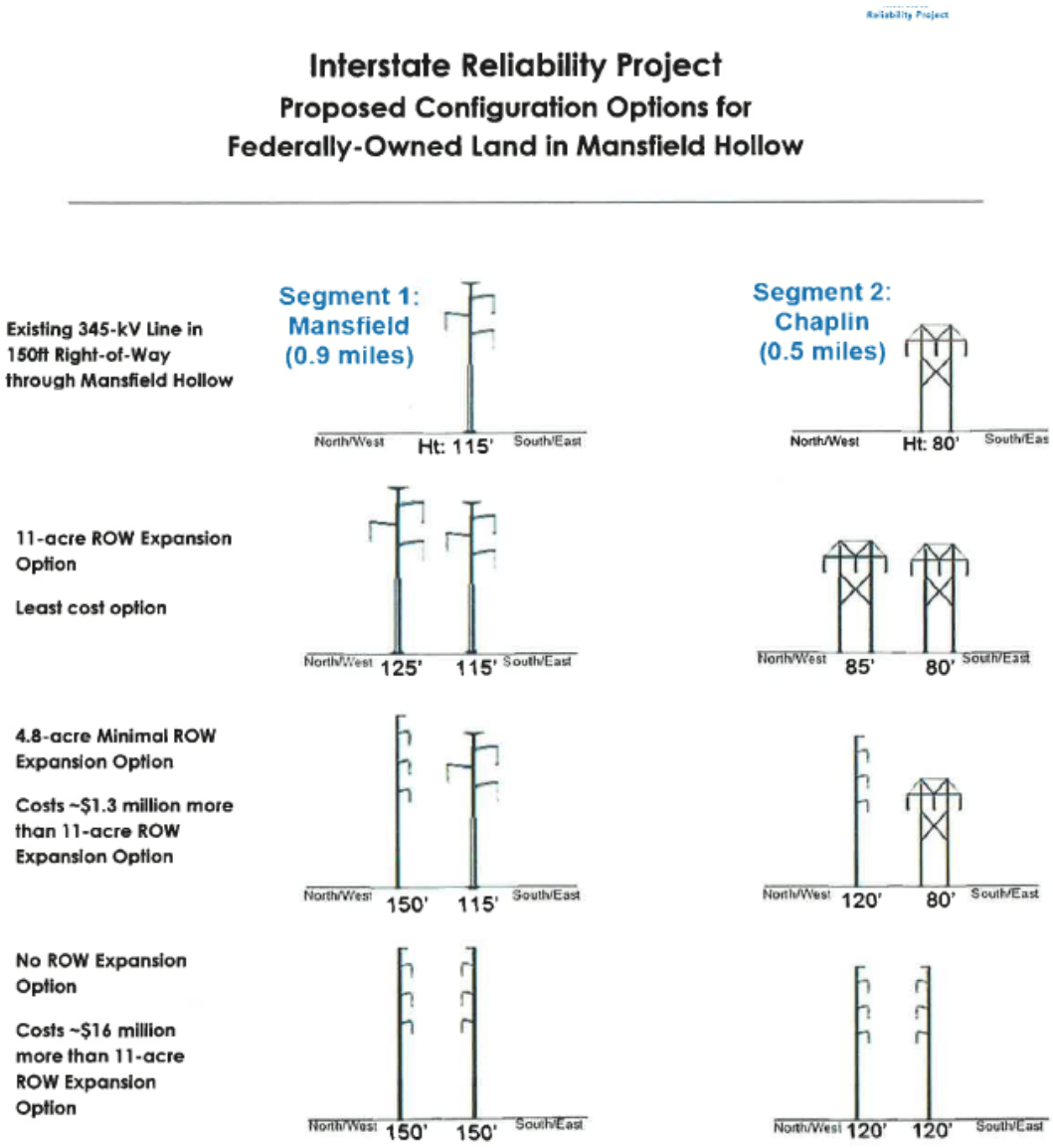
477. The 11-acre ROW Expansion Option would require the most forested upland and wetland vegetation removal of the three options described. (CL&P 1, Vol. 1, p. 10-38; CL&P 18, LFM-3 revised)

478. Structure heights for the 11-acre expansion option would range from 115 to 145 feet in Segment 1 and 70 to 85 feet in Segment 2. (CL&P 1, Vol. 1, p. 10-39)

479. The 11-Acre ROW Expansion Option compared to the Minimal ROW Expansion would result in 6.2 more acres of easement to be acquired from USACE, 4.3 more acres of upland forest clearing, 1.2 more acres of forested wetland vegetation clearing. (CL&P 15, R. 39; CL&P 18, LFM-3 revised)

480. The cost of the 11-acre ROW Expansion Option is approximately $13.0 million. (CL&P 1, Vol. 1, p. 10-26)

481. Mansfield Hollow configuration options:



(CL&P 17, Attachment 6)

Hawthorne Lane Option

482. See Chapter VI, "Electric and Magnetic Fields", Focus Area C)

Potential General Alternatives Considered and Rejected

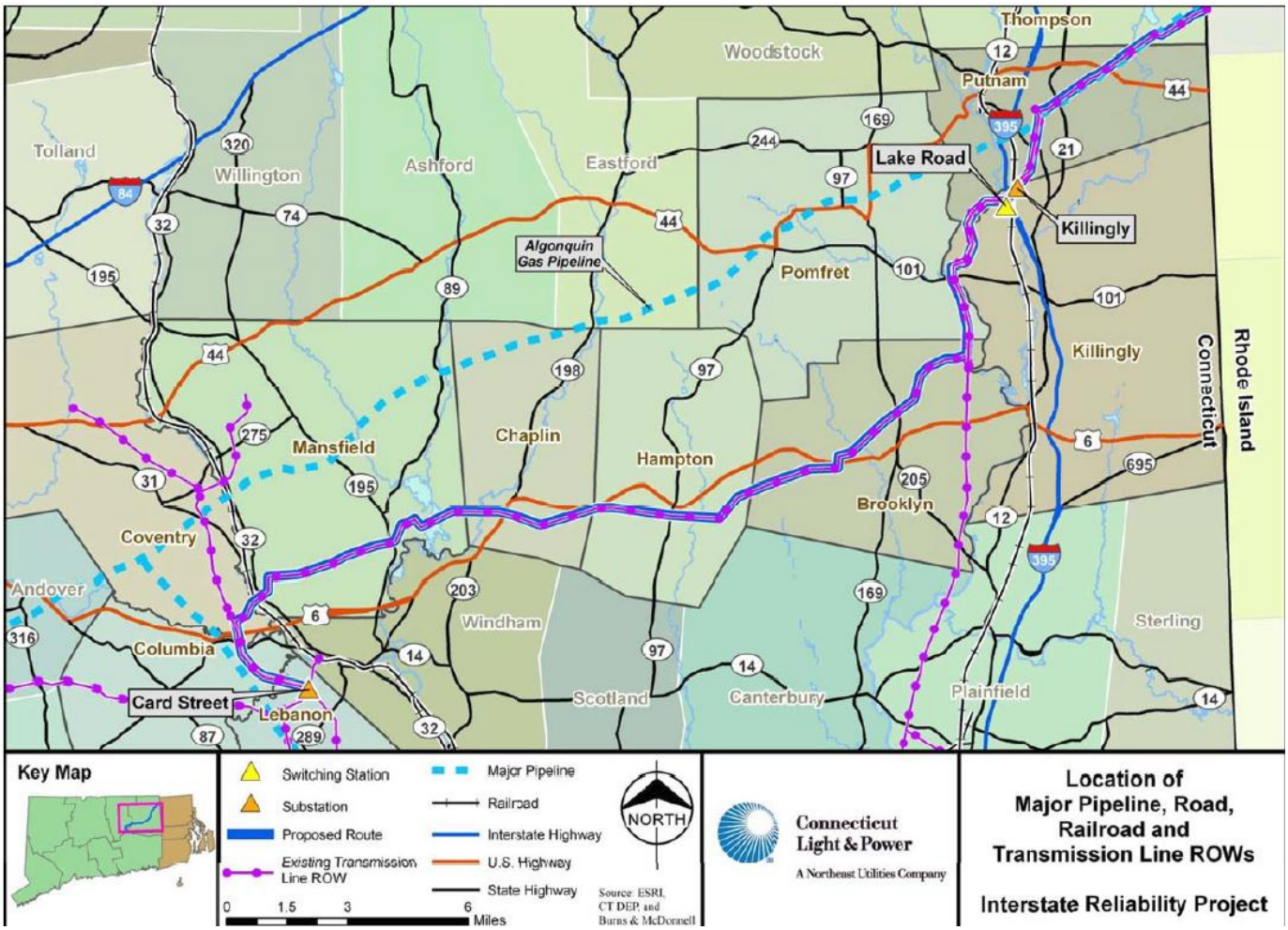
Overhead Alternatives

Along Established Linear Corridors Outside of CL&P ROW

483. The only linear pipeline in the project area is the Algonquin Gas Transmission Company natural gas pipeline. CL&P analyzed the potential of installing the 345-kV transmission lines along the pipeline but rejected the option because the pipeline is not located near Card Street Substation or Lake Road Switching Station, and even if it were nearby the unoccupied portion of the pipeline ROW is not wide enough to accommodate the new 345-kV transmission lines. The result would be the transmission lines being located close to residences, possibly with a need to acquire some residences. (CL&P 1, Vol. 1A, p. 14-10 to 14-12)

484. CL&P investigated the use of limited access highway corridors for the construction of the proposed transmission lines. The lines would have to be constructed in a vertical configuration, which would require the narrowest amount of ROW, at 100 feet in width. That width could be reduced if ConnDOT agreed to share the outer portion of the highway ROW with an aerial easement. (CL&P 1, Vol. 1A, pp. 14-12 to 14-13)

Figure 13. Existing Pipeline, Highway, Railroad, and Transmission line corridors in the Project area.



