STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

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October 27, 2017

TO: Parties and Intervenors

FROM: Melanie Bachman, Executive Director MAB

RE: **DOCKET NO. 461A** - Eversource Energy application for a Certificate of Environmental Compatibility and Public Need for the construction, maintenance, and operation of a 115-kilovolt (kV) bulk substation located at 290 Railroad Avenue, Greenwich, Connecticut, and two 115-kV underground transmission circuits extending approximately 2.3 miles between the proposed substation and the existing Cos Cob Substation, Greenwich, Connecticut, and related substation improvements.

As stated at the hearing in New Britain on September 5, 2017, after the Connecticut Siting Council (Council) issues its draft findings of fact, parties and intervenors may identify errors or inconsistencies between the Council's draft findings of fact and the record; however, no new information, evidence, argument, or reply briefs will be considered by the Council.

Parties and Intervenors may file written comments with the Council on the Draft Findings of Fact issued on this docket by November 2, 2017.

MB/RDM/laf

Enclosure

DOCKET NO. 461A - Eversource Energy application for a Certificate of Environmental Compatibility and Public Need for the construction, maintenance, and operation of a 115-kilovolt (kV) bulk substation located at 290 Railroad Avenue, Greenwich, Connecticut, and two 115-kV underground transmission circuits extending approximately 2.3 miles between the proposed substation and the existing Cos Cob Substation, Greenwich, Connecticut, and related substation improvements.	}	Connecticut
	}	Siting
	}	Council
		October 20, 2017

DRAFT Findings of Fact

Introduction

1. On June 26, 2015, The Connecticut Light and Power Company doing business as Eversource Energy (Eversource), applied to the Connecticut Siting Council (Council) for a Certificate of Environmental Compatibility and Public Need (Certificate) for the construction, maintenance, and operation of a new 115-kilovolt (kV) bulk substation located at 290 Railroad Avenue, Greenwich, Connecticut, and two 115-kV underground transmission circuits extending approximately 2.3 miles between the proposed substation and the existing Cos Cob Substation including related substation improvements in Greenwich, Connecticut (Greenwich Substation and Line Project or GSLP). (Council Administrative Notice Item No. 43)

2. On May 12, 2016 the Council voted to deny without prejudice a Certificate to Eversource for the GSLP. (Council Administrative Notice Item No. 43)

3. The parties in the original Docket 461 proceeding were Eversource, the Office of Consumer Counsel (OCC) and the Town of Greenwich (Town). The intervenors were Parker Stacy; Pet Pantry Super Discount Stores LLC; Field Point Estate Townhouses, Inc.; Christine Edwards; Richard Granoff; Bella Nonna Restaurant and Pizzeria; Cecilia Morgan; Greenwich Chiropractic & Nutrition; Joel Paul Berger; and Meg Glass. (Record)

4. During the original Docket 461 proceeding, the Council grouped the following intervenors with the same interests pursuant to Connecticut General Statutes (C.G.S.) §16-50n(c): Bella Nonna Restaurant and Pizzeria, Greenwich Chiropractic & Nutrition, Joel Paul Berger and Meg Glass (Grouped Intervenors). (Council Administrative Notice Item No. 43)

5. On May 5, 2017 Eversource submitted a Petition for Reconsideration of the Denial of a Certificate of Environmental Compatibility and Public Need for the GSLP to the Council and the service list for the original Docket 461 proceeding based on changed conditions pursuant to C.G.S. §4-181a(b) (Motion to Reopen). The Motion to Reopen requested the Council to reconsider the denial without prejudice and provided additional direct testimony on the GSLP. (Eversource 1, Vol. 1, Motion to Reopen p. 1)

6. On May 5, 2017, the Council issued a memorandum to the service list for the original Docket 461 proceeding requesting comments or statements of position in writing with respect to whether the Motion to Reopen should be granted or denied by May 18, 2017. The Town, Meg Glass, Cecilia Morgan, Field Point Estate Townhouses, Inc., and Parker Stacy submitted comments in opposition to the Motion to Reopen. (Record)

7. At a meeting held on May 25, 2017, the Council voted to grant Eversource's Motion to Reopen. The reopening allows the Council to consider changed conditions, public need and alternate locations for the proposed electric substation and electric transmission circuits (Modified GSLP). (Council Memorandum re Docket 461A, dated May 26, 2017)

8. The Modified GSLP consists of the installation of a new 115-kV bulk power substation, referred to as the Greenwich Substation, a new 115-kV electric transmission line, and modifications to the existing Cos Cob and Prospect Substations. Two routes are proposed for the Modified GSLP: the Proposed Modified Project (PMP) and Alternate Modified Project (AMP). (Eversource 1, Motion to Reopen, pp. 6-7)

Procedural Matters

9. During a regular Council meeting on May 25, 2017, the Council voted to approve the schedule for consideration of the reopened proceeding with a public field review of the Modified GSLP and public hearing in the Town of Greenwich on July 13, 2017. On May 26, 2017, all parties and intervenors to the original Docket 461 proceeding were notified of the reopening. (Record)

10. On May 25, 2017, the Council granted intervenor status to Morningside Circle Association. (Record)

11. On May 26, 2017, pursuant to C.G.S. §16-50m, the Council sent a letter to the Town to provide notification of the scheduled public hearing and to invite the Town to participate in the proceeding. (Record)

12. Pursuant to C.G.S. §16-50m, the Council published legal notice of the date and time of the public hearing in The Greenwich Time on May 31, 2017. (Record)

13. On June 14, 2017, the Council held a pre-hearing conference on procedural matters at the office of the Council, 10 Franklin Square, New Britain, Connecticut, for parties and intervenors to discuss the requirements for pre-filed testimony, exhibit lists, administrative notice lists, expected witness lists, filing of pre-hearing interrogatories and the logistics of the public inspection of the project. (Council Pre-Hearing Conference Memoranda, dated June 2, 2017 and June 16, 2017).

