DOCKET NO 105 - An application of The Connecticut Light and Power Company for a Certificate of Environmental Compatibility and Public Need for the reconstruction of the Stevenson-Newtown and Newtown-Plumtree 115-kV transmission lines through the Towns of Monroe, Newtown, and Bethel, Connecticut. : Connecticut
: Siting
: Council
: August 30, 1989

F I N D I N G S OF F A C T

1. On December 16, 1988, the Northeast Utilities Service Company (NU), acting as an agent for Connecticut Light and Power Company (CL&P), in accordance with provisions of Sections 16-50k(a) and 16-50l of the Connecticut General Statutes (CGS), applied to the Connecticut Siting Council (Council) for a Certificate of Environmental Compatibility and Public Need (Certificate) to reconstruct an overhead 115-kV electric transmission line between the Stevenson Substation in Monroe, the Newtown Substation in Newtown, and the Plumtree Substation in Bethel, Connecticut. (Record).
2. The application fee was submitted as prescribed by Section 16-50v-1 of the Regulations of Connecticut State Agencies (RSA). (Record)
3. The application was accompanied by proof of service as prescribed by CGS Section 16-50l(b). (Record)

4. The Department of Mental Retardation, the Department of Environmental Protection (DEP), and the Connecticut Historical Commission filed written comments with the Council pursuant to Section 16-50j of the CGS. (Record)

5. Notice of the application was given to the general public by publication in the Danbury News-Times, on December 14, 1988; the Hartford Courant, on December 15, 1988; and the Newtown Bee, on December 16, 1988, as prescribed in Section 16-50l(b) of the CGS. (NU 2)

6. The parties to the proceeding include the applicant and those persons and organizations whose names are listed in the Decision and Order which accompanies these Findings. (Record)

7. Members of the Council and its staff conducted a public field inspection of the proposed line route on March 28, 1989. (Record)

8. The Council after giving due notice thereof, held a public hearing on this application on March 28, 1989, beginning at 1:00 p.m. (Transcript 1) and continuing at 6:30 p.m. (Transcript 2), as prescribed by CGS Section 16-50m. The hearings were held in the auditorium of Newtown High School, Route 34, Newtown, Connecticut. (Record)

Overview

9. CL&P is proposing to construct and operate the proposed 115-kV electric transmission line to replace an existing 115-kV line comprised of two circuits: Stevenson Substation to Newtown Substation (#1876), and Newtown Substation to Plumtree Substation (#1760). (NU 1, pp. 1, 11)

10. The original line was constructed nearly 40 years ago, in accordance with Public Utility Control Rules, Regulations, Standards, and Specfications for electric companies that were in effect from 1932 to 1959. The existing rights were acquired by Danbury and Bethel Gas and Electric Company, and the Housatonic Public Service Company between 1919 and 1960. The right-of-way (ROW) was acquired by CL&P from the Housatonic Public Service Company by merger on May 1, 1961. (NU 3, Q-4, Q. 25)

11. Approximately 20 acres of the subject ROW is land owned by CL&P. The remaining ROW is maintained by CL&P through easement agreements. (NU 3, Q-3)

12. All the proposed reconstruction work would be entirely within the existing 12.5 mile ROW and would generally take place along the centerline of the existing cleared ROW. (NU 1, pp. 1, 5-6, 11, 17, Figure 1, Figure 2; NU 3, Q-3)

13. The existing ROW is occupied by the one 115-kV transmission line. Approximately 9000 feet of distribution line shares the ROW from Route 25 in Newtown to Toddy Hill Road, Newtown. The proposed project would not affect the existing distribution line. (NU 1, p. 16)

14. The ROW along the Newtown Substation to Plumtree Substation section is 5.9 miles long and varies in width from 80 feet to 114 feet. The cleared area ranges from 60 to 77 feet wide. The ROW from Stevenson Substation to the Newtown Substation is 6.6 miles long and typically 114 feet wide. Along one 1200-foot section, the ROW narrows to 80 feet wide with the existing line 20 feet from the north edge of the ROW. The cleared portion of the ROW ranges from 77 to 114 feet wide. (NU 1, pp. 5-6, 18)

15. The proposed reconstruction would replace the existing structures and conductors, and increase the current capacity, but not the voltage of the transmission lines. (NU 1, p. 7)