(CL&P 1, Vol. 1A, p. 14-11)

485. ConnDOT does not allow the longitudinal collocation of transmission lines in its limited access highways except under certain circumstances. (CL&P 1, Vol. 1A, p. 14-13)

486. The highways extending in the general direction of the route that would interconnect the substations, switching station and National Grid facilities are U.S. Route 6 (which travels east-west from Willimantic to the CT/RI border) and Interstate 395 (which travels north-south parallel to the CT/RI border). (CL&P 1, Vol. 1A, p. 14-13)

487. Highway route alternatives were eliminated from further consideration because routes would be difficult to construct and there would be an associated need to remove homes and business for construction. (CL&P 1, Vol. 1A, p. 14-15)

488. CL&P investigated the use of railroad ROWs that are in the project area. There are several railroad lines in northeastern Connecticut that are owned and operated by the Providence & Worcester and New England Central Railroad. CL&P found that it would be impractical to align the proposed transmission lines along the existing railroad lines in the area since none are near Card Street Substation, Lake Road Switching Station, or the National Grid facilities at the Rhode Island border. (CL&P 1, Vol. 1A, p. 14-16)

489. Railroad corridors typically have 50 to 100-foot ROWs, which are too narrow to accommodate the proposed 345-kV lines. Expanding the ROW would require the acquisition of adjacent land, which would be costly, since the land is currently developed for various uses. Additionally, there are safety concerns associated with the construction and operation of a 345-kV transmission line directly adjacent to active railroad lines. (CL&P 1, Vol. 1A, p. 14-16)

Underground Alternatives

General Technological and Environmental Considerations

490. Cable technologies are identified according to the type of insultation employed. The two technologies CL&P considered are High Pressure Fluid Filled (HPFF) and Cross-linked Polyethylene (XLPE). (CL&P 1, Vol. 1A, p. 14-18)

491. HPFF is historically the most common technology used for underground 345-kV cable systems in the United States. The cables are insulated by pressurized dielectric fluid within a steel pipe. The system requires pressurization plants and reservoirs that hold thousands of gallons of dielectric fluid. HPFF systems have higher electrical losses than XLPE, lower capacity for equivalent size conductors, and higher capacitive charging requirements. They require more maintenance than XLPE. (CL&P 1, Vol. 1A, pp. 14-18, 14-19)

492. XLPE uses cross-linked polyethylene insulation. Each cable is installed within a separate pipe and the pipes are bundled within a larger concrete pipe or "duct bank." XLPE does not use fluid, has lower electrical losses and higher ratings than HPFF. Therefore, XLPE was the chosen technology for the evaluation of an underground cable system alternative to the proposed project. (CL&P 1, Vol. 1A, p. 14-19)

493. Since underground cables have a lower current-carrying capacity than overhead transmission lines of the same voltage, multiple underground cables must be installed to obtain equivalent power-transfer capacity of a single overhead transmission line. For each set of cables, a splice vault is needed, which results in multiple splice vaults at each splicing location. (CL&P 1, Vol. 1A, p. 14-19)

494. Most medium and long-length underground cable installations require special switching devices and large shunt reactors to compensate for capacitive charging of the underground cables to prevent unacceptable high system voltages during normal operating conditions. These devices add operating complexity, decrease system reliability, and add cost to the project. (CL&P 1, Vol. 1A, p. 14-20)

495. An underground 345-kV cable system requires a two to four-acre transition station at each interconnection point. Typically, for each transition station approximately 1.5 to 2 acres of the 2 to 4-acre required land is developed. The remaining land is left undeveloped. (CL&P 1, Vol. 1A, p. 14-20)

496. For technical reasons, underground transmission lines are limited in length, depending on where they are located within the regional electric grid. Load flow and harmonic transient voltage studies are needed to determine the maximum length of a given underground cable that can be installed at a particular location without adverse impact to the regional grid. (CL&P 1, Vol. 1A, p. 14-21)

497. Underground transmission cable systems are typically used under circumstances where overhead lines may be impractical due to site-specific environmental, social, construction, or regulatory factors. An underground cable system requires a continuous trench and underground splice vaults, both of which have to be accessible throughout the life of the system. (CL&P 1, Vol. 1A, p. 14-17)

498. Underground cable systems are typically used for distances of less than five miles in urban environments, which characteristically are in proximity to strong electrical sources such as generation facilities or multiple transmission lines. (CL&P 1, Vol. 1A, p. 14-19)

499. Underground cable systems do not allow for spanning environmentally sensitive areas. River crossings are difficult to get permitted and difficult to construct. (CL&P 1, Vol. 1A, p. 14-17; p. 14-43)

500. Installing an underground cable system within existing transmission line ROWs avoids conflicts with other underground utilities and the potential for traffic congestion. In transmission ROWs, underground construction allows duct banks and splice vaults to be installed at uniform depths, and does not require pavement removal or replacement. Additionally, transmission ROWs offer the most direct linear corridor for the construction of such facilities. (CL&P 1, Vol. 1A, p. 14-42)

501. Some obstacles to installation of an underground cable system along the existing transmission ROWs may include:
    a. the presence of rough terrain;
    b. long and/or steep grades;
    c. the presence of rock that would require removal;
    d. crossing wetlands and watercourses; and
    e. crossing various state-listed species habitat and sensitive archaeological sites.

    (CL&P 1, Vol. 1A, p. 14-44)

502. Most environmental effects associated with underground installation are temporary and related to construction; however, some effects extend throughout the life of the facility. All land within the workspace is typically cleared, graded and filled to allow for a level workspace for duct bank and splice vault installation. Installation of the duct bank can also require permanent disturbance of wetlands and watercourses. (CL&P 1, Vol. 1A, p. 14-24, Appendix 15A, pp. 15A-6 to 15A-23)

503. Installation of an underground cable system within a highway ROW would have fewer environmental impacts than installation within a transmission ROW. (CL&P 1, Vol. 1A, p. 14-45)

504. In evaluating the feasibility of installation of an underground cable system within a highway ROW, CL&P would have to resolve complexities caused by:
    a. the presence of road embankments and elevated portions of the road;
    b. the presence of rock where removal may result in temporary highway closures;
    c. the presence of wetlands and/or watercourses adjacent to the road ROWs;
    d. the potential for traffic delays during construction and maintenance; and
    e. ConnDOT's policy of not allowing the installation of transmission lines within and parallel to limited access highways.

    (CL&P 1, Vol. 1A, p. 14-46)

505. AAL MF levels associated with underground cables are typically higher directly above and near the underground cables. At the ROW edges, AAL MF levels would be slightly lower post-Interstate (2020) than pre-project (2015) levels. Underground variations may not result in magnetic field levels along the ROW that are significantly different than those resulting from an EMF BMP line design and may create new MF sources in some areas. Near splice vaults, MF levels would increase because of the increased spacing between cables. (CL&P 1, Vol. 1A, pp. 15-12; 15-32, 15-53, 15-97, 15-98)

506. Post-NEEWS AAL MF levels for the proposed overhead line configuration were compared to various underground cable alternatives. Typically, the MF levels from underground transmission cables are slightly lower than MF levels from the overhead horizontal line configuration on one transmission ROW edge and slightly higher on the other ROW edge. (CL&P 1, Vol. 1A, pp. 15-34, 15-57, 15-59, 15-101)

507. The cost of an underground cable system is typically at least five times greater than that of an overhead system on existing transmission ROW. Only part of the extra cost is due to the insulation technologies and operational characteristics of underground systems. A major part is associated with the transition stations and splice vaults. Each transition station may require the acquisition of private property and cost several million dollars to construct. Splice vaults are typically required by ConnDOT to be located outside of highway corridors and therefore require additional landowner easements, with associated cost. (CL&P 1, Vol. 1A, pp. 14-25, 14-26)

Potential Underground Alternatives to Proposed Route

New ROW

508. An underground cable system within a new ROW would have to extend between the same key points as the proposed line: Card Street Substation, Lake Road Switching Station, and the Connecticut/Rhode Island border. (CL&P 1, Vol. 1A, p. 14-40)

509. A 40-foot minimum easement width would be required for the construction and operation of the cable system, with additional width needed in the area of splice vaults. If a new ROW could be acquired in a straight line between Card Street Substation, Lake Road Switching Station, and the National Grid facilities at the Rhode Island border (a distance of about 28 miles, approximately 136 acres of new easement would be required. (CL&P 1, Vol. 1A, p. 14-41)

510. Aligning a 38.6-mile underground cable system within CL&P's existing ROWs between Card Street Substation, Lake Road Switching Station, and the Rhode Island border would present construction difficulties and cause significant environmental impacts. The underground cable would have to be installed beneath major rivers and other watercourses. (CL&P 1, Vol. 1A, p. 14-41)

Existing Transmission ROW

511. An underground cable system would require crossing varying terrain and water resources, such as the Willimantic, Natchaug, and Quinebaug Rivers and Mansfield Hollow Lake. (CL&P 1, Vol. 1A, p. 14-43)

512. Underground in-ROW installation would require approximately 122 splice vault locations, assuming a splice vault every 1,600 feet. Installation would directly affect a minimum of 175 acres for the cables only. The required splice vaults and material staging areas would affect additional land. (CL&P 1, Vol. 1A, p. 14-43)

513. Following installation, a permanent 20-foot wide access road would be required along the entire length of the cable system. This would result in the conversion of approximately 88 acres of ROW land to permanent road use, including approximately seven miles through wetlands that would require permanent fill. (CL&P 1, Vol. 1A, pp. 14-43, 14-44)

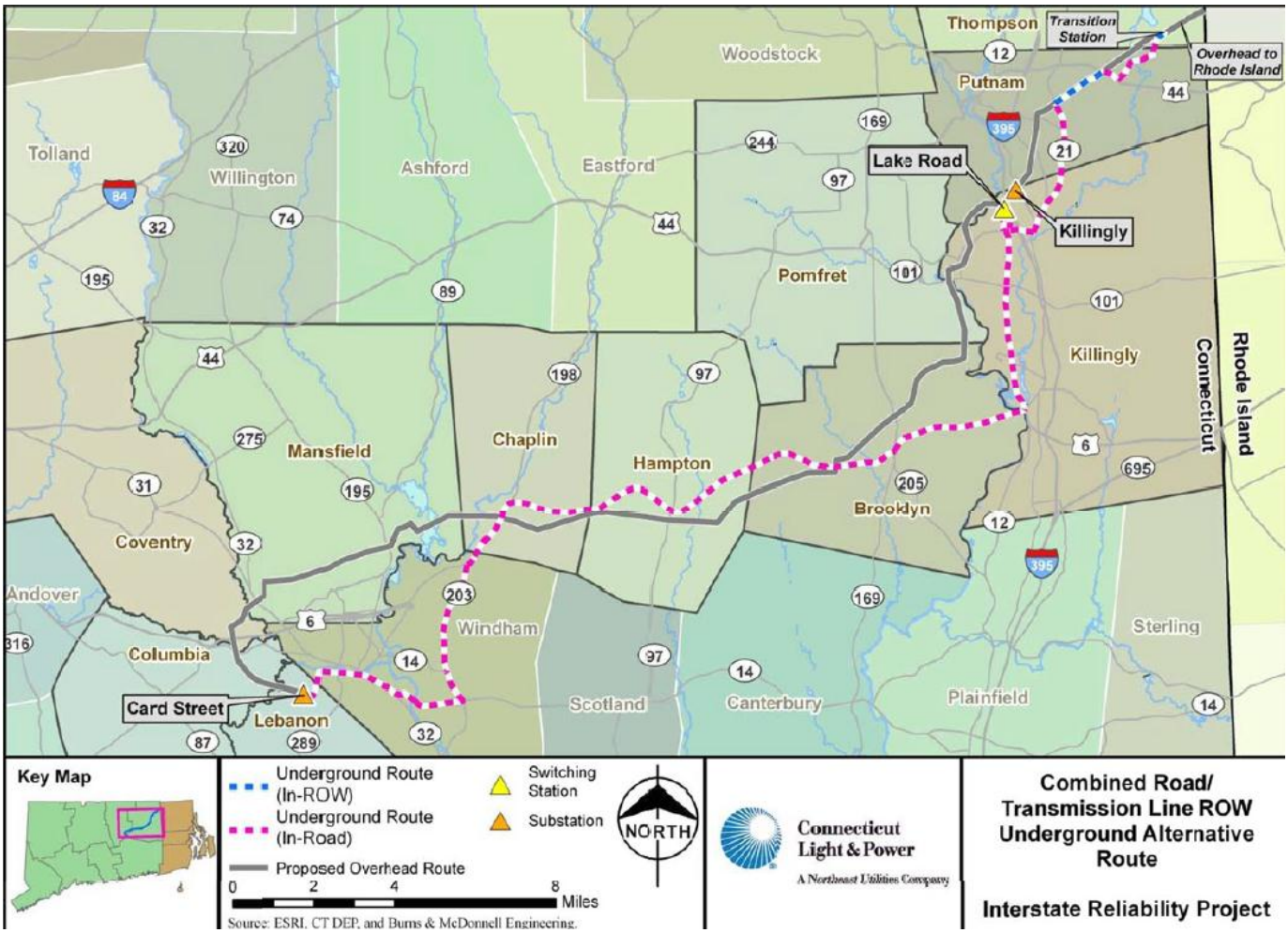
Established Linear Corridors Outside of Transmission ROW