14. On June 15, 2017 Greenwich Chiropractic & Nutrition withdrew their Intervenor Status. (Record)

15. On July 11, 2017, Pet Pantry Super Discount Stores LLC withdrew their Intervenor Status. (Record)

16. Pursuant to R.C.S.A. §16-50j-21, Eversource installed eleven signs, measuring four feet by six feet at various locations along the project route and at the proposed substation locations, notifying the public of the type of facility proposed, the public hearing date and contact information for the Council. (Eversource 3)

17. The Council and its staff conducted a public inspection of portions of the Modified GSLP on July 13, 2017, beginning at 2:00 p.m. Eversource provided bus transportation along the AMP transmission line route and to the existing Cos Cob substation and proposed AMP and PMP substation locations. (Council Hearing Notice dated July 24, 2015; Council Field Review Notice Memoranda, dated June 28, 2017; Transcript, July 13, 2017, 6:30 p.m. [Tr. 1], pp. 4-5)

18. Pursuant to C.G.S § 16-50m, the Council, after giving due notice thereof, held a public comment hearing session on July 13, 2017, beginning at 6:30 p.m., at the Greenwich Library, Cole Auditorium, 101 West Putnam Avenue, Greenwich, Connecticut. (Council Hearing Notice dated May 26, 2017; Tr. 1, pp. 1-5)

19. The Council continued the public hearing by holding evidentiary sessions on July 25, August 29, and September 5, 2017 at the office of the Council at 10 Franklin Square, New Britain, Connecticut. (Council Hearing Notice dated May 26, 2017; Council Continued Hearing Memoranda of July 25 and August 30, 2017; Transcript, July 25, 2017, 11:00 a.m. [Tr. 2], pp. 1-5; Transcript, August 29, 2017, 11:00 a.m. [Tr. 3] p. 1-5; Transcript, September 5, 2017, 1:00 p.m. [Tr. 4] pp. 1-4)

20. During the evidentiary hearing sessions, the Council, parties and intervenors were afforded opportunities to cross examine the applicant and other parties and intervenors. Also during the evidentiary hearing sessions, the applicant, parties and intervenors were afforded opportunities to submit pre-filed testimony and exhibits. (Tr. 2, pp. 180-190; Tr. 3, p. 120; Tr. 4 pp. 10-11, 48, 71, 81; Council Memoranda dated July 25, 2017; August 30, 2017)

21. The following parties and intervenors did not appear at any of the public hearings: Office of Consumer Counsel, Christine Edwards, Richard Granoff, Grouped Intervenors and Morningside Circle Association. (Tr. 2, pp. 180-190; Tr. 3, p. 120; Tr. 4 pp. 10-11, 48, 71, 81; Council Hearing Programs dated July 13, 2017; July 25, 2017; August 29, 2017; September 5, 2017)

22. The following intervenors did not submit any pre-filed testimony or exhibits, but availed themselves of opportunities to cross examine the applicant and other parties and intervenors during the evidentiary hearing sessions: Cecilia Morgan and Field Point Estate Townhouses, Inc. (Tr. 2, pp. 180-190; Tr. 3, p. 120; Tr. 4 pp. 10-11, 48, 71, 81; Council Hearing Programs dated July 13, 2017; July 25, 2017; August 29, 2017; September 5, 2017)

23. The following party and intervenor submitted pre-filed testimony and exhibits, and availed themselves of opportunities to cross examine the applicant and other parties and intervenors during the evidentiary hearing sessions: Town and Parker Stacy. (Tr. 2, pp. 180-190; Tr. 3, p. 120; Tr. 4 pp. 10-11, 48, 71, 81; Council Hearing Programs dated July 13, 2017; July 25, 2017; August 29, 2017; September 5, 2017)

24. The Connecticut Supreme Court acknowledges that constitutional principles permit an administrative agency to organize its hearing schedule so as to balance its interest in reasonable, orderly and non-repetitive proceedings against the risk of erroneous deprivation of a private interest. (*Concerned Citizens of Sterling v. Connecticut Siting Council*, 215 Conn. 474 (1990); *Pet v. Department of Public Health*, 228 Conn. 651 (1994); *FairwindCT, Inc. v. Connecticut Siting Council*, 313 Conn. 669 (2014))

Municipal Consultation and Community Outreach

25. Prior to submitting the Modified GSLP, Eversource, in consultation with the Town, reconsidered both distribution and transmission solutions that would meet the redefined need. Additionally, proposals for demand side measures to mitigate future load growth were discussed. (Eversource 1, Vol. 1, PFT p. 15)

26. Consultation with the Town began in late June 2016 and continued until April 21, 2017. Multiple meetings, conference calls and exchange of correspondence occurred during this time. (Eversource 1, Vol. 1, PFT p. 15)

27. During the consultation process, eight potential distribution alternatives, with variations, were discussed. Eversource, with various Town's representatives and consultant, Mr. Mitchell Mailman, reviewed all of the distribution solutions and determined they were impractical, ineffective, or unreasonably expensive. These rejected alternatives are discussed in the Project Alternatives section of this document. (Eversource 1, Vol. 1, PFT p. 17)

28. Two transmission line routes were ultimately developed and submitted as part of the Modified GSLP; the PMP, preferred by Eversource, consisting of an overhead-underground transmission line route and a new air insulated substation at 290 Railroad Avenue, and the AMP, preferred by the Town, consisting of an all underground transmission route extending from Cos Cob Substation to a new "indoor substation" at 281 Railroad Avenue. (Eversource 1, Vol. 1, PFT pp. 17-18)