16. No additional ROW would need to be acquired. No existing ROW easements would be updated. No widening of the existing cleared ROW would be needed except for the removal of danger trees and other maintenance clearing. (NU 1, pp. 1-2)

17. Additional guying rights would need to be obtained for six angle structures: numbers 1730, 1677, 1670, 1641, 1637, and 1615. These structures are located in areas where wood-pole angle structures are needed with guying towards the outside edge of the ROW. (Transcript (Tr.) II, pp. 32-34; NU 3, Q-32)

18. The existing line uses double wood-pole, H-frame structures approximately 48 to 61 feet in height, with a single circuit horizontal configuration and two lightning shield wires at the top, over the entire distance of the line. (NU 1, Figure 3A)

19. New wood H-frame structures with a horizontal conductor configuration would be used in the Stevenson Substation to Newtown Substation section. The new wood H-frame structures would range from 57 to 70 feet in height, 10 to 15 feet taller than the existing structures. The taller structures would be needed to accommodate the heavier weight and sag of the larger proposed conductor. (NU 1, pp. 7, 18, 32)

20. The spacing between proposed structures would remain approximately the same as with the existing structures. Span lengths between new wooden structures would be mostly limited from 500 to 600 feet apart due to ROW edge clearances. Self-supporting steel pole structures approximately 75 to 90 feet high with a vertical conductor configuration would be used: where a span greater than 500 to 600 feet is required and where the ROW narrows to 80 feet; at places where the existing line is located 20 feet from the edge of the ROW; at some angle locations where insufficient ROW area exists for guyed wood structures; and within the Newtown Substation to Plumtree Substation section. (NU 1, pp. 18, 20; NU 3, Q-30, Q-33, Q-34)

21. Along the Newtown Substation to Plumtree Substation section, new self supporting steel pole structures with a vertical conductor configuration would be used. These structures would range from 75 to 85 feet high where the existing ROW is 114 feet wide. In the narrower sections where the ROW is 80 feet wide, structures 80 to 90 feet high would be used. In some areas, horizontally configured guyed wooden angle structures could be needed and guying rights could be required. (NU 1, pp. 1,6; NU 3, Q-30; Q-32)

22. Because of the vertical conductor configuration, the proposed self-supporting, steel pole structures would not require widening the cleared areas of the ROW. (NU 1, p. 32)

23. The maximum allowable distance between steel poles along the Newtown Substation to Plumtree Substation segment, would be 700 feet. Distances are determined by clearance requirements for a wind deflected conductor to the edge of the ROW. (NU 3, Q-34)

24. The proposed wood H-frame structures for the Stevenson Substation to Newtown Substation section would appear similar to the existing structure, but would be approximately eight feet higher, five feet wider, and 2.5 feet closer to the northern and southern edges of the ROW. The steel poles proposed for the Newtown Substation to Plumtree Substation section would be approximately 30 to 35 feet higher, have a slimmer overall appearance, occupy less ground area than the existing structures, and would be placed 6.5 feet closer to the centerline of the cleared ROW. (NU 1, pp. 2, 32; NU 3, Q-70)

25. The proposed structures would be designed for the proposed 1272 kcmil aluminum core steel reinforced (ACSR) conductor and would not be able to support a larger conductor. (NU 3, Q-24)

26. The existing electric circuits consist of three conductors and two lightning shield cables each. The line was rebuilt in the early 1959's by the Housatonic Public Service Company using 397.5 kcmil ACSR conductors. These were uprated to the present maximum capacity in 1983 by CL&P. (NU 1, p. 7)

27. The existing 397.5 kcmil ACSR conductor is the maximum standard size that can be supported on the existing structures. (NU 3, Q-23)

28. The proposed rebuild would use three conductors of 1272 kcmil ACSR, 1-1/3 inches in diameter. Shield wires would be No. 8 Alumoweld lightning wires 3/8 inch in diameter. Two shield wires would be used from Stevenson Substation to Newtown Substation and one shield wire from Newtown Substation to Plumtree Substation. The nominal life of these conductors would be 35 years. (NU 1, pp. 1, 7, 20; NU 3, Q-24, Q-25)

29. The purchase of property in Newtown by NU for a new substation along the existing ROW would not effect the engineering and design of the proposed line. (Tr. 1, pp. 55-57)