514. The installation of a cable system along established pipeline or railroad corridors is not feasible for the same reasons that overhead transmission lines cannot be installed within these corridors: the ROWs are not sufficiently wide. (CL&P 1, Vol. 1A, p. 14-42)

Combination Highway/Transmission Line ROW Alternative

515. CL&P investigated using a combination of highway ROWs and transmission line ROWs. The shortest identified potential route includes approximately 38 miles of underground cable consisting of approximately 36.3 miles along road ROWs and 1.8 miles along two segments of existing transmission ROW. The remaining 1.1 mile segment would extend overhead between a new transition station in Thompson and the Connecticut/Rhode Island border. Potential sites for transition stations would be on property owned by CL&P east of Quaddick Town Farm Road and Elmwood Hill Road in Thompson, CT. Transition facilities would also have to be located at Card Street Substation and Lake Road Switching Station, which would require a fence line expansion at both facilities. (CL&P 1, Vol. 1A, pp. 14-46 to 14-50)

Figure 14. Combined Highway and Transmission Line ROW Underground Alternative Route.



(CL&P 1, Vol. 1A, p. 14-48)

516. The potential fence line expansion at Card Street Substation could be done on CL&P-owned property, requiring the removal of vegetation in a currently undeveloped portion of the property. CL&P does not own the Lake Road Switching Station property, therefore: expansion of the fenced area would require additional property easements. (CL&P 1, Vol. 1A, p. 14-50, 14-51)

517. The Combination route would follow Route 6 through Windham, avoiding the route through Mansfield Hollow Lake, Mansfield Hollow State Park and WMA. The route would also travel underground within the transmission line ROW through Putnam and Thompson to decrease the length of the route compared to an all in-highway installation. (CL&P 1, Vol. 1A, p. 14-50)

518. The Combination route would help to avoid areas where construction is difficult. Construction along highways would also avoid the potential visual impacts of the proposed overhead route. However, many of CL&P's easements in Putnam and Thompson do not include underground line rights and would require additional easements. (CL&P 1, Vol. 1A, pp. 15-50, 14-51)

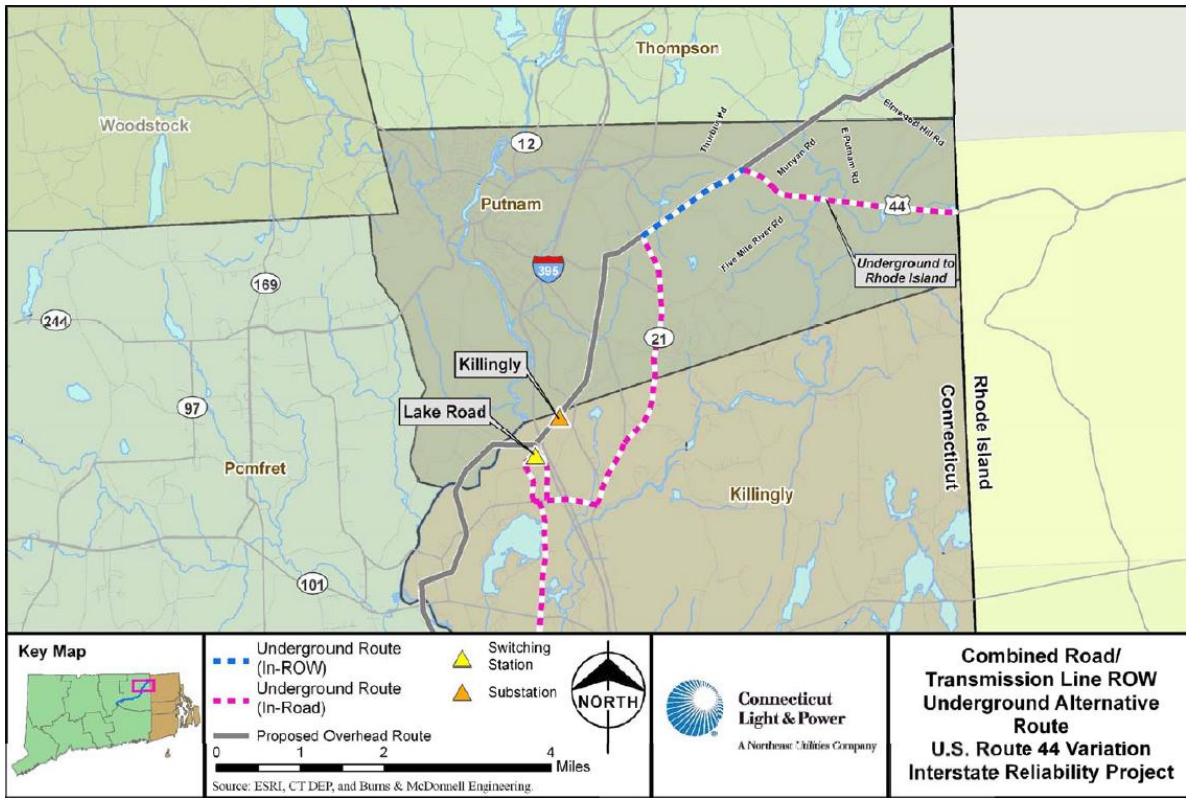
519. In Putnam and Thompson, where the Combination route would move onto the transmission line ROW and go underground, installing the cable system would directly affect wetlands, state-listed species habitat, and vernal pools and amphibian breeding habitats. (CL&P 1, Vol. 1A, pp. 14-53, 14-54)

520. The estimated cost of the Combination Alternative is $1.1 billion, compared to the $193 million estimated cost of a new 345-kV overhead transmission line. The life-cycle cost for an all-underground transmission system is approximately $1.6 billion, compared to approximately $319 million for the proposed overhead transmission lines. (CL&P 1, Vol. 1A, pp. 14-54, 14-55)

Route 44 Variation of Combined Highway/Transmission Line ROW Alternative

521. This variation was considered to accommodate the possibility that National Grid's Rhode Island transmission line would be constructed underground. The 2.3 mile variation would replace the easternmost 2.9 miles of the Combination Alternative and would eliminate the need for an overhead line segment in Thompson. (CL&P 1, Vol. 1A, p. 14-56)

Figure 15. Route 44 Variation – Combined Highway/Transmission Line ROWs Underground Alternative



(CL&P 1, Vol. 1A, p. 14-58)

522. The variation would deviate from the Combination Alternative at the intersection of Route 44 and Munyan Road in Putnam, and extend underground east along Route 44 to interconnect with a potential Nation Grid underground cable system at the Connecticut/Rhode Island border. The variation would be entirely within Putnam. (CL&P 1, Vol. 1A, p. 14-56)

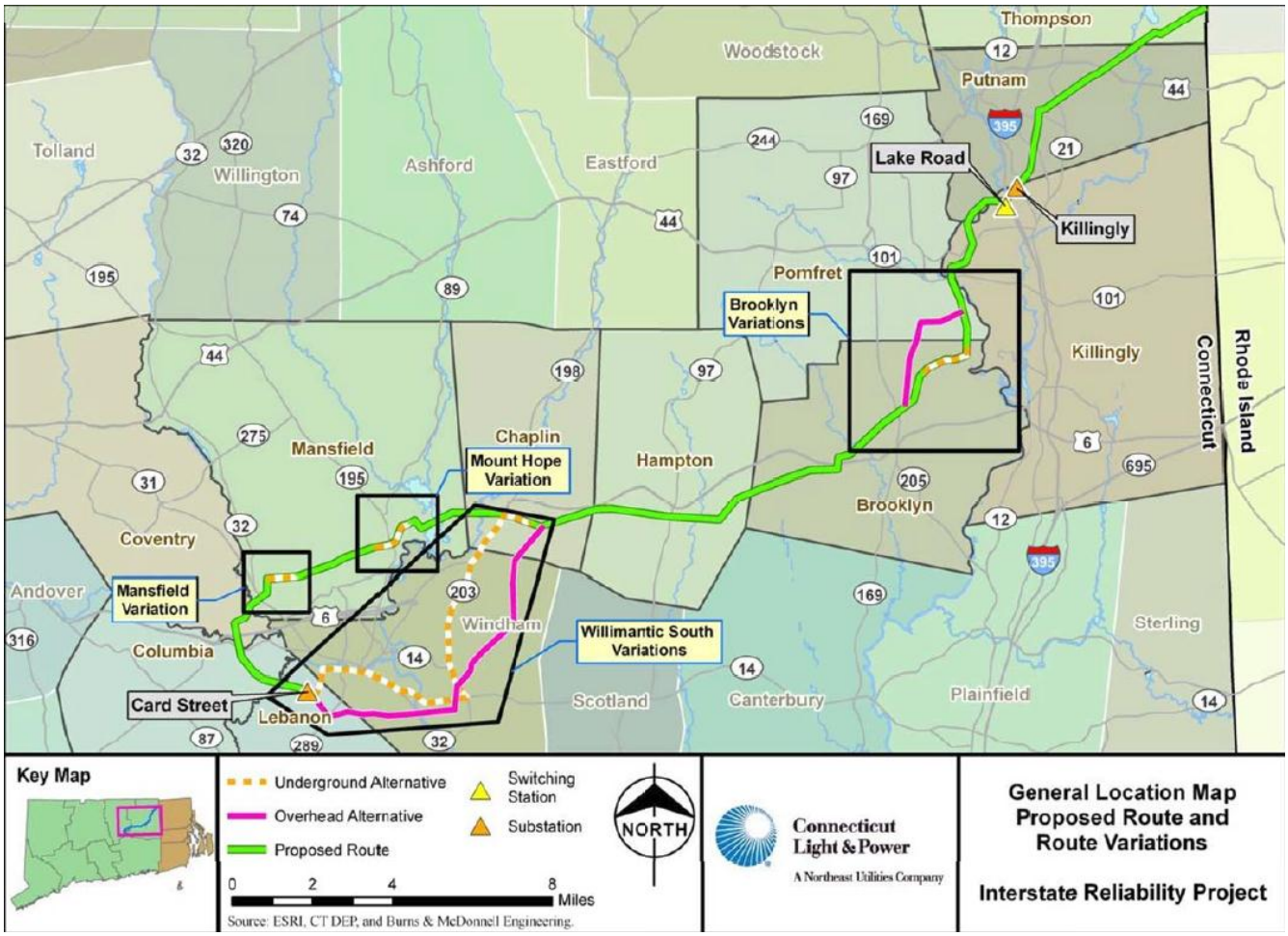
523. The variation would decrease the length of the project by 0.6 miles and eliminate environmental effects and costs associated with developing a transition station in Thompson. However, the variation would have the same generally adverse environmental impacts as the Combination Alternative and would cost more than the project with the all-overhead route as proposed. (CL&P 1, Vol. 1A, p. 14-57)