29. Once details of the Modified GSLP were developed, Eversource notified property owners along the routes of both the PMP and the AMP and the abutters of the proposed and alternate locations of the new Greenwich Substation that the Petition would be filed. (Eversource 1, Vol. 1, PFT p. 22)

30. Eversource notified federal and state elected officials of the Modified GSLP during Project development. (Eversource 1, Vol. 1, PFT p. 22)

State Agency Comment

31. Pursuant to C.G.S § 16-50j(g), on May 26, 2017, the following State agencies were solicited by the Council to submit written comments regarding the proposed facility: Department of Energy and Environmental Protection (DEEP); Department of Public Health (DPH); Council on Environmental Quality (CEQ); Public Utilities Regulatory Authority (PURA); Office of Policy and Management (OPM); Department of Economic and Community Development (DECD); Department of Agriculture (DOAg); Department of Transportation (DOT); Connecticut Airport Authority (CAA); Department of Emergency Services and Public Protection (DESPP); and State Historic Preservation Office (SHPO). (Council State Agency Memorandum, dated May 26, 2017)

32. The Council received comment from the DOT Bureau of Engineering and Construction on August 31, 2017 indicating certain project design preferences and adherence to DOT approval and permit requirements. DOT's design preferences are presented in FOF # 22, 223, 227, 228. (DOT comments of August 31, 2017)

33. No other state agencies commented on the Modified GSLP. (Record)

Changed Conditions

34. Eversource's Motion to Reopen identifies the following changed conditions since the Council's May 12, 2016 denial without prejudice decision:
    a. Altered the design of the GSLP to account for current electric needs rather than to provide improvements with a 30 to 40 year planning horizon;
    b. Designed a system to meet reliability needs based on 130.5 MVA of peak load on the Greenwich 27.6-kV system;
    c. No longer use a ten year load growth forecasting that anticipated one percent load growth per year;
    d. Two potential GSLP project routes and substation sites were developed for consideration (Modified GSLP); the PMP which was developed based on inquiries from the Council during the Docket 461 proceeding, and the AMP which was developed upon Eversource's consultation with the Town after the Council's Docket 461 decision;
    e. Developed a transmission line route that avoids, to the extent possible, environmental impact to the Town-owned Bruce Park;
    f. Reduced costs of both the PMP and AMP from than the original GSLP presented in Docket 461;
    g. Redesigned the GSLP substation that does not use costly Gas-insulated switchgear;
    h. Use of Cross-linked Polyethylene (XLPE) cable instead of a High Pressure Fluid Filled cable design for all underground transmission line installations;
    i. Consultations with the Town to develop a feasible GSLP route; and
    j. Consultations with the Town to develop demand side management programs to promote energy efficiency.

    (Eversource 1, Vol. 1 Motion to Reopen pp. 1-8, PFT p. 15; Vol. 1, Ex. B, p. C-12; Tr. 2, pp. 88-89; Tr. 3, pp. 15-22)

System Planning

35. The Independent System Operator of New England (ISO-NE), a regional reliability council, is responsible for the reliable and economical operation of New England's electric power system, which includes managing the comprehensive, long-term planning of the regional power system to identify the region's electricity needs and plans for meeting those needs. (Council Administrative Notice 43, FOF # 28)

36. ISO-NE would have to review and approve the Modified GSLP to ensure it has no impact on the bulk power system. ISO-NE approved the original Docket 461 design. The Modified GSLP is a smaller design so would have less of an impact on the bulk power system than the previous project. (Tr. 2, pp. 155-156)

37. No regional planning criteria apply to the distribution voltage elements of the GSLP or to the related distribution elements of the Greenwich distribution system. ISO-NE criteria does apply to the Cos Cob Substation as it is classified as a regional network transmission facility. The Modified GSLP 115 kV lines and the new Greenwich Substation are not part of the regional transmission system. (Eversource 2, response 4)

38. The Modified GSLP is identified in the ISO-NE Regional System Plan as project no. 1533. (Eversource 2, response 5)

39. ISO-NE would also determine the appropriate cost recovery allocation for the Project. (Tr. 2, p. 156)

40. Connecticut's Comprehensive Energy Strategy proposes further investments in grid reliability and identifies three important components to grid reliability: resource adequacy, transmission security and distribution resiliency. (Council Administrative Notice 43, FOF #30)

41. Reliability can be looked at in three parts - assuring adequate supply; frequency of interruptions; and duration of outages. The existing electric system in the Town of Greenwich is unacceptable in all three aspects. (Council Administrative Notice 43, FOF #110)

42. The distribution network in Greenwich is under PURA regulatory authority. PURA periodically reviews electric system operations. If reliability concerns are not addressed, PURA could open a docket to determine if certain measures are necessary to ensure the distribution system is operated appropriately. The North American Electric Reliability Corporation has jurisdiction over the reliable operation of a transmission system. (Tr. 2, pp. 107-108)