NEED

30. The purpose of the project is to prevent the energized line from exceeding emergency ratings during overlapping outages involving concurrent outages of one transmission circuit and one generator unit, or involving the concurrent outage of any two transmission circuits. (NU 8, p. 6)

31. Load flow studies forecast high load currents of 905 amps or more for the subject lines by 1990. The ratings for the Stevenson Substation to Newtown Substation section would be exceeded by the summer of 1990 during peak flow conditions and any overlapping outage of the 345-kV Long Mountain/Plumtree 321 line and a generation facility at Devon Station (Milford), Bridgeport Harbor Station (Bridgeport), or Norwalk Harbor Station (Norwalk). The Newtown Substation to Plumtree Substation would overload by 1991 during similar overlapping outage situations. (NU 1, pp. 10-11; NU 8, pp. 6-11; Tr. 1, p. 33)

32. The smallest ACSR conductor that could reliably use the proposed structures with the same vertical and horizontal clearances, and support the projected 1990 amperage loading, would be a 556 kcmil ACSR line. The proposed project using 556 ACSR would have little reserve capacity by 1993-1994. (NU 3, Q-72)

33. The maximum Long Term Emergency (LTE) (a 24 hour maximum load rating), and Short Term Emergency (STE) (a 15 minute maximum load), winter ratings for the existing line are 1035 amps. The existing lines are presently limited by the 397.5 kcmil conductor size to LTE and STE ratings of 905 amps during the summer. The proposed line's LTE, would be 1920 amps during the summer. The proposed line's STE would be 2180 amps during the

summer. The proposed line's normal summer load capacities would be 1490 amps. Terminal restrictions at Stevenson Substation, Newtown Substation, and Plumtree Substation, would initially limit STE ratings to 1600 amps. The maximum LTE and STE winter ratings for the proposed line would be respectively 2200 amps and 2515 amps. (NU 1, pp. 11-12; NU 3, Q-12)

34. The average current through the existing Newtown Substation to Plumtree Substation line section, over the last two years, has been 106 amps. The current through the line for 99 percent of the time was at or below 315 amps. The average load would increase over the years, approximately three to five percent per year. (Tr. I, p. 31, p. 93)

35. Reinforcing the tranmission system to the west and towards Norwalk would only delay the proposed rebuild by four years. (Tr. I, p. 51)

36. Under overlapping outage conditions, additional generation at Devon, Bridgeport Harbor, and Norwalk Harbor Stations would reduce flow on the subject line and increase flow on other lines into Southwestern Connecticut. This could result in line overloading of other facilities. (NU 3, Q-7)

37. An overlapping situation occured only once in the last five years, in March 1987, when the #321 line from Long Mountain Substation to Plumtree Substation line and the Norwalk Harbor Station unit were out of service. (NU 3, Q-9)

38. Based on CL&P's current statistics, an overhead line trips out by lightning, once every 100 circuit mile years of experience. For the proposed 12 mile line, lightning trips on either of the two circuits could be expected about once every eight years. (Tr. 1, p. 109)

39. A 14.4 mile buried High Pressure Oil Filled (HPOF) pipe-type cable along town roads could be expected to have a failure about once every 6.2 years. A solid dielectric cable buried along the same route could be expected to have an outage about once every 1 to 1.2 years. (Tr. 1, pp. 104-105)

40. The process to repair an underground circuit could take one week to a month. (Tr. I, pp. 107-108)

41. During construction, only one section of the line would be out of service at any time. No disruption of the supply of electricity to customers is expected. No customer outages are expected as a result of construction activities. (Tr. 1, p. 65; NU 3, Q-64)

42. Future importation of energy from the Seabrook Project, Pilgrim Nuclear Plant, and Hydro-Quebec Phase II, would have no direct impact on the flows over the existing lines and would not change the need for rebuilding the line. (NU 3, Q-5)

43. The 1272 kcmil ACSR is designed for lines at 230-kV or higher and could be operated at 345-kV. However, the height of the proposed structures and the width of the ROW would have to be increased if the line were energized at 345-kV. (NU 3, Q-18)

Right-of-Way (ROW) Land Use

44. Low density residential and undeveloped areas occupy most of the land crossed by the line. Open space, recreational, agricultural, industrial, commercial, and institutional uses account for the remaining area. (NU 1, pp. 1, 22)