524. The variation, including the Route 44 Variation to the Combination Alternative described above, would cost approximately $1.1 billion. (CL&P 1, Vol. 1A, p. 14-57)

Alternatives Designed to Avoid Federal Property or Actual/Potential Statutory Facilities

525. CL&P identified and evaluated six line-route variations to the proposed project: either to avoid the placement of 345-kV overhead transmission line through the federally-owned Mansfield Hollow area, or to avoid the placement of the 345-kV overhead transmission line along the proposed route areas where actual and potential statutory facilities have been identified. (CL&P 1, Vol. 1A, pp. 15-1 to 15-6; CL&P 17, p. 69)

Figure 16. Proposed Route and Variations.

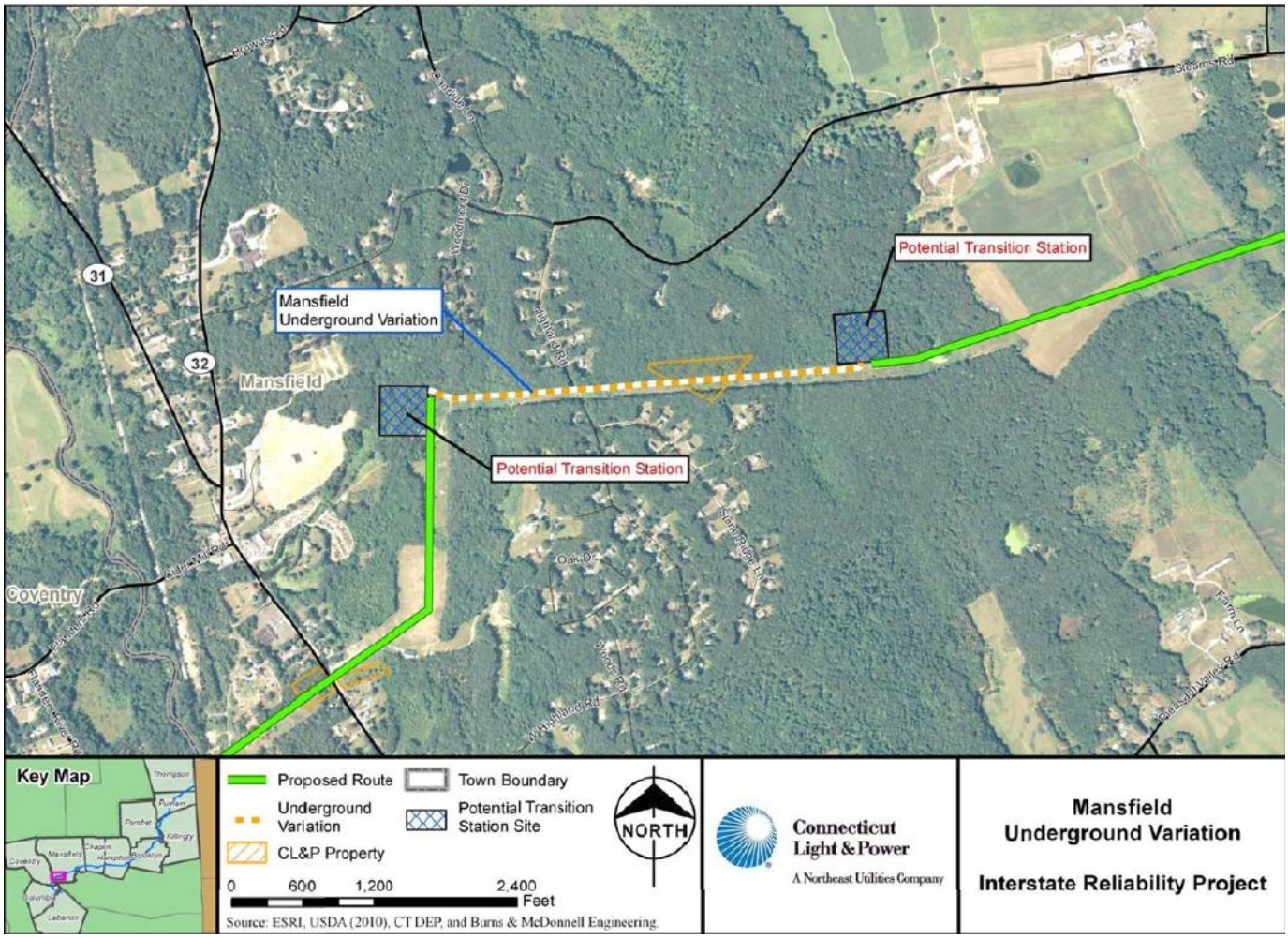


(CL&P 1, Vol. 1A, p. 15-2)

1. Mansfield Underground Variation

526. The Mansfield Underground Variation would extend underground along the transmission ROW for 0.7 miles to avoid the overhead transmission configuration near residences along Highland Road, Woodmont Drive, and Stone Ridge Road in Mansfield. See above at Chapter VI, "Electric and Magnetic Fields", "Focus Area A." (CL&P 1, Vol. 1A, p. 15-16; CL&P 17, p. 73)

Figure 17. Location of the Mansfield Underground Variation.



(CL&P 1, Vol. 1A, p 15-17)

527. The Mansfield Underground Variation would consist of nine XLPE cables in a common duct bank north of the existing 330 Line. Splice vaults would be required at approximately 1,200 foot to 1,300 foot intervals along the cable route. One splice vault is necessary for each set of three cables. The duct bank would be approximately 15 feet from the outside conductor of the existing 330 Line. (CL&P 1, Vol. 1A, p. 15-18)

528. This variation would require four to eight acres of additional land to be acquired for the construction of two transition stations, one at each end of the underground cable system. CL&P would also have to acquire easement rights to install the cables underground along the easements. (CL&P 1, Vol. 1A, p. 15-18)

529. The western transition station would be surrounded by residential areas along Woodmont Drive, the transmission ROW, forest, and agricultural land. The eastern transition station would be surrounded by upland forest, with Conantville Brook to the north and west of the site. (CL&P 1, Vol. 1A, pp. 15-26, 15-27)

530. The 0.7-mile underground cable system would be constructed in a 40-foot wide construction workspace on CL&P's ROW and would require the clearing of approximately 3.6 acres of land, including 0.2 acres for splice vaults outside of the construction workspace. (CL&P 1, Vol. 15-19)

531. An access road, for use during both construction and operation, would be 20 feet wide and extend along the existing ROW. Vehicles and equipment would have to use Highland Road to reach the on-ROW access road. (CL&P 1, Vol. 1A, p. 15-19)

532. Each transition station would consist of an above-ground 345-kV line-terminal structure, a control building, and related equipment within a fenced-in area. The station would be graded and surfaced with crushed stone. (CL&P 1, Vol. 1A, p. 15-20)

533. The Mansfield Underground Variation would extend under two perennial watercourses, a tributary to Cider Mill Brook and a tributary to Conantville Brook. Both watercourses have an A water quality classification. (CL&P 1, Vol. 1A, p. 15-22)

534. Along this variation, approximately 0.3 acres of palustrine-forested and 0.6 acres of scrub-shrub wetlands along the portion of the ROW would be affected. The same wetlands would be spanned by the proposed overhead transmission lines. (CL&P 1, Vol. 1A, p. 15-22)

535. The variation would disturb approximately 11.6 acres of vegetation, including 9.1 acres of forested (both upland and wetland) habitat and 2.5 acres are scrub-shrub habitat. The underground cable route would extend through approximately 200 linear feet of upland deciduous forest and 50 linear feet of forested wetlands. The transition stations would be on upland deciduous forested land. (CL&P 1, Vol. 1A, p. 15-24)

536. There is one state-listed Species of Special Concern butterfly, Horace's duskywing (*Erynnis horatius*), near the underground variation. However, Lepidoptera field surveys did not identify any Horace's duskywing individuals or host plants near the variation route. (CL&P 1, Vol. 1A, p. 15-25)

537. There are no significant historic resources within 500 feet of the variation, but two Native American archaeological sites are within 1 mile of the variation. (CL&P 1, Vol. 1A, p. 15-27)