Public Need

Greenwich Area Electric System

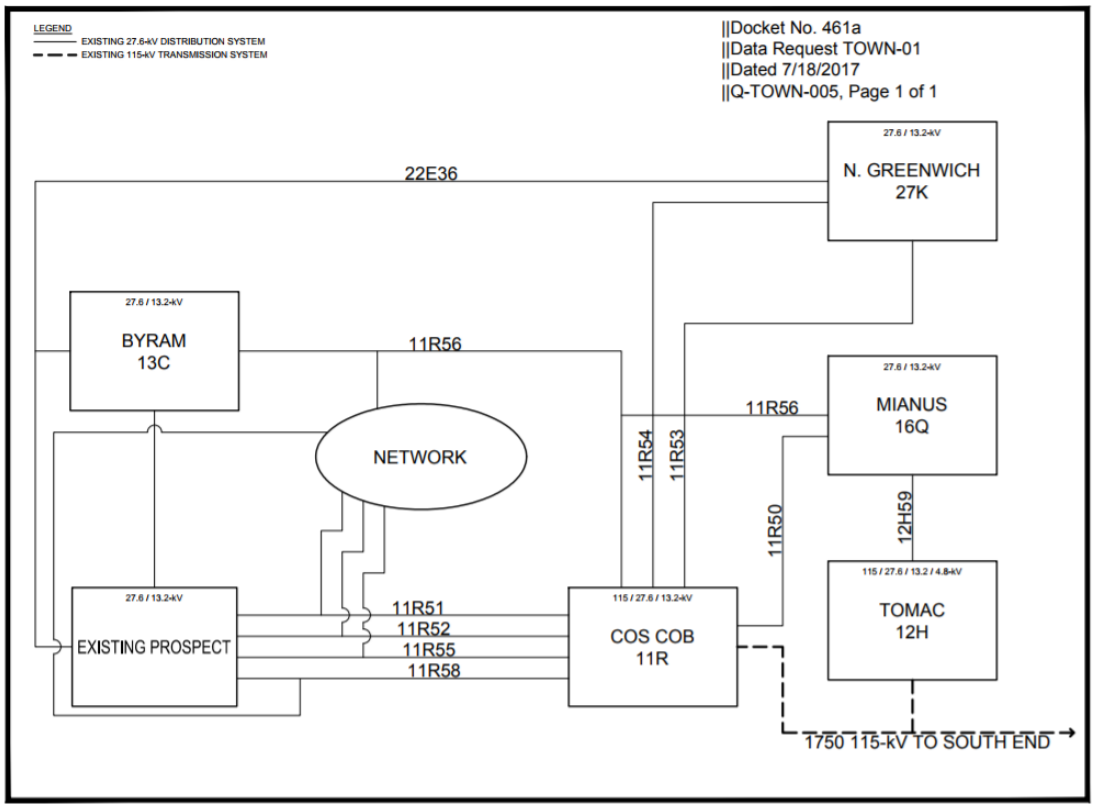
43. The electric distribution system in Greenwich was designed over 50 years ago to serve much lower load levels than those that exist today. (Council Administrative Notice 43, FOF #49)

44. Greenwich is at the farthest extent of Eversource's electric network in southwest Connecticut. Greenwich is electrically isolated and relies heavily on one bulk substation, to the Cos Cob Substation, to provide power to three distribution substations in Greenwich; the Prospect, Byram and North Greenwich Substations. (Council Administrative Notice 43, FOF # 50)

45. A small portion of Greenwich load, in the southeast area of Town, is served by the Tomac Substation from a single 115-kV to 13.2-kV transformer. The Tomac Substation was added in the early 1990's to

alleviate load at the Cos Cob Substation. It was designed as a temporary installation that did not incorporate a standard design. (Council Administrative Notice 43, FOF # 51; Tr. 3, p. 37)

46. A simplified line drawing of the existing Greenwich area electric system is presented below:



A diagram depicting the approximate service territory of each substation in Greenwich is provided in Attachment 1. (Eversource 9, Response Town 5)

47. The diagram above does not depict the 1740 115-kV transmission line that also feeds the Cos Cob Substation from Stamford. Both the 1740 and 1750 lines are located on common structures. The loss of both the 1740 and 1750 lines servicing the Cos Cob Substation would also result in the loss of electric service to the almost all of Greenwich. An outage in 2012 interrupted service for both the 1740 and 1750 lines. (Council Administrative Notice 43, FOF #123; Tr. 3, pp. 11, 65-69)

Existing Cos Cob Substation

48. The Cos Cob Substation serves approximately 176 megavolt ampere (MVA) of load, and as such, is the most heavily loaded substation in Connecticut. It provides 130.5 MVA of peak load at 27.6-kV to the Prospect, North Greenwich and Byram Substations, 29.5 MVA of peak load to 13.2-kV distribution feeders and 16.4 MVA of peak load at 115-kV to an adjacent Metro North Railroad (MNRR) substation. (Council Administrative Notice 43, FOF # 54, #55)

49. The Cos Cob Substation is one of two bulk substations in Eversource's service area that has three transformers serving 27.6-kV load. No bulk substation in Eversource's service area has four or more transformers serving 27.6-kV load. (Council Administrative Notice 43, FOF #56)

50. Typically, areas with large customer load have two or more bulk substations with multiple transmission supply lines to serve that load. Such a design allows for the transfer of load from one station to another if one of the transmission sources were interrupted. (Council Administrative Notice 43, FOF #61)

51. The Cos Cob Substation has three 115-kV to 27.6-kV transformers; 1X -50.4 MVA, 2X -46.7 MVA and 3X -46.7 MVA and two 115 to 13.2-kV transformers. (Eversource 1, Vol. 1, PFT p. 6; Eversource 2, response 19)

Existing Prospect Substation

52. The Prospect Substation is a non-bulk substation that was designed in 1954. It has 55 MVA of capacity, served by four 27.6-kV to 13.2-kV transformers: 1X -15 MVA, 2X -12.5 MVA, 3X -12.5 MVA, 4X -15 MVA. (Eversource 1, Vol. 1, PFT pp. 5-7)

53. The Prospect Substation is only served by Cos Cob Substation and only has about a one percent backup from other sources in the event of an outage of the entire substation. (Tr. 2, p. 144)

Existing 27.6-kV Distribution Feeders

54. Four 27.6-kV distribution circuits from Cos Cob Substation provide power to the Prospect Substation; the 11R51, 11R52, 11R55, and 11R58 circuits. (Eversource 1, Vol. 1, PFT pp. 4-5)

55. In addition to the Prospect Substation, these four feeders are designed to also feed the Greenwich Network, certain large customers, and the Byram Substation. (Eversource 9, Response Town 5; Tr. 3, pp. 28, 36)