45. The existing ROW crosses residential yards in some locations and would continue to do so after reconstruction. (NU 1, p. 24; Tr. II, p. 30)

46. Other utilities crossing the ROW include electric distribution, telephone, cable television, and an underground AT&T transcontinental cable. In addition, the ROW is crossed by several roads and a railroad. No natural gas pipelines cross the ROW at this time. (NU 3, Q-46)

47. There are no other electric transmission lines within one mile of the proposed project except at each end of the line where other lines traverse in north-south directions, and at Plumtree Substation where lines continue in a westerly direction. (NU 1, p. 16)

48. The topography along the ROW varies from level terrain to steeply sloping, rolling hillsides. The highest elevation occurs south and east of Scudder Road, Newtown, at approximately 780 feet above sea level. The lowest elevation is 40 feet above sea level near the Stevenson Substation in Monroe. (NU 1, p. 26)

49. The ROW is entirely within the Housatonic River drainage basin. The tributaries along the route include the Halfway River, Pootatuck River, Limekiln Brook, and Still River. No major rivers are crossed by the existing line. (NU 1, pp. 16-17)

50. The proposed reconstruction including vertical and horizontal clearances would conform to the standards of the National Electrical Safety Code (1987) and the Connecticut Department of Public Utility Control regulations for method and manner of construction. (NU 3, Q-26)

ROW Environment

51. Town wetland maps, Soil Conservation Service soil maps, aerial photographs, and field reconnaissance indicates 42 wetlands and water courses are crossed by the ROW. Of these, 26 would be crossed or constructed upon by the proposed project. The remaining 16 wetlands would not be affected by construction activities. Approaching difficult wetland crossings from both sides would minimize construction effects on these areas. (NU 1, pp. 2, 20, 27-30, 33)

52. An actively used aquifer, the Pootatuck Aquifer, is located within the ROW of the line. (Tr. 11, p.32)

53. Eight active private water supply wells are located within 50 feet of the ROW. Town records would be searched to locate additional wells of abutting property owners. (NU 3, Q-68)

54. Public water supply wells located within one mile of the proposed project include those located at: Meckauer Circle, Bethel; Meadowbrook Terrace Mobile Home Park, Newtown; the Town of Newtown garage, Newtown; Chestnut Tree Hill, Newtown; and Buckingham Gardens Convalescent Home, Newtown. None of these wells are located within 1,000 feet of the project. (NU 1, p. 17)

55. The line is generally screened from most vantage points located off the ROW. Hilly topography and adjacent vegetation provide visual screening. The line is visible from road crossings, most of which are perpendicular to the line, thereby presenting limited views of the ROW. CL&P would retain as much screening as possible adjacent to residences and at road crossings. (NU 1, p. 25, 32)

56. The predominant vegetation in the wooded upland areas boardering the ROW is typical of a central hardwood-hemlock forest. No vegetative habitat or species of concern were identified by the DEP Natural Diversity Data Base. (NU 1, p. 22, 23, 26)

57. The vegetation within the ROW would be maintained in accordance with NU's ROW management practices. No vegetation would be affected except for selective maintenance clearing and the removal of danger trees within the ROW, and the removal of low-growth vegetation at accessways and work sites. (NU 1, pp.1, 19, 31-33; NU 1, Table 4; NU 8, p.17; Tr. 1, p.47)

ROW - Wildlife

58. Indigenous wildlife residing in the ROW typically include: groundhog, cottontail rabbit, meadow mole, white-footed mouse, striped skunk, song sparrow, field sparrow, eastern kingbird, and mourning dove. Construction activity would have minimal effects on resident wildlife due to the small area of ROW affected by construction, the range encompassed by wildlife in this area, and the capability of wildlife to flee construction activities in the immediate vicinity. No perceptive flight of animals into residential areas is expected. (NU 3, Q-73)

59. Except for an area maintained by the Pootatuck Fish and Game Club and the East Swamp Wildlife Area (DEP owned), none of the land adjacent to the ROW is actively managed for wildlife. (NU 1, p. 26)

60. Because the project would have minor disturbances to the existing ROW habitat, no significant effect on wildlife is expected. (NU 1, p. 33)