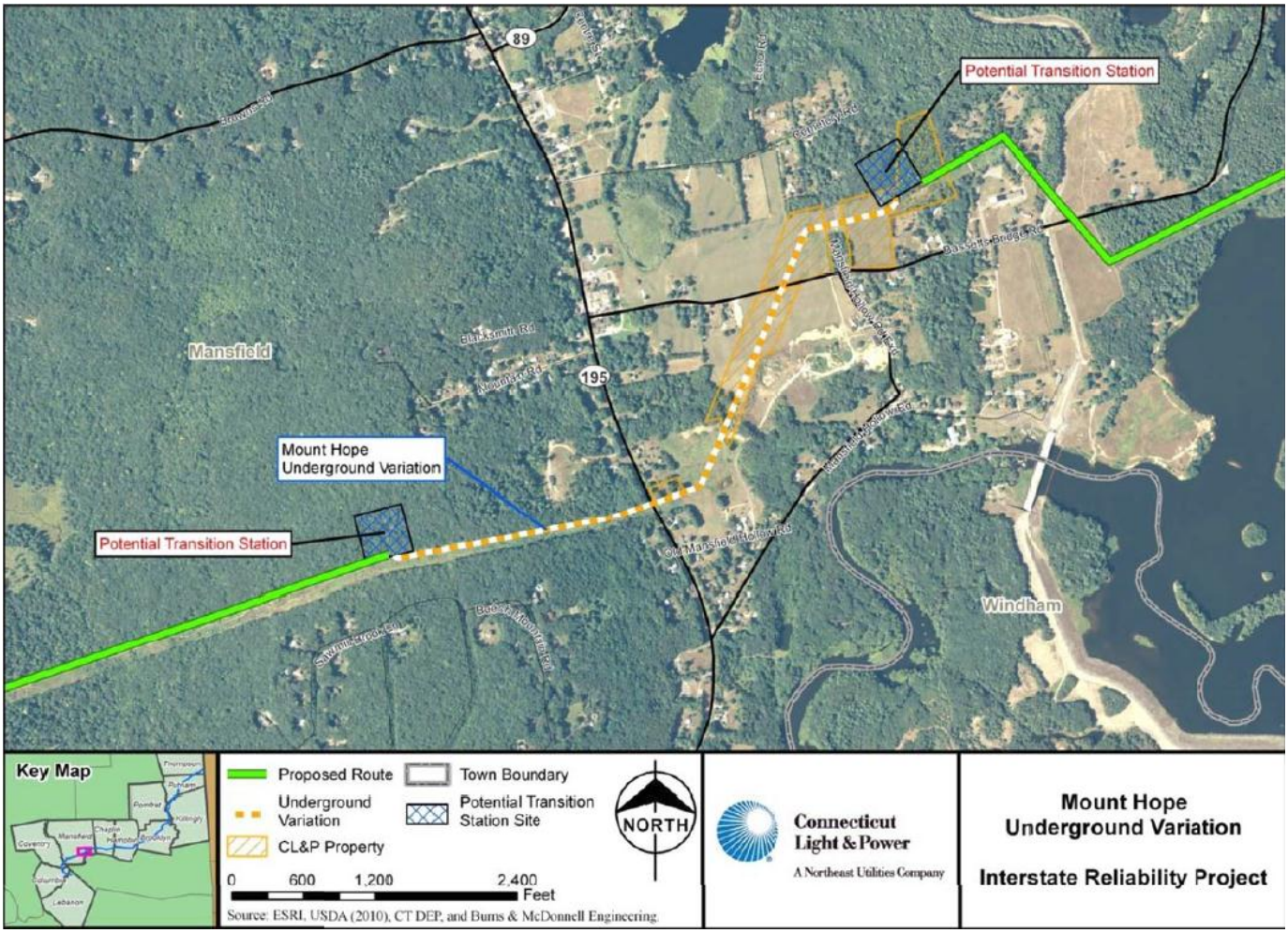
538. Approximately 74 percent of the 0.7-mile variation was considered sensitive for Native American archaeological sites. One Native American site was identified as potentially eligible for the NRHP/SRHP. Further investigations would be conducted to identify archaeological sites and appropriate mitigation measures. (CL&P 1, Vol. 1A, pp. 15-27, 15-28, 15-31)

539. The cost of the Mansfield Underground Variation would be approximately $58.2 million. The cost of the same section using the proposed overhead configuration would be approximately $4.7 million. (CL&P 1, Vol. 1A, p. 15-18)

2. Mount Hope Underground Variation

540. The 1.1-mile Mount Hope Underground Variation would be located in the southeastern portion of Mansfield along CL&P's ROW because the ROW is near the Mount Hope Montessori School. The variation was identified as a potential alternative to the alignment of the new overhead 345-kV line within the ROW because the ROW edge of the proposed lines is within 300 feet of the Mount Hope Montessori School and the Green Dragon Day Care, both of which are on Bassetts Bridge Road in Mansfield, as well as Come Play with Me Day Care, which was located adjacent to the west side of Storrs Road in Mansfield. See above at Chapter VI, "Electric and Magnetic Fields", "Focus Area B." (CL&P 1, Vol. 1A, pp. 15-39, 15-49)

Figure 18. Location of the Mount Hope Underground Variation.



(CL&P 1, Vol. 1A, p. 15-40)

541. Mount Hope Montessori School is a 501(c)(3) corporation located at 48 Bassets Bridge Road in Mansfield. The school requested the burial of the proposed transmission line in the segment near its property or the relocation of the school through a land exchange or other reasonable solution. (Mount Hope Montessori School 1)

542. A new transition station would be located approximately 1,600 feet west of Storrs Road. The underground cable system would extend 1.1 miles from that transition station east along the CL&P ROW then north across Bassetts Bridge Road and east, staying on the ROW either north or west of the existing 330 Line between structure #s 9068 and 9078. The second (easternmost) new transition station would be built 800 feet north of Bassetts Bridge Road on a site that is partially owned by CL&P and partially privately-owned: the latter part would have to be acquired. CL&P would have to purchase up to six acres of land for the transition stations. (CL&P 1, Vol. 1A, pp. 15-41, 15-42)

543. Both transition stations would be located on undeveloped and forested property. The western transition station would be on forested upland with surrounding residential areas along Sawmill Brook Lane, Beech Mountain Road, and Mountain Road. Areas surrounding the eastern transition station would include forested wetlands, residences on Hawthorne Lane and Bassetts Bridge Road, and Mansfield Hollow State Park. (CL&P 1, Vol. 1A, p. 15-50)

544. The Party Civie has a proposed residential development west of Storrs Road. The Civies' property is crossed by the existing CL&P ROW. The Civies requested that if the proposed transmission project is approved, the Mount Hope Underground Variation be approved with an approximately 0.3 mile extension of the underground cables to the west past proposed Structure No. 67 to end past the Civies' planned development. (CL&P 1, Vol. 9, Mount Hope Variation Mapsheet 1 of 2; Civie 3; Tr. 10, pp. 20, 40, 52)

545. If the Civie request were also included, the variation length would be about 1.4 miles. (CL&P 1, Vol. 1A, p. 15-42, Vol. 9, Mount Hope Variation Mapsheet 1 of 2)

546. CL&P did not conduct soil borings in the area of the potential western transition station that was proposed by the Party Civie; therefore, actual ground conditions are unknown. (CL&P 17, p. 36; Tr. 6, p. 80; Tr. 10, p. 52)

547. Since Come Play with Me Day Care is no longer licensed, CL&P could relocate the westerly transition station farther east onto CL&P-owned land. (CL&P 17, p. 74)

548. The cable system would consist of nine XLPE cables in a duct bank with three splice vaults at each splicing location. (CL&P 1, Vol. 1A, p. 15-42)

549. Construction of this variation would disturb approximately 13.7 acres of land for the duct bank, splice vaults, access road, and line transition stations. The installation of just the duct bank would disturb approximately 5.3 acres. (CL&P 1, Vol. 1A, p. 15-43)

550. Access to the on-ROW access road would be via Storrs Road and Bassetts Bridge Road. (CL&P 1, Vol. 1A, p. 15-43)

551. The underground variation would traverse areas of Prime Farmland Soils and Farmland Soils of Statewide Importance. (CL&P 1, Vol. 1A, pp. 15-44, 15-45)

552. The variation would cross two un-named intermittent watercourses. Three manmade ponds are nearby, one of which would be immediately adjacent to the workspace area. (CL&P 1, Vol. 1A, p. 15-44)

553. Seven wetlands are within or adjacent to the ROW and would be affected by the Mount Hope Underground Variation. Three of the seven would be directly along the variation, while the remaining four are within the ROW but outside of the variation route. The wetlands along the variation route include 0.1 acres of palustrine forested wetland, 0.1 acres of scrub-shrub wetland, and less than 0.1 acres of emergent marsh wetland. These wetlands would be spanned by the proposed overhead transmission line with only tall vegetation that conflicts with the proposed transmission lines removed. (CL&P 1, Vol. 1A, pp. 15-46, 15-47)

554. Two additional wetlands systems would be affected along the Civies' 0.3-mile extension of this underground variation. These wetlands systems (wetlands W20-58 and W20-59) are between Structures 67 and 66, which is near where the transition station proposed by the Civies would be located. (CL&P 1, Vol. 9, Mount Hope Underground Variation, Mapsheet 1 of 2; CL&P 23, Corrected Mount Hope Underground Variation Mapsheets, Tr. 10, pp. 146-147)

555. One state-listed species of special concern, the frosted elfin butterfly (*Callophryus irus*), may be present near the underground variation. This butterfly feeds exclusively on wild lupine (*Lupinus perennis*) and wild indigo (*Baptisia tinctoria*). Transmission line ROWs are considered important habitat for these species. (CL&P 1, Vol. 1A, p. 15-48)

556. Nine Native American archaeological sites are within one mile of the variation, two of which are within 300 feet. Approximately 69 percent of the variation was considered sensitive for potential Native American archaeological sites. During field investigations, two Native American sites were found, one is potentially eligible for the NRHP/SRHP and it is undetermined of the other is eligible. Further archaeological reconnaissance would be needed to determine the potential effects of the underground variation on these identified sites and to assess the archaeological sensitivity of the off-ROW line transition station sites. (CL&P 1, Vol. 1A, p. 15-51)

557. Four Euro-American archaeological sites that have not been determined eligible for the NRHP are within one mile of the variation. The Mansfield Historic District boundary is approximately 500 feet east of the variation, with the nearest historic structures approximately 1,000 feet from the variation. (CL&P 1, Vol. 1A, p. 15-51)

558. The cost of the Mount Hope Underground Variation, estimated by CL&P, is approximately $65 million. The cost for the same section of overhead H-frame configuration is $5.4 million. (CL&P 1, Vol. 1A, pp. 15-42, 15-61

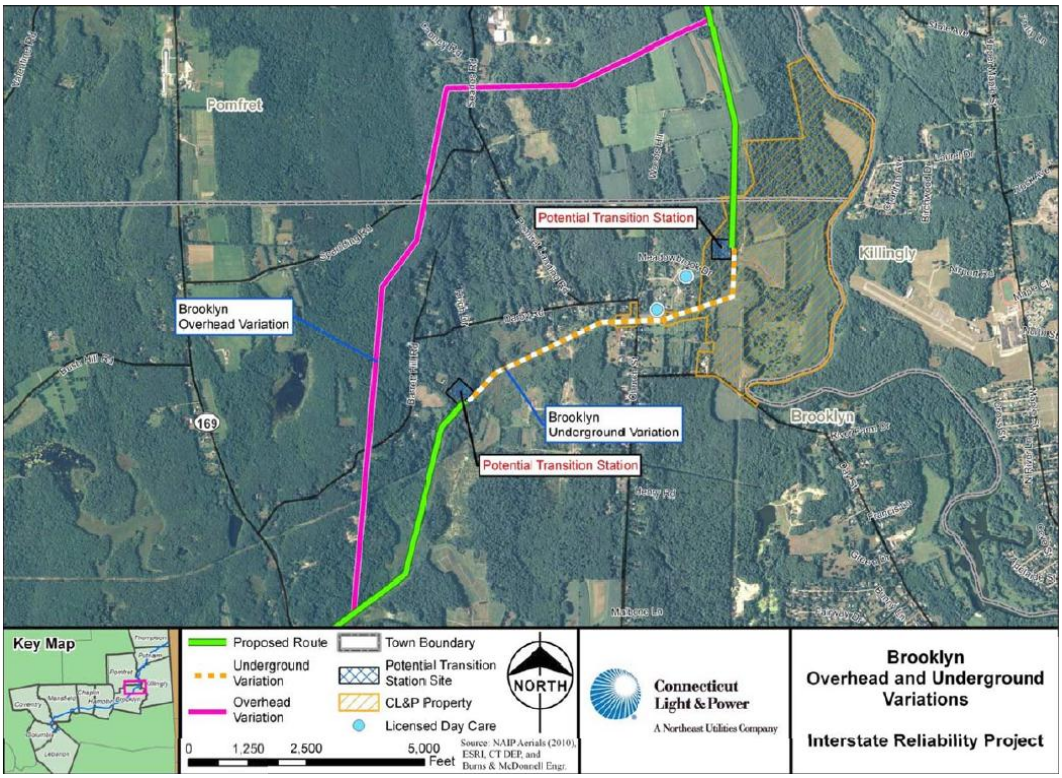
559. Using different assumptions, Messrs. Civie estimated the cost for the 1.1 mile Mount Hope Underground Variation as approximately $12.5 million. (Civie 4; Tr. 10, p. 21)