56. The current design of having distribution feeders to collectively serve substation load, network load, and large individual customer load is unique and not a good design. It was deigned approximately 40 years ago to defer electric system investments. Eversource acquired the rights to the 290 Railroad Avenue location in 1971 in anticipation of a new substation in the future. (Tr. 3. pp. 36-37)

57. The Greenwich Network generally consists of the downtown area of Greenwich with the feeders sharing a common bus and multiple transformers to create a grid distribution network. An additional feeder (11R-56) also serves the Greenwich Network but does not serve the Prospect Substation. (Eversource 9, Response Town 20; Tr. 2, pp. 20-21, 176)

58. If a common distribution feeder is de-energized to accommodate work at either the Prospect Substation or within the Greenwich Network, it affects both the substation and the network. The feeders cannot be isolated so that they can serve one or the other. (Eversource 9, Response Town 2)

59. Eversource regularly schedules outages on the feeders typically once every 24 months to perform maintenance on the 22 transformers associated with the Greenwich network. (Eversource 9, Response Town 2; Tr. 2, p. 25)

60. Certain sections of the four distribution feeders were installed in the 1950's to 1960's and are at the end of their useful life. Once the Project is operational, the feeders would continue to be repaired/replaced on an as needed basis. (Tr. 2, pp. 23-25)

61. In general, outages on feeders can be caused by age, loading, operational history, especially related to temperature, and weather events such as lightning. (Tr. 3, pp. 49-51)

62. An overload on a feeder results in a loss of service life of two percent per occurrence. (Tr. 4, p. 67)

GSLP Background

63. Eversource identified a need for a new substation in Greenwich in 1989. At that time, it was projected that the Cos Cob Substation would reach capacity in 1994. Many reliability and load demand measures subsequently were undertaken by Eversource to delay the need for a substation. In 2011 Eversource determined there were no more measures that could be undertaken to further delay the need for a new substation closer to the load in central Greenwich. (Council Administrative Notice 43, FOF # 63 – 68; Tr. 2, pp. 99-100)

64. Eversource publically announced its intent to construct a new substation west of Indian Harbor in 2011 in response to reliability concerns that were exposed by storm events in June 2011, before the Cos Cob Substation peak load of 130.5 MVA on the 27.6-kV system occurred in 2013. (Council Administrative Notice 43, FOF # 70; Tr. 2, pp. 13, 15)

65. The June 2011 event interrupted service to over 5,000 customers due to multiple outages on the underground circuits emanating from Cos Cob Substation. (Council Administrative Notice 43, FOF # 71; Tr. 2, 13-15)

66. This event demonstrated to Eversource an inadequate supply of power during contingency events, an unacceptable interruption of service (over 5,000 customers lost power) and cascading effects from the interruption in service, and the inability to recover from the interruption in a timely manner (75 minutes to 18 hours). (Council Administrative Notice 43, FOF #74 – Tr. 3, pp. 40-41)

67. The GSLP was submitted to the Council on June 26, 2015 as a reliability project to provide immediate load relief and add transformer capacity to the electric distribution supply system in the Town of Greenwich by establishing a new bulk substation near the center of the customer electrical demand to avoid overloads on existing electric system equipment. The new substation at 290 Railroad Avenue would be connected to the Cos Cob Substation by installing two separate 115-kV transmission circuits that extended approximately 2.3 miles from Cos Cob Substation. (Council Administrative Notice 43, FOF #1, #2)

68. As part of Eversource's need analysis in Docket 461, Eversource used load forecasting that used one percent annual peak load growth on the Cos Cob 27.6-kV system beginning with the 2013 peak load of 130.5 MVA. Overloads were projected to occur in 2017 (134.5 MVA). The projected loading of 131.8 MVA in 2014, 133.1 in 2015, and 134.5 MVA in 2016 did not materialize. (Council Administrative Notice 43, FOF #97; Eversource 2, response 11; Tr. 3, pp. 15-18)

69. The peak load on the Cos Cob 27.6-kV system from 2008 to 2016 is presented in the table below :

Cos Cob 27.6-kV System Peak - actual values												
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
96.8	117.9	125	116.1	112.1	107.7	119.7	121.8	128.2	130.5	107.7	114.8	115.6

(Eversource 2, response 11)

70. The 2013 peak occurred over a sustained period of high temperatures combined with high humidity. Year 2012 also experienced several days of high heat and humidity resulting in a peak load of 128.2 MVA. Although 2016 was extremely hot, based on average temperature, there were no sustained days of high temperatures coupled with high humidity, to cause a similar spike in peak load. (Eversource 2, response 2; Tr. 2, pp. 15-16, 19-20)

71. There was a short duration heat wave starting around July 19, 2017 throughout the State that caused a cable fault on a 27.6-kV feeder (11R56) to Byram Substation on July 20. It occurred early in the morning with a load below the cable's normal rating. The cable fault caused an overload on the Prospect 2X

transformer causing a load to be shed that affected 477 customers for approximately 2 hours. For this weather event, Eversource experienced outages throughout the State, but Greenwich was the only location where customers could not be restored because the feeder capacity was not available. (Tr. 2, pp. 16-19; Tr. 3, pp. 46-47, 51)

72. Cable failures also occurred under other non-peak load conditions. Several recent distribution feeder failures not related to loading occurred as follows:
    a) The 11R52 feeder failed in July 5, 2015 at 25 MVA, below its normal rating of 33.5 MVA;
    b) The 11R56 feeder failed on July 27, 2015 at a load of 7.5 MVA, below its cable rating of 15.9 MVA;
    c) The 11R55 feeder failed on July 28, 2015 at a load of 14 MVA, below its normal rating of 32.5 MVA.