61. Connecticut DEP's Natural Diversity Data Base indicates recent sitings of the bog turtle, a special status species, in the wetlands of Meckauer Park, Bethel, near the ROW of the Plumtree Substation. No other such habitats or species are recorded on or in the vicinity of the ROW. No federally threatened or endangered species have been identified on the ROW. (NU 1, pp. 22, 33; NU 3, Q-61)

62. The wetland associated with Limekiln Brook, located north and west of Meckauer Park is considered a prime habitat for the bog turtle. No confirmed sitings of this species has been documented along the existing route of the proposed project. (NU 3, Q-74)

63. The DEP suggests erosion and sedimentation control mechanisms be implemented to minimize impact on the habitat of the bog turtle located within one mile of a portion of the proposed rebuild. CL&P would implement erosion and sedimentation controls at stream crossings and wetland areas during construction. (NU 3, Q-61, Q-74)

Recreation

64. The proposed project crosses no public recreational areas. The nearest public recreational areas located within one mile of the line include: Meckauer Park, Bethel; Dickinson Memorial Park, Newtown; and Paugussett State Forest, Newtown. There are no designated scenic areas within one mile of the proposed project. (NU 1, p. 16)

65. A private recreational area is located off Route 34 on Lake Zoar, which contains a marina and picnic area. Structure #1604 is located in the picnic area. This recreational facility is located on CL&P fee-owned property under a yearly license agreement which can be cancelled by either party. (CL&P 3, Q-71)

Archaeology

66. The Connecticut Historical Commission stated on April 26, 1988, that the project would have no effect on historic, architectural, or archaeological resources listed on or eligible for the National Register of Historic Places. (NU 1, p. 34; NU 3, Q-61, Q-75)

Public Agencies

67. CL&P held meetings with town officials from Bethel, Newtown, and Monroe, on February 5, 1988, to inform the chief executives of each community about the proposed project, identify potential problems, and identify contact persons in each municipality. No public hearings were held. (NU 3, Q-2)

68. CL&P notified the local officials of Watertown, Woodbury, Roxbury, Washington, New Milford, Brookfield, Bethel, and Bethlehem, of the proposed overhead alternative route to the proposed project. (NU 1, p. 8; NU 5, NU 7)

69. Permits from the Department of Public Utility Control for approval of the method and manner of construction and from the United States Army Corps of Engineers for construction within inland wetlands need to be secured prior to construction. (NU 1, p. 21)

Construction Schedule

70. After certification and prior to construction, a Development and Management Plan (D&M Plan) would be submitted to the Council for review and approval. During this phase, NU would provide detailed specifications of construction activities and access roads, determine how to avoid steep slopes and environmentally sensitive areas, and seek adjacent property owners' consent for use of land off the ROW for access. (NU 1, pp.19-20)

71. A construction schedule of approximately 35 months would be needed for both segments following certification, for detailed engineering, D&M Plan work, other regulatory approvals, construction, and rehabilitation of the line. (NU 1, p. 8)

72. The scheduled in-service date for the Stevenson Substation to Newtown Substation section would be 1991. The Newtown Substation to Plumtree Substation section would be completed in 1992. (NU 1, pp. 2, 7-8, 11)

73. Seasonal scheduling of construction would be necessary when the existing line would be de-energized. This occurs usually during the spring and fall seasons when electric loads are low. No outages of the line would occur during seasonal peak load conditions. Specific activities in wetlands or other sensitive areas would take advantage of seasonal scheduling if possible. (NU 3, Q-44; NU 3, Q-53)

74. Construction would occur in several general stages, some of which would overlap. Construction activities would include the clearing of danger and maintenance trees, access road improvement, structure site preparation, foundation installation, structure erection, conductor installation, and ROW rehabilitation. (NU 1, p. 19)

75. The lines would be reconstructed so they could be put back into service in as short a period of time as possible. Due to ROW width limitations, reconstruction along the same centerline as the existing line allows the shortest return to service by transferring conductors onto the new structures. (NU 1, p. 17)

ROW Construction Activities

76. At intersections of public roads and the ROW, traffic would be controlled during daylight hours. Police protection would be provided when required for large equipment movement. (NU 1, Table 4, p. 30)

77. Temporary access roads 12 to 15 feet wide for construction equipment, ranging in size from pickup trucks to cranes, would be across certain adjoining properties. Continuous access along the ROW is usually not required since some access can be attained at road crossings. Access roads within the ROW would be planned to avoid wetlands, steep cuts, and fill areas. (NU 1, p. 20, 32-33)