Brooklyn Variations

560. In Brooklyn, the proposed line would extend overhead along the existing transmission ROW. Near Day Street Junction, which is in northeastern Brooklyn, the existing ROW passes near residences along Church Street, Darby Road, Hickory Lane, and Meadowbrook Lane. From approximately 0.2 miles west of Church Street to approximately 0.3 miles east of Church Street, there is a project segment where nine homes, including one child day care facility, are within 100 feet of the ROW edge and 24 homes within 300 feet of the ROW edge. Within 300 feet of this ROW segment, there are 24 homes (including the nine within 100 feet). On Hickory Lane, there is a child day care facility within approximately 500 feet of the ROW. On the south side of this segment, there are five additional homes within 300 feet of the ROW edge, two of which are within 100 feet. See above at Chapter VI, "Electric and Magnetic Fields", "Focus Area D." (CL&P 1, Vol. 1A, p. 15-63)

561. CL&P's proposed base design for the new overhead transmission line in Brooklyn is the installation of horizontally-configured conductors on H-frame structures north of the existing 330 Line from Hampton to existing structure No. 9209. From Structure No. 9210 to Day Street Junction, the proposed line is a delta configuration on steel monopoles, which is CL&P's EMF BMP design for Focus Area D. North of Day Street Junction, the proposed configuration resumes to the H-frame structures with horizontally-configured conductors. (CL&P 1, Vol. 1A, pp. 15-63, 15-64)

Figure 19. Location of the Brooklyn Overhead and Underground Variations.



(CL&P 1, Vol. 1A, p. 15-65)

3. Brooklyn Overhead Variation

562. The Brooklyn Overhead Variation would extend approximately 3.3 miles through portions of Brooklyn and Pomfret and replace 3.4 miles of the proposed route. The variation would include a new "greenfield" corridor that would extend from the existing CL&P ROW approximately 0.2 miles east of Route 169 in Brooklyn (near existing structure 9201). From there, the new overhead line would extend north for approximately 2.1 miles through primarily forested areas, then cross into Pomfret. In Pomfret, the line would turn east and continue for approximately 1.2 miles, crossing Spaulding and Searles Roads and rejoining the existing CL&P ROW near Structure Nos. 9229 and 9230. (CL&P 1, Vol. 1A, pp. 15-68, 15-69)

563. The variation would be aligned through forested land, lawn areas associated with rural residential development, and agricultural fields. (CL&P 1, Vol. 1A, p. 15-73)

564. Assuming a 150-foot wide ROW over the 3.3 miles variation, new easement rights would be required on approximately 58.8 acres of land. (CL&P 1, Vol. 1A, p. 15-69)

565. The variation would be approximately one mile west of the Quinebaug River and would traverse three perennial watercourses, including White Brook in Brooklyn, Barrett Ledge Brook and White Brook in Pomfret. The route would traverse the 100-year FEMA-designated floodplains associated with Barrett Ledge Brook and White Brook. (CL&P 1, Vol. 1A, p. 15-72)

566. The overhead variation would cross five wetland areas. These wetlands consist of approximately 2.1 acres of palustrine-forested wetland, 1.2 acres of palustrine scrub-shrub wetland and 1.1 acres of emergent marsh, for a total of 4.4 acres of wetlands disturbed. (CL&P 1, Vol. 1A, pp. 15-72, 15-73)

567. Of the 58.8 acres that would be disturbed by this variation, 47.6 acres are mature mixed upland forest, 3.1 acres are agricultural land, 1.8 acres are commercial/industrial land, 1.5 acres are open field/shrub lands, and 0.4 acres are highway ROW, for a total of 54.4 acres of uplands/highway ROW disturbed. (CL&P 1, Vol. 1A, p. 15-73)

568. At the eastern end of the route variation, there is known habitat for the wood turtle, a state-listed species of special concern. (CL&P 1, Vol. 1A, p. 15-74)

569. The variation would cross an existing 23-kV electric distribution line ROW in Brooklyn, south of Barrett Hill Road. (CL&P 1, Vol. 1A, p. 15-75)

570. No reported archaeological sites are within one mile of the Brooklyn Overhead Variation. Approximately 80 percent of the variation route appears sensitive for Native American archaeological sites. No significant historic sites were found within approximately 0.25 miles of the variation. (CL&P 1, Vol. 1A, p. 15-75)

571. CL&P calculated the MF levels for the Brooklyn Overhead Variation assuming H-frame structures centered on a 150-foot wide ROW. The post-NEEWS MF calculations at both ROW edges are 30.9 mG. (CL&P 1, Vol. 1A, p. 15-79)

572. The cost of the Brooklyn Overhead Variation is approximately $27.4 million. The proposed overhead segment that this variation would replace would cost approximately $16.9 million. (CL&P 1, Vol. 1A, pp. 15-59, 15-66, 15-81 to 15-83)

4. Brooklyn Underground Variation

573. CL&P identified a Brooklyn Underground Variation that would be located entirely within Brooklyn and would replace 1.4 miles of the proposed overhead transmission line route. The Variation would begin northeast of line Structure No. 208 and extend underground along the existing ROW to end near line structure No. 222, which is north of Day Street Junction. One transition station would be located approximately 0.8 miles west of Church Street. The other transition station would be located on CL&P property approximately 0.2 miles north of Day Street Junction. Up to four acres of privately-owned land would have to be acquired for the western transition station and CL&P would have to acquire underground easement rights within the new overhead line ROW. (CL&P 1, Vol. 1A, pp. 15-84, 15-85; CL&P 17, p. 75)

574. The installation of the duct bank, four sets of splice vaults, an access road and two line transition stations would disturb approximately 15 acres of land. (CL&P 1, Vol. 1A, p. 15-86)

575. This variation would cross three perennial streams: White Brook, Creamery Brook, and an un-named watercourse, along with the FEMA-designated 100-year floodplains associated with White Brook and Creamery Brook. The un-named watercourse is adjacent to what would be the western boundary of the western transition station. (CL&P 1, Vol. 1A, p. 15-89)

576. The variation would traverse several wetland areas, crossing one 1,615 feet wide. Affected would be: approximately 0.1 acres of palustrine-forested wetland, approximately 0.7 acres of scrub-shrub wetland, and approximately 1.2 acres of palustrine-emergent wetland. The same wetlands would be spanned by the proposed overhead configuration. (CL&P 1, Vol. 1A, p. 15-89)

577. Two vernal pools are located within the CL&P ROW along this variation, and an additional area of amphibian-breeding habitat was identified. (CL&P 1, Vol. 1A, p. 15-91)

578. There is no known federal or state-listed species habitat along the underground variation. (CL&P 1, Vol. 1A, p. 15-92)

579. Residences are located near the CL&P ROW along Darby Road, Church Street, Meadowbrook Drive, and Hickory Lane. One in-home child day care facility is near the underground variation in the vicinity of Church Street. (CL&P 1, Vol. 1A, p. 15-92; Tr. 7, p. 13)

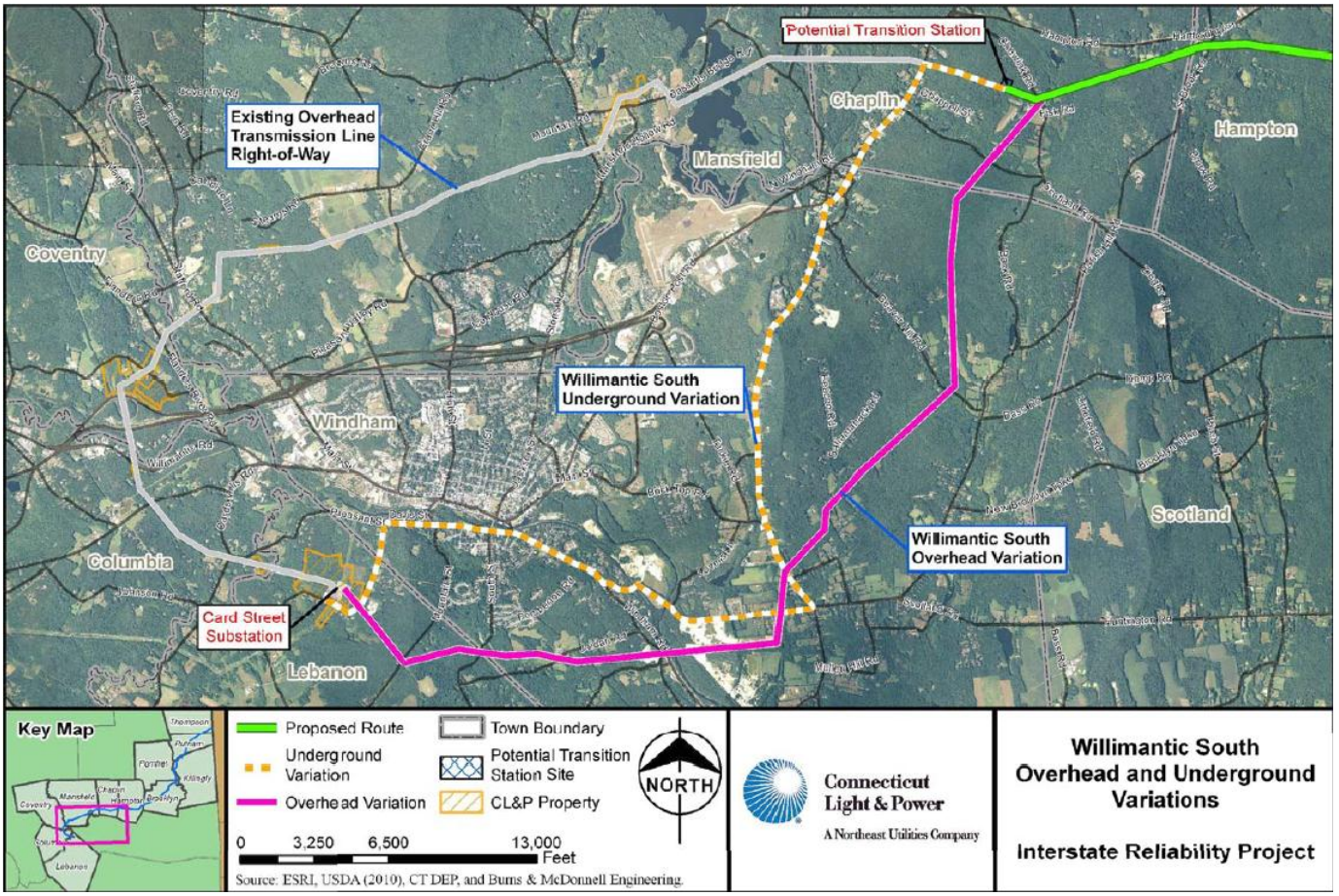
580. No reported archaeological sites are located within one mile of the variation, and no significant historic resources are within approximately 500 feet of the variation. Approximately 77 percent of the variation route was identified as sensitive for Native American archaeological sites. Field surveys identified five Native American sites within or proximate to the ROW as potentially eligible for the NRHP/SRHP. Additional surveys would be required to assess the archaeological sensitivity of the transition station sites. (CL&P 1, Vol. 1A, pp. 15-93, 15-94)

581. The cost of the Brooklyn Underground Variation would be approximately $82 million. The portion of the proposed overhead configuration that would be replaced would cost approximately $8.2 million. (CL&P 1, Vol. 1A, pp. 15-66, 15-86)

Willimantic South Variations

582. CL&P investigated two Willimantic South Variations, one overhead and one underground. Both were designed to avoid construction of a new 345-kV line across the federally-owned Mansfield Hollow State Park and Mansfield Hollow WMA in Mansfield and Chaplin. See above in this chapter, "Proposed Alternatives Under Negotiation." (CL&P 1, Vol. 1A, p. 15-107)

Figure 20. Location of Willimantic South Overhead and Underground Variations.