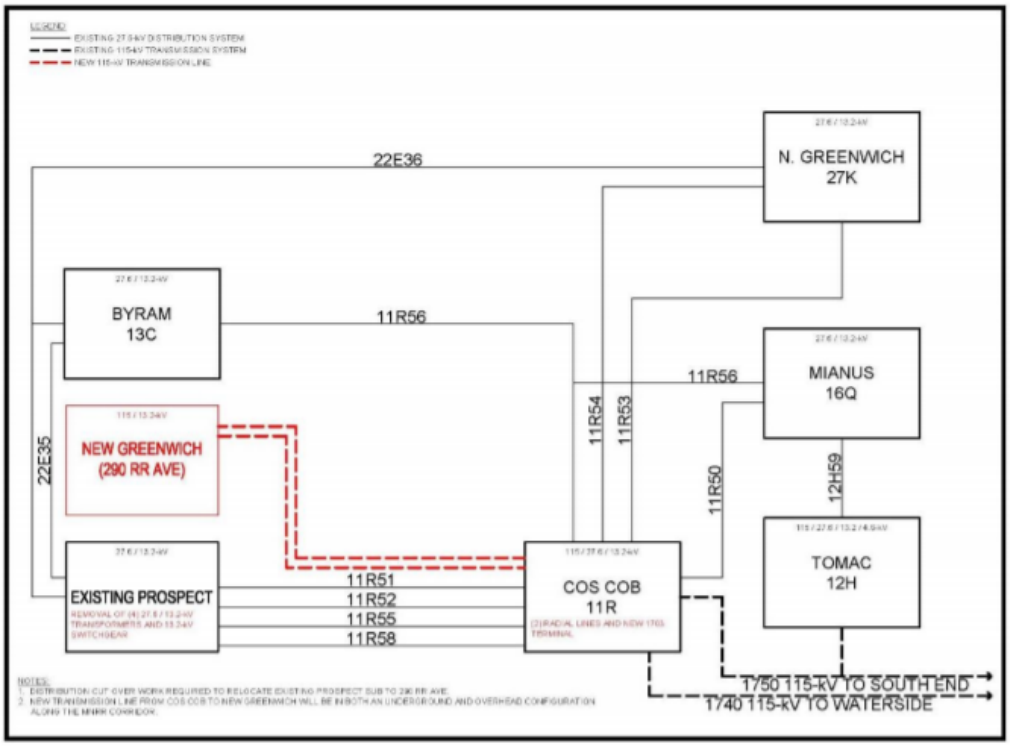
    A cable failure causes the other cables remaining in operation to carry more load. (Eversource 9, response Town 17; Tr. 3, pp. 52-57)

Modified GSLP Objectives

73. Unlike the original project, Eversource is no longer projecting load growth in this area and load growth is not part of the need for the Modified GSLP. (Eversource 1, Vol. 1, PFT, p. 15)

74. The Modified GSLP is designed to address the need for reliability improvements to the electric distribution system in Greenwich as previously identified by the Council in its Docket 461 decision. (Eversource 1, Vol. 1, PFT pp. 1-3)

75. The Modified GSLP would establish a new 115-kV to 13.2-kV substation west of Indian Harbor (Greenwich Substation), and a new 115-kV transmission line connection between the existing Cos Cob Substation and the new Greenwich Substation, as shown below:



(Eversource 10a, pp. D-4)

76. The Modified GSLP would function reliably with peak loads of approximately 195 MVA, representing a permissible load of 135 MVA at Cos Cob and a permissible load of 60 MVA at the new Greenwich Substation. (Eversource 1, Vol. 1, PFT pp. 8-9; Eversource 2, response 23)

77. It would allow Eversource the capability to transfer load between the Cos Cob Substation and proposed Greenwich Substation at the transmission level and provide automatic electric supply backup to most of the customers in Greenwich in the event of an outage. There is no capability in the current electric system for this redundancy. This capability is consistent with Eversource's current electric system design in that if one power supply source is unavailable, the remaining bulk substation would be able to supply necessary power. (Council Administrative Notice 43, FOF # 118)

78. Two 60 MVA transformers would be installed at the new Greenwich Substation and both would operate and share the load at all times. The load at the new Greenwich substation is expected to be approximately 51 MVA. (Eversource 9, response Town 13; Tr. 2, pp. 30-31)

79. The substation would be rated at 60 MVA, based on the loss of one transformer. (Tr. 2, pp. 30-31)

80. In the event of the loss of a single transformer (and N-1 condition) at Cos Cob Substation under 2013 peak conditions, load would be automatically transferred to the new Greenwich Substation, and the capacity of the remaining transformers at Cos Cob and the transformers at the new Greenwich Substation could serve 100 percent of the load. (Eversource 1, Vol. 1, PFT pp. 9-10)

81. In the event of a loss of one of the two transformers (N-1) at the new Greenwich Substation, the remaining transformer would be able to carry 100 percent of the load until the failed transformer was repaired/replaced. (Eversource 1, Vol. 1, PFT pp. 10-11)

82. In the event that two transformers were lost at either the Cos Cob or the new Greenwich Substation, approximately 80 percent of the load would automatically be transferred to other substations and the remaining 20 percent of the load could be restored quickly by operator adjustment. (Eversource 1, Vol. 1, PFT pp. 10-11)

83. The transmission level connection between the two substations is an improved design in that the new transmission line would provide a direct connection to the new Greenwich Substation, reducing the loading on the 27.6-kV feeder system. (Eversource 9, Response Town 2)

84. This project is similar to other projects in the State to improve system reliability. In the last ten years, Eversource has constructed new substations and rebuilt others throughout the State, including in areas near the State boundary line. The new substations have been built in mostly rural areas and did not have the same physical property constraints as the two proposed locations. (Tr. 2, pp. 105-107, 114-115)

85. In most cases, the new substations are adjacent to existing transmission lines. The new Greenwich Substation is different in that a new transmission line would be extended to the new substation. (Tr. 2, pp. 106-107)