78. At access roads with steep grades and side slopes, permanent and temporary erosion control measures would be used including: surfacing the access road with processed stone; seeding road edges; and installing waterbars, culverts, geotextile or fabric barriers, rip-rap, or haybale check dams. Rehabilitation and revegetation would follow construction. (NU 1, p. 20, 32-33)

79. To traverse a wetland, access roads would be constructed with crushed stone, gravel, or traprock. A corduroy road could be developed by laying stone over a base of wood slabs, brush, or tree limbs and branches. Either would serve to stabilize and protect a wet area from erosion and sedimentation, rutting, and bottom disturbance. No foreign materials would be introduced to the wetland in order to protect water quality and related wildlife habitat. (NU 3, Q-42)

80. A stone topping of access ways near public road entrances would limit mud tracking onto public roads. (NU 1, Table 4, p. 30)

81. Mitigation measures to be used by CL&P to control wind dispersion of dust would include spraying gravel roads with water during dry periods. CL&P would not use chemical dust control measures. (NU 3, Q-49)

82. Agricultural land within the ROW may be temporarily affected by access of heavy equipment during construction. If possible, construction would be performed outside of cultivated areas and scheduled during the non-growing season. (NU 1, p. 31)

83. Construction activities are not expected to have an adverse effect on private domestic wells. DEP-EPA approved herbicides would be used in water supply areas. No herbicides would be used within 50 feet of any domestic well. If blasting activities are needed near a known well, extra holes would be driven and smaller charges set. Most wells are steel encased which would be expected to protect them from blasting vibrations. (NU 3, Q-48)

84. Unintentional dispersion of herbicides would be controlled by using low volumes, restricting use to foliar applications during calm days only, and using drift control agents. (NU 3, Q-49)

85. ROW maintenance would be performed by licensed professionals. CL&P does not use pesticides in its ROW maintenance activities. (Tr. II, pp. 39-40)

86. No structures would be located on steep slopes unless absolutely necessary. Hay bales or fabric check dams would be used to keep sediment from running down a slope. The area would be graded, seeded, and mulched with hay to hold the soil in place until permanently stabilized by vegetation. (Tr. 1, pp. 63-64)

87. If practical, the proposed structures for the new line would be located away from private residences for aesthetic reasons. (NU 3, Q-66)

88. The wooden pole structures would be directly embedded in the earth; steel structures would require a reinforced concrete foundation. All excess excavated material resulting from structure placement would be removed from the site. (NU 3, Q-34)

89. Steel pole structures would have a vertical conductor configuration and would be used without any supporting guys. (Tr. 1, p. 62)

90. The steel poles used in wooded areas could be made of corrosion resistant Corten steel. These could be left bare or painted at the factory. CL&P could use painted or bare galvanized corrosion-resistant steel structures in the more developed areas. (Tr. 1, pp. 46-47)

91. Rock blasting, if required, would be done by a State-licensed contractor using controlled blasting techniques. If blasting were to be performed near buildings and other structures, a pre-blast survey would be conducted and a seismic recording of the blasting operations performed. (NU 1, Table 4, p. 30)

92. The proposed line would be designed so that a building or structure could be built at the edge of the ROW. The minimum design clearance from a wind deflected conductor towards any structure would be 11 feet. (NU 3, Q-27)

Row Restoration

93. After construction, rehabilitation would include raking, seeding accessways and structure work areas, installation of waterbars on erosion prone accessways, removing culverts, stabilization of stream crossings and water cross-flow areas, and installing or modifying gates or barriers to control unauthorized access to the ROW. (NU 3, Q-50)

94. Localized disturbances to lawn areas in developed areas would be kept to a minimum, and drainage to lawns and driveways within the ROW would be rehabilitated after construction. (NU 1, Table 4, p. 30)

95. The poles of the dismantled existing structures would be removed from the ROW. Some poles may be salvageable for future use. (Tr. 1, p. 74)

96. CL&P would not expect construction activities to have any affect on a stone wall located off Old Town Road, Newtown, that crosses the ROW. (Tr. 1, p. 72)