(CL&P 1, Vol. 1A, p. 15-108)

5. Willimantic South Overhead Variation

583. The Willimantic South Overhead Variation would consist of an approximately 9.6-mile route that would replace the westernmost 11.9 miles of the proposed route. Overall, it traverses parts of Lebanon, Windham, and Chaplin. It would start at Card Street Substation, including 0.3 miles on that property, then extend southeast adjacent to an existing 115-kV transmission line for 0.7 miles, then along a new corridor for approximately 8.6 miles. The variation would reconnect with the proposed line on the existing CL&P ROW near Route 6. (CL&P 1, Vol. 1A, p. 15-114)

584. The 0.7-mile portion of the variation on existing transmission ROW would follow an existing 125-foot wide ROW occupied by two 115-kV transmission lines on H-frame structures and a 23-kV distribution line. Here, the ROW would have to be expanded by 15 feet on the eastern side to accommodate the variation. (CL&P 1, Vol. 1A, p. 15-115)

585. For the 8.6 mile new ROW CL&P would have to acquire approximately 156 acres of easements from private landowners to develop a 150-foot wide ROW for a new 345-kV overhead transmission line. (CL&P 1, Vol. 1A, pp. 15-115, 15-116)

586. Existing residences along Card Street adjacent to the existing ROW limit options for widening. In this section, the existing double-circuit 115-kV line would have to be rebuilt on vertically-configured double-circuit steel monopole structures and the new 345-kV line would also be constructed in a vertical configuration on single-circuit monopole structures. (CL&P 1, Vol. 1A, pp. 15-115, 15-116)

587. The variation would include conductors supported on steel-monopole structures along the 0.7-mile segment of the existing ROW in Lebanon. The new 8.6 mile corridor would include 85 to 90-foot H-frame structures. (CL&P 1, Vol. 1A, p. 15-115)

588. The primary land uses near the overhead variation are forested land, residential and commercial development, scrub-shrub lands, and agricultural areas. (CL&P 1, Vol. 1A, p. 15-126)

589. The variation would cross 15 watercourses, the largest of which are Jordan Brook and the Shetucket River. It would traverse the FEMA-designated 100-year floodplains associated with Jordan Brook and the Shetucket River. (CL&P 1, Vol. 1A, pp. 15-118, 15-122)

590. The variation would traverse 22 wetlands, encompassing approximately 29 acres within the route variation ROW. Of these 29 acres, approximately 26.8 acres would be affected by the development of the route variation. The wetlands consist of approximately 16.1 acres of palustrine forested, 5.5 acres of palustrine scrub-shrub, 3.2 acres of palustrine emergent, and 2 acres of open water or riverine. (CL&P 1, Vol. 1A, pp. 15-122, 15-124)

591. In addition to affecting 26.8 acres of wetlands, the variation would impact approximately 19.2 acres of open field/shrubland, 2.1 acres of ROWs, 111.6 acres of mature mixed forest, 3.3 acres of agricultural lands, 2.2 acres of house/yard, and 7.5 acres of commercial/industrial uses. (CL&P 1, Vol. 1A, p. 15-126)

592. The variation would have an approximately 172.5 acre footprint, 127.7 acres of which are forested (upland and wetland). (CL&P 1, Vol. 1A, p. 15-124)

593. The New England cottontail (*Sylvilagus transitionalis*), a federally-listed candidate species for federal protection is known to occur in Lebanon. The variation would not traverse areas that are known habitat for state-listed species; however the route is directly south of Natural Diversity Database areas along the Shetucket River and near Lake Marie, both in Windham. (CL&P 1, Vol. 1A, p.; 15-125)

594. The variation would extend for approximately 0.5 miles across Pomeroy State Park in Lebanon and approximately 0.3 miles of the route would be adjacent to Beaver Brook State Park in Windham and Chaplin. The variation would also traverse approximately 0.6 miles of property owned by the Fin, Fur and Feather Club, Inc. in Chaplin. (CL&P 1, Vol. 1A, p. 15-125)

595. There are 22 residences within 300 feet of the ROW edge in the vicinity of Plains Road, North Road, and Ballamahack Road in Windham, and Chewink Road in Chaplin. (CL&P 1, Vol. 1A, p. 15-127)

596. The variation would cross 14 roads, including Routes 289, 32, and 14/203. Portions of Route 14 and Route 203 are state-designated scenic highways. Windham Airport is approximately two miles west of the variation. Additionally, the variation would cross two railroad lines. (CL&P 1, Vol. 1A, pp. 15-12, 15-128, 15-129)

597. Four reported Native American archaeological sites are within one mile of the variation, none of which are adjacent to or within the route variation. Approximately 72 percent of the route variation appears sensitive for possible Native American sites. (CL&P 1, Vol. 1A, p. 15-129)

598. Four significant historic resources are within 0.25 miles of the variation, including the Dr. Chester Hunt Office and the Windham Center Historic District in Windham, and the Chewink and Old cemeteries in Chaplin. (CL&P 1, Vol. 1A, p. 15-129)

599. The cost of the Willimantic South Overhead Variation would be approximately $79.3 million. The cost of the section of ROW it would replace, using an H-frame configuration and a vertical configuration along the ROW in Mansfield Hollow State Park, is $60.9 million. The cost of that same section of ROW if delta structures were used for EMF BMP Focus Area A and vertical structures were used through Mansfield Hollow State Park would be $63.6 million. (CL&P 1, Vol. 1A, pp. 15-110, 15-117, 15-139, 15-140, 15-142)

6. Willimantic South Underground Variation

600. The Willimantic South Underground Variation would involve the development of an approximately 10.7-mile underground cable system through portions of Lebanon, Windham and Chaplin, replacing the westernmost 11.6 miles of the proposed overhead route. The cables would be primarily installed beneath or adjacent to paved roadways. (CL&P 1, Vol. 1A, p. 15-143)

601. The underground variation would begin at Card Street Substation, where transition facilities would be installed, and extend north along Card Street to Pleasant Street, then follow Pleasant Street east to Plains Road. From Plains Road, the variation would cross the Shetucket River and continue to the intersection of Route 14 and 203 in Windham Center, then turn north and follow Route 203 to Route 6. From Route 6 the route would extend to the intersection of the transmission ROW and follow the ROW for approximately 0.6 miles. A transition station would be developed approximately 100 feet east of Park Road in Chaplin. (CL&P 1, Vol. 1A, pp. 15-143, 15-144, 15-146)

602. An additional four acres would have to be acquired, cleared and graded for the development of the eastern transition station, which would potentially be located on private property near Natchaug State Forest and Fin, Fur, and Feather Club, Inc. land. (CL&P 1, Vol. 1A, p. 15-146)

603. The route variation would extend approximately 10.1 miles along road ROWs. Alignment of the remaining 0.6 miles of cables within the existing CL&P ROW would require acquisition of easements from private landowners. Splice vaults and portions of the cable duct bank would likely have to be located on private property adjacent to the road ROWs. (CL&P 1, Vol. 1A, p. 15-144)

604. The installation of the underground cable system would require approximately 60 acres, including approximately 4.2 acres for splice-vault installation. Within the 0.6 mile segment along the CL&P ROW, approximately 3.6 acres would be cleared of vegetation and graded. Access to this portion of the underground cables would extend from Willimantic Road (Route 6) or Park Drive. (CL&P 1, Vol. 1A, pp. 15-145, 15-146)

605. The underground variation would cross 17 watercourses, the largest of which are the Shetucket River and Potash Brook. It would traverse FEMA-designated 100-year floodplains of the Shetucket River and Potash Brook. Also, it would extend along Pleasant Street and the SCEL of the Willimantic River, and along Plains Road, and the SCEL of the Shetucket River, both within Windham. (CL&P 1, Vol. 1A, pp. 15-150, 15-151)

606. The Shetucket River would likely require crossing using subsurface techniques such as jack and bore or horizontal directional drill. These techniques would require staging areas on both sides of the river. (CL&P 1, Vol. 1A, p. 15-164)

607. The variation would cross one wetland within the Card Street Substation property and five wetlands along the variation route within the CL&P ROW. An additional 28 wetlands would be crossed by the underground route variation that are traversed by or adjacent to the associated road ROWs. (CL&P 1, Vol. 1A, p. 15-152)

608. Of the 60 acres of land that would be disturbed by the underground variation,45.8 acres are road ROWs, 6.7 acres are upland forest, 0.2 acres are forested wetland, 2.7 acres are open field/shrub land upland, 0.1 acre is agricultural land, 3.1 acres are house/yard, 0.1 acres are emergent wetland, 0.9 acres are scrub-shrub wetland, and 0.4 acres have commercial/industrial uses. (CL&P 1, Vol. 1A, p. 15-157)

609. Seven vernal pools and one amphibian breeding habitat were identified along the portion of the underground variation that would be located within CL&P ROW in Chaplin. (CL&P 1, Vol. 1A, p. 15-155)

610. The New England cottontail (*Sylvilagus transitionalis*), a candidate species for federal protection, is known to occur in Lebanon. The portion of the variation near the Shetucket River in Windham, Route 6 in Windham and Chaplin, and the CL&P ROW in Chaplin, is within known habitat of six state-listed species, including the endangered banded bog skimmer dragonfly (*Williamsonia lintneri*); three threatened species—the frosted elfin (*Callophryus irus*), Harris' checkerspot (*Chlosyne harrisii*), and the moustached clubtail (*Gomphus adelphus*); and two species of special concern—Horace's duskywing (*Erynnis horatius*) and the bog copper butterfly (*Lycaena epixanthe*). All but two of these species (the banded bog skimmer dragonfly and the bog copper butterfly) are also present along the proposed overhead route. (CL&P 1, Vol. 1A, pp. 15-155, 15-156)