86. After the Modified GSLP is constructed, Eversource would still operate and maintain the 27.6-kV distribution feeders to serve 11 large customers out of the Prospect Substation and the Greenwich Network. From 2011 to 2016, the average annual peak load from the 11 large customers is 18.4 MVA. (Eversource 9, Response Town 20, response 21)

87. The Prospect Substation would be modified to a 27.6-kV switching station by removing the transformers and associated switchgear. (Eversource 1, Vol. 1, PFT, p. 9)

88. It is anticipated that by significantly offloading demand on the distribution feeders, the feeders would be able to operate with enough capacity to operate normally even under N-1 conditions, reducing the likelihood of outages that have historically occurred with this electric supply configuration. There would be enough capacity to operate in a N-2 condition. (Eversource 1, Vol. 1, PFT pp. 9-10; Council Administrative Notice 43, FOF #41, #76; Eversource 9, Response Town 3, response 20; Tr. 2, p. 23; Tr. 3, p. 64, 97-98)

89. Eversource ultimately intends to serve load in Greenwich at the 13.2-kV level and retire other voltages. The Project serves as a foundation to accomplish this goal. For example the Byram Substation is not included within the Modified GSLP. Eversource would continue to examine load at both the new Greenwich Substation and the Byram Substation. If load is stable or declines due to energy efficiency measures, demand response and distributed generation initiatives, the Byram substation may be retired with the load served from the new Greenwich Substation. If load increases significantly, Eversource could recondition the substation to meet demand needs. (Tr. 2, pp. 26-27, 148-149)

90. The new Greenwich Substation would be connected through the Cos Cob Substation. The loss of both the 1740 and 1750 lines from Stamford would still cause the loss of service to most of Greenwich, including customers served by the new Greenwich Substation. (Tr. 3, pp. 67-69)

Eversource Reliability Planning

91. Eversource is not projecting load growth in this area. According to Eversource's recent evaluation and recent ISO-New England forecasts, current load growth is flat mainly due to energy efficiency, demand response and distributed generation. (Eversource 1, Vol. 1, PFT p. 15; Tr. 2, pp. 12, 88-90; Tr. 3, pp. 15-23)

92. Eversource used the 2013 peak load of 130.5 MVA on the 27.6-kV system served by the Cos Cob Substation as a baseline to conduct contingency planning studies to design the project since it was a recently recorded value that has the potential to reoccur. The 2013 peak load occurred over a sustained period of high temperatures combined with high humidity. (Council Administrative Notice 43, FOF #84; Eversource 1, Vol. 1, PFT p. 4)

93. Electric system elements of concern were studied first with all elements in service ("N-0" condition), and second, with each of the system elements out of service ("N-1" conditions). (Eversource 1, Vol. 1, PFT p. 4)

94. The results of those simulations confirmed the same reliability deficiencies in the existing electric system identified in the original Docket: potential transformer overloads at both the Cos Cob and Prospect Substations and potential overloads of the 27.6-kV distribution feeders supplying power to Prospect Substation. (Eversource 1, Vol. 1, PFT p. 4)

95. The Town concurs that utilities should plan for multiple contingencies. (Town 1, p. 15)

96. To measure reliability, Eversource predominately uses two metrics; the frequency of interruptions and the duration of interruptions. The analysis is based on circuits, not by Town. Based on these metrics, Town of Greenwich customers experience reliability far below the state average. The average customer in Connecticut has an interruption every 16 months with an average interruption time of approximately 85 minutes. Greenwich customers experience an interruption average below ten months with an average interruption time of approximately 110 minutes. (Tr. 2, pp. 102-104)

97. Approximately half of the outages in Greenwich are related to storm events affecting the overhead 13.2-kV distribution system. The 13.2-kV distribution system is regulated by PURA and is not the subject of the Modified GSLP. (Tr. 3, pp. 81-88, 98-99)

Contingency Modeling - Cos Cob Substation

98. Contingency modeling indicates the loss of any one of the Cos Cob transformers (N-1) would cause in the remaining transformers to operate in their emergency ratings to carry the substation load. Under these conditions, the substation would have capacity of 94 MVA. (Eversource 1, Vol. 1, PFT p. 6; Tr. 3, p. 17)

99. Electric power at 27.6-kV cannot be transferred to another substation to reduce power demand on the transformers; however, 6 MVA of load can be transferred to the 115-kV to 13.2-kV transformers within the substation. This small amount of load transfer is currently sufficient to relieve overloads on the two remaining transformers to enable them to operate within their normal ratings. This small reliability margin could be reduced or entirely disappear with load growth on the 13.2-kV system served directly from the Cos Cob Substation. (Eversource 1, Vol. 1, PFT pp. 6, 7)

100. In the event of a transformer outage requiring a prolonged repair, only a 30 MVA (maximum) mobile transformer can be temporarily installed within the substation, which is insufficient to support the 2013 peak loading on either the 2X or 3X transformers. Under this circumstance, the substation would have to be manually reconfigured to redistribute loading. (Eversource 1, Vol. 1, PFT pp. 7, 8)

101. The permissible load rating at Cos Cob is 135 MVA for the 27.6-kV system based on a 2-hour emergency rating. It is based on the loss of the largest transformer (50.4 MVA) where the remaining two transformers would have to operate 145 percent above their nameplate rating in order to maintain electric service. After two hours, the load on the remaining two transformers must be reduced to a 22 hour rating. Although Eversource is willing to operate equipment above nameplate ratings for short intervals, it cannot operate its equipment in their emergency ratings for extended periods of time without permanent damage to equipment. (Council Administrative Notice 43, FOF #88, #89; Tr. 3, p. 18)