Costs

97. The total cost of the proposed overhead 12.5 mile reconstruction, with a 1991 or 1992 in-service date, is estimated at $8,740,800 (1991 $). (NU 1, p.2; NU 3, Q-55)

98. The copper core equivalent to 1271 kcmil Aluminum Core Steel Reinforced conductor is 800 kcmil conductor. The cost per mile for 1272 kcmil ACSR is $35,700. The cost per mile of 800 kcmil copper conductor is $159,700. (NU 3, Q-56)

Alternatives

99. The entire line could be redesigned to use steel poles with wood structures only at angle locations. (NU 3, Q-36)

100. CL&P could place a separate line of steel pole structures next to the existing line before removing the existing structures. This alternative would be more costly, would introduce the use of more angle structures, and would require the entire ROW width to be cleared. However, this option would allow the existing line to remain in service during the construction period. (NU 1, p. 18; NU 3, Q-31)

101. At angle locations within the Newtown Substation to Plumtree Substation segment, a three-pole guyed structure could be used. This alternative configuration would require a 20-foot line shift to the south through the 80-foot wide areas, and would require an additional 20 feet of clearing towards residences along the southern ROW borders. This would also require the existing line to be put out of service during construction and four additional angle-structures to be placed through the 80-foot wide areas of the ROW. (NU 1, p. 18; NU 3, Q-35)

102. As an overhead 115-kV alternative to the proposed reconstruction, CL&P proposed the addition of a second circuit from Frost Bridge Substation to Rocky River Substation (20.8 miles) on existing double circuit structures and to construct a new line from Plumtree Substation to Brookfield Junction (3.4 miles), totalling 24.2 miles along existing ROWs. With a 1992 in-service date, this would cost $10,380,000 (1991 $), about $1.7 million more than the proposed project. This option would delay the proposed rebuild by four years. (NU 1, pp. 11, 35; NU 3, Q-55)

103. As an underground alternative, CL&P could route a double parallel line 14.4 miles through public roads within a closed trench four feet wide and five feet deep. Rock would be mechanically removed or blasted if necessary and excavated materials would be removed. Pipe would be placed on two feet of thermal sand in 40-foot lengths and welded. The trench would be backfilled with three feet of new compacted sand and gravel. Pre-cast concrete manholes 15 feet long, 8 feet wide, and 7 feet deep would be installed at 2500-foot intervals for pulling cable. The cable would be installed, spliced, and the pipe filled with insulating fluid. The system would be pressurized and tested. The road surface would be replaced in accordance with local specifications. (NU 1, p.36, Figure 9)

104. The underground alternative route would use a HPOF pipe cable system. The underground alternate route would not be suitable for a Low Pressure Oil Filled (LPOF) cable system because elevation changes would not allow minimum pressures to be maintained. CL&P could use a self-contained oil filled (SCOF) system for this route which would be more costly than a HPOF system. (NU 3, Q-58)

105. The HPOF underground pipe type system would use a double 6-5/8 inch diameter steel pipe containing three 1500 kcmil copper-cored paper-insulated cables, spaced 24 inches apart. (NU 1, p. 36, Figure 9)

106. Following completion of underground construction, the existing overhead conductors and supporting structures along the ROW would be dismantled and removed. (NU 1, p. 36)

107. Problems encountered by installation of an underground line through town roads and streets would include: traffic disruption, adjacent property owners' access inconveniences, and obstruction blasting when needed. Additional undergrounding easements would not be required for this option. (NU 1, p. 35)

108. Problems encountered with undergrounding a line along the existing ROW would involve the preparation of a complete route of access along the entire length of the line; steep and rocky terrain, which could make construction difficult; acquisition of undergrounding rights, which CL&P does not possess; and higher costs. (NU 1, p.35; Tr. 1, pp.52-53)

109. Underground lines are used more often in urban areas where ROW acquisition for an overhead line results in disruption of existing land uses and where costs are not excessive in relation to costs of an overhead line. (NU 1, p. 36)

110. CL&P has never experienced oil leaks in any of its 115-kV underground cable systems. An alarm and automatic devices would remove the cable line from service, reduce the oil pressure to a minimum, and reduce the potential for pollution in the event of a line rupture. (Tr. 11, pp. 38,39)