611. The variation would be within 300 feet of six Statutory Facilities. In Windham, the Statutory Facilities include a residential child day care facility adjacent to Plains Road, the Windham Center School and playground, and North Windham Elementary School and playground. In Chaplin, the Statutory Facilities include Carelot Children's Center, adjacent to Route 6 and Old Willimantic Road. (CL&P 1, Vol. 1A, p. 15-157)

612. The variation would also pass next to residential developments. The most densely developed residential areas are along Pleasant Street and Plains Road in Windham and Route 6 in Windham and Chaplin. (CL&P 1, Vol. 1A, p. 15-157)

613. In Windham, recreational land uses near the variation route include the American Legion athletic fields, the Willimantic Camp Meeting Association property, town open space and ball fields, the Windham Center School playground, and the Windham Elementary School playground. Additionally, the variation would cross the Airline State Park Trail, Northern Section. It would also cross the Mansfield Hollow State Park and WMA in Windham and Chaplin, pass 300 feet south of the Natchaug State Forest, and run alongside land owned by the Fin, Fur, and Feather Club, Inc. (CL&P 1, Vol. 1A, p. 15-158)

614. The road ROWs used for the variation would all be two-lane roads. The variation would also cross one rail line (the New England Central Railroad) and would be located approximately one mile east of the Windham Airport. (CL&P 1, Vol. 1A, p. 15-159)

615. Sixteen Native American archaeological sites are located within one mile of the Willimantic South Underground Variation, none of which are within the construction workspace for the variation. Approximately 71 percent of the unpaved areas along the associated roadways appear sensitive for possible Native American sites, and undocumented disturbance may have occurred. (CL&P 1, Vol. 1A, p. 15-159)

616. Sixteen Euro-American archaeological sites have been previously reported within approximately one mile of the variation. (CL&P 1, Vol. 1A, p. 15-160)

617. Seven significant above-ground historic properties are within 500 feet of the variation. All of these properties are within Windham including: Willimantic Armory; Willimantic Elks Club; Willimantic Footbridge; Windham Road Bridge (No. 01850); Dr. Chester Hunt Office; Windham Historic District; and North Windham Cemetery. (CL&P 1, Vol. 1A, p. 15-160)

618. The cost of the Willimantic South Underground Variation would be approximately $325.9 million. The cost of the proposed section of ROW that would be replaced, using an overhead H-frame line configuration through Focus Area A, except for 1.5 miles where a vertical configuration would be used through Mansfield Hollow State Park, would cost approximately $59.4 million. The cost for the same section of ROW along the proposed project route, if it were constructed with delta structures in Focus Area A and vertical structures through Mansfield Hollow State Park, would be $62.1 million. (CL&P 1, Vol. 1A, pp. 15- 145, 15-171, 15-172)

VIII. COST

Summary of Costs

619. The estimated cost for the entire Massachusetts, Rhode Island, and Connecticut project, including both CL&P and National Grid facilities, is $511 million. Transmission line construction would cost $407 million and substation modifications would cost $104 million. Of the total $511 million, National Grid's construction costs are estimated at $293 million and CL&P's at $218 million. (CL&P 1, Vol. 1, p. 3-23)

620. CL&P's overall $218 million cost estimate has two components: an estimate for substation work and an estimate for lines and structures. The estimate for substation work is $25 million, a figure independent of route and line-design variations. The estimate for lines and structures, however, could vary widely depending on Council decisions as to such variations. The table below in FOF #623, employs a provisional estimate of $193 million, a figure representing the cost of the base design for the project, which incorporates low-cost, no- cost EMF mitigations per Council guidelines, plus the incremental cost of EMF BMP designs for Focus areas A and D. (CL&P 1, Vol. 1, p. 3-24; CL&P 1, Vol. 1, Appendix 7B, p. 7B-2)

621. Following the Council's guideline that four percent of an overall project cost is reasonable to add on for significant EMF mitigation, CL&P determined a "budget" for EMF BMPs to be $8.5 million. (CL&P 1, Vol. 1, Appendix 7B, p. 7B-2)

622. Below is a breakdown of the incremental costs for implementing EMF BMP designs (delta configurations) at Focus Areas A and D. For comparison, the table also shows the cost of implementing the EMF BMP design in Focus Area E. That cost would be higher than both A and D combined because it would necessitate not only building the proposed line in a delta configuration but rebuilding the existing lines in a delta configuration as well. (CL&P 1, Vol. 1, Appendix 7B, p. 7-2; CL&P 9, R. 7; CL&P 17, p. 60)

Focus Area	A	D	E
Cost of EMF BMP above base design	$2.7 million	$1.4 million	$4.3 million
Percent cost increase	1.3 %	0.7 %	2.0 %

(CL&P 1, Vol. 1, p. 7-46

623. Below is a table summarizing comparative costs of alternatives to the base design for the Connecticut portion of Interstate as proposed.

Route & Variations	**FOF Reference (Page & Figure numbers)**	**Section Length**	**Cost estimate for alternative**	**Cost estimate for proposed base desgin**	**Incremental cost above base-design***
Combination Alternative	Pages 73-74 Figure 14	38 miles	$1.1 billion	$193 million	$907 million
Route 44 UG Variation	Pages 74-75 Figure 15	2.3 miles (+ 29 miles of Combination Alternative)	$1.1 billion	$193 million	$907 million
Mansfield UG Variation	Pages 76-78 Figure 17	0.7 miles	$58.2 million	$4.7 million	$53.5 million
Mount Hope UG Variation	Pages 78-81 Figure 18	1.1 miles	$65 million	$5.4 million	$59.6 million
Brooklyn OH Variation	Pages 82-83 Figure 19	3.3 miles	$27.4 million	$16.9 million	$10.5 million
Brooklyn UG Variation	Pages 83-84 Figure 19	1.4 miles	$82 million	$8.2 million	$73.8 million
Willimantic South OH Variation	Pages 85-86 Figure 20	9.6 miles	$79.3 million	$62.3 million	$17 million
Willimantic South UG Variation	Pages 86-88 Figure 20	10.7 miles	$325.9 million	$59.8 million	$266.1 million
XS-2 BMP Focus Area A	Pages 49-50, 58-59 Figure 8	2.3 miles	$13 million	$10.3 million	$2.7 million
XS-6 BMP Focus Area D	Pages 54-55, 61 Figure 8	1 mile	$6.5 million	$5.1 million	$1.4 million
XS-12 BMP Focus Area E	Pages 56-58, 64 Figure 8	0.6 miles	$7.4 million	$3.1 million	$4.3 million

(CL&P 1, Vol. 1, p. 7-46, Appendix 7B, p. 7B-18, 7B-19, 7B-24; CL&P 1, Vol. 1A, pp. 14-54, 14-57, 15-18, 15-42, 15-59, 15-81, 15-85, 15-86, 15-139. 15-171)

* The two Willimantic South variations' "base design" cost includes an 11-acre ROW expansion on federally-owned Mansfield Hollow property, the XS-2 BMP design in Focus Area B, and no Hawthorne Lane Alternative.

624. The life-cycle cost for the Connecticut portion of Interstate, as proposed, is calculated to be $319 million. Life-cycle costs include annual carrying charges of the capital cost; annual operation and maintenance costs; cost of energy losses; and cost of capacity. For the purposes of this calculation, the project's life is estimated to be 35 years. (CL&P 1, Vol. 1, p. 3-24)

Cost Allocation

625. Pursuant to Schedule 12C of the ISO-NE Open Access Transmission Tariff and ISO-NE Planning Procedure No. 4, ISO-NE allocates the cost of virtually all New England transmission projects to load areas within the region. (Council Admin. Notice #15, Council Admin. Notice #18)

626. The ISO-NE Tariff includes two transmission services: Regional Network Service (RNS) facilities that are part of New England's pool transmission facilities, and Local Network Service (LNS) facilities that are non-pool transmission facilities. RNS facilities allow power to move freely on the New England transmission system. The pool transmission facilities enable power flows throughout the region and are deemed by the Federal Energy Regulatory Commission to benefit all region customers. Therefore, all New England customers share in the cost recovery of the transmission facilities. LNS facilities, deemed to benefit a local area, are charged to local system customers. (CL&P 16, pp. 63, 64)

627. When ISO-NE determines that a project is eligible for cost allocation, the project costs are included in New England regional transmission rates and shared by consumers throughout New England. The cost to consumers is based on the electric transmission company's share of the regional electric load. (CL&P 1, Vol. 1A, pp. 14-26 through 14-28)

628. In the transmission cost allocation process, ISO-NE determines if a transmission project uses good utility practice. ISO-NE would ascertain the lowest reasonable cost for practical construction of a project, if project construction is more expensive than the reasonable amount, the difference is localized. For example, if a transmission line is built underground that could have been practically built overhead at less cost, the additional cost spent on underground line construction would be localized. (Tr. 6, p. 111)

629. Connecticut uses about 27 percent of the New England load, so if ISO-NE were to regionalize all portions of Interstate, Connecticut consumers would simply pay about 27 percent of the project's entire costs, regardless of how much of the project is located in Connecticut. (Council Admin. Notice #33, FOF #168; CL&P 16, p. 64; Tr. 6, pp. 111-118; Tr. 8, p. 17)

630. ISO-NE could decide that one or more portions of Interstate in Connecticut are more expensive ("gold-plated") than the cost of a practical engineering design—which, in the case of Interstate, is an overhead line on H-frame structures. If ISO-NE were to make that decision, the extra costs for "gold-plating" would be localized: ISO-NE would charge the incremental costs to Connecticut alone. In the final accounting, Connecticut consumers would pay not only their 27 percent share of the cost for whatever portions of Interstate are regionalized, but also, on top of that, 100 percent of the incremental cost(s) for the portion(s) localized to Connecticut. (Council Admin. Notice #33, FOF #168; CL&P 16, p. 64; Tr. 6, pp. 111-118; Tr. 8, p. 17)

631. For CL&P's Bethel to Norwalk Project (Council Docket No. 217), ISO-NE determined that $117.4 million of the $357.2 million project cost would be localized. The localized cost is primarily associated with undergrounding segments of the project. (Council Admin. Notice 18, pp. 42-60)

632. The proposed base design Connecticut portion of Interstate would have an incremental retail rate impact of 24 cents per month for a typical 700 kilowatt-hour CL&P residential customer bill. The Rhode Island and Massachusetts portion of the project would add 30 cents to an average 700 kilowatt-hour CL&P residential customer bill. Therefore, the total initial impact of the project on Connecticut's residential electric customers is 54 cents per month. Any costs localized by ISO-NE would be on top of the 54 cents. (CL&P 10, R. 25; Tr. 8, p. 8)