Contingency Modeling - Prospect Substation

102. Prospect Substation would experience overloaded transformers at the 2013 peak load levels under N-0 conditions. One transformer (4X) would exceed its current rating at this load level. Additionally, since one transformer (3X) is not connected to any other transformer, its loss would result in service interruption (N-1 condition). If one of the other three transformers is lost (1X, 2X, 4X), the remaining two would have to operate above their ratings (N-1 condition). One of the three connected transformers (2X) is prone to failure during overload conditions. (Eversource 1, Vol. 1, PFT pp. 5-7)

103. The Modified GSLP would be able to provide 100 percent backup in the event the Prospect Substation was lost from service. (Tr. 2, p. 144)

Contingency Modeling – 27.6-kV Feeder System

104. When the loss of one of Cos Cob to Prospect feeders (N-1) was modeled at the peak load of 130.5 MVA, the remaining cables would be overloaded, as shown below:

Feeders	Load relative to Normal cable ratings			
11R51	O.O.S.	151%	140%	122%
11R52	117%	O.O.S.	109%	95%
11R55	114%	117%	O.O.S.	97%
11R58	73%	73%	69%	O.O.S.

Normal ratings are based on a 75 percent load factor. Contingency modeling does not account for load redistribution to other circuits in the Greenwich electric system that can occur to protect system elements. (Eversource 1, Vol. 1, PFT p. 5; Tr. 3, p. 32; Tr. 4, pp. 61-62)

105. The length and impedance differences of the parallel feeders limit the capability of each feeder to accept flow from another feeder that is out of service. (Eversource 1, Vol. 1, PFT p. 5)

106. Overloads on one or more of the feeders occur on loads as low as approximately 82 MVA. (Eversource 1, Vol. 1, PFT p. 5; Eversource 2, response 1)

107. If two of the circuits are out, load would have to be shed to protect system components. (Council Administrative Notice 43, FOF #79)

108. In 2015, the Cos Cob peak demand reached 114.8 MVA a cable fault occurred on the 11R52 feeder. Under contingency modeling the loads on the remaining three feeders would have been as follows:
    - 11R51 - overloaded by 36 percent.
    - 11R55 - overloaded by 5 percent.
    - 11R58 - loading at 65 percent of cable rating.

    In actual conditions with the loss of the 11R52 feeder, the load was redistributed to the three remaining feeders as well as to the 11R53 and the 11R54 feeders serving North Greenwich Substation. Eversource accepted overloads on the 11R53 and 11R54 feeders to minimize overloads on the 11R51 and 11R55 feeders. Even though the load was re-distributed in this fashion, the 11R51 feeder was overloaded by 17 percent. No customers lost service during this fault event. (Eversource 2, response 1; Tr. 4, pp. 55-62)

Project Alternatives

109. Project Alternatives were examined in detail during the original Docket 461 proceeding and included transmission, distribution, interconnection, generation, demand side management alternatives as well as energy efficiency measures. (Council Administrative Notice 43, FOF #s 132- 210)

110. In OCC's Docket 461 Post-Hearing brief of April 11, 2016, the OCC mentioned two potential alternatives they believed were not addressed sufficiently during the original proceeding: replacing the existing transformers at Cos Cob Substation with larger transformers, and retrofit the Prospect Substation in conjunction with switching some load to other substations. These potential alternatives were rejected as described below:
    a. Eversource examined the feasibility of replacing the existing Cos Cob 46.7 MVA and 50.4 MVA transformers with two 80 MVA transformers but after contacting four different manufacturers, determined there is not enough space within the substation to accommodate the physically larger replacement transformers.

b. There is not enough room within the Prospect Substation to install an additional transformer and associated bus connection. Any load transfer to another distribution substation supplied from Cos Cob would not reduce the load on the Cos Cob 115-27.6 kV transformers. Transfer of load to Byram is not practical since it does not relieve load on the 27.6 kV circuits from Cos Cob. Transfer of load to North Greenwich is not practical since it would add load to the North Greenwich 13.2 kV feeders which would reduce the ability to accept load during contingencies. In addition, additional feeders would need to be installed to transfer load to the substation due to existing feeder constraints.

(Eversource 2, response 27; Council Administrative Notice 43 – OCC brief)

111. After the Council's final May 2016 decision, Eversource consulted with the Town to examine potential projects to improve reliability in Greenwich. Eight distribution alternatives were examined, but were found to be inferior to the proposed project due to cost concerns, inferior reliability, or engineering difficulties. These rejected distribution alternatives are provided in Attachment 3. (Eversource 1, Vol. 1, PFT p. 17; Eversource 2, response 26)

112. Rebuilding the existing 27.6-kV system in Greenwich, as examined in the eight distribution alternatives, would cost more, and offer less electric system flexibility when compared to the Project, and is incompatible with Eversource's plan to convert 27.6- kV system to a multi-grounded system at 23-kV or 13-kV across its service territory in Connecticut. (Eversource 9 – Response Town 12)

Energy Efficiency Measures

113. Discussions with the Town also included energy efficiency initiatives for both Town owned facilities and private investments to mitigate the electrical demand and usage within the Town. The types of investments presented included energy storage, as well as distributed generation and demand response programs. A variety of incentives are available within federal and state programs for these types of investment. (Eversource 9, Response Stacy 1)

114. Eversource cannot undertake distributed generation and energy efficiency projects. The Town and its businesses and residents can only be made aware of the different programs available to assist in development of these types of projects. (Tr. 2, pp. 127-129)

115. Load demand has been offset in the Greenwich area through energy efficiency and distributed generation projects. Load could even decline through continued use of these measures as well as incorporation of demand response projects. Future demand is expected to be flat or negative with utilization of energy efficiency, distributed generation and demand response programs. (Tr. 2, p. 12; Tr. 3, pp. 24-25)

116. Some energy efficiency results