111. As another underground alternative, CL&P would bury two parallel HPOF lines along the existing ROW. This placement would require isolated oil pumping systems to compensate for abrupt changes in elevation which would affect the required pressure within the pipe cable. Wetland and water crossings would involve special consideration and design. In addition, underground easement rights would have to be acquired. (NU 1, p. 35; NU 3, Q-59

112. Although more simplistic in design, the use of an underground solid dielectric cable was rejected by CL&P because of lower reliability and higher costs. (NU 1, p. 36; Tr. 1, pp. 104-105)

113. The costs to underground the 14.4 mile alternative line through existing streets and roads, using parallel HPOF, SCOF, and solid dielectric cable systems, are estimated as follows:

High Pressure Oil Filled	$41,405,000	(1991$)
Self Contained Oil Filled	$56,200,000	(1991$)
Solid Dielectric	$84,075,000	(1991$)

These costs include additional substation work, but not the purchase costs of any additional land which may be required for the substations. (NU 3, Q-58, Q.59)

114. The estimated cost to underground two parallel 115-kV HPOF pipe cables along the existing ROW for 12.5 miles, would be as follows:

Cable system	$35,455,000	(1991$)
Substation work	$ 1,670,000	(1991$)
Subtotal	$37,125,000	(1991$)

Acquisition of additional undergrounding rights are estimated to be seven to eight million dollars, bringing the total cost to $44,125,000. (1991$) (NU 3, Q-59; NU 11)

115. The estimated cost, excluding the cost for acquisition of undergrounding rights, to underground two circuits of 115-kV solid dielectric cables along the existing ROW for 12.5 miles would total $47,755,000 (1991 $). (NU 15; Tr. 1, pp. 53-55)

116. The cost to establish a separate 345-kV overhead supply into the Norwalk/Stamford area or construct a second 345-kV supply to Plumtree substation to provide load relief to the subject line could exceed $50 million. (NU 3, Q-21)

117. CL&P estimates the annual average maintenance cost per mile for CL&P's 1,695.3 miles of overhead 115-kV transmission lines was $1,179 (1987). The annual average cost per mile for CL&P's 33.9 underground 115-kV lines not including the submerged Long Island Sound cable was $318 (1987). (NU 3, Q-57)

Electrical and Magnetic Fields

118. There are no national or Connecticut 60 Hz magnetic field standards. CL&P voluntarily observes the New York State standard for measuring electric fields. This standard has a maximum rating of 1.6-kilovolts per meter (KV/m) at the edge of the ROW. The electric field from the proposed line would remain below 1.6 kV/m at the edge of the ROW. (NU 3, Q-51, Q-52; Tr. 1, p. 58)

119. At 37 feet from the centerline of the line, a typical distance between the centerline of the line and the edge of the ROW, the existing horizontally configured line produces a magnetic field of approximately six milligauss when loaded at 80 amperes. At a typical load of 167 amperes, the magnetic field is approximately 13 milligauss. At a maximum load of 905 amperes, the magnetic field is approximately 68 milligauss. (NU 12)

120. At 37 feet from the centerline of the line, the proposed vertically configured line would produce a magnetic field of approximately three milligauss when loaded at 80 amperes. At a load of 167 amperes, the magnetic field would be approximately six milligauss. At a load of 905 amperes, the magnetic field would be approximately 34 milligauss. At a maximum summer load of 2180 amperes the magnetic field would be approximately 82 milligauss. (NU 12)

121. At 37 feet from the centerline of the line, the proposed horizontally configured line would produce a magnetic field of approximately seven milligauss when loaded at 80 amperes. At a load of 167 amperes, the magnetic field would be approximately 15 milligauss. At a load of 905 amperes, the magnetic field would be approximately 81 milligauss. At a maximum summer load of 2180 amperes the magnetic field would be approximately 196 milligauss. (NU 12)

122. Measured magnetic fields from household applicants range from 0.1 to 10.0 milligauss. (Tr. 1, p. 40; NU 14)

123. The proposed rebuilt line would create no sources of radio frequency interference. Television interference which could be caused by loose connections of the conductors, would be located and corrected by NU. (Tr. 2, pp. 41-42)

124. The American Institute of Biological Scientists conducted a review of scientific literature and concluded that results of studies on cancer related to electric or magnetic fields, such as those associated with power lines, do not demonstrate that such fields are causally related to cancer. (Tr. 1, p. 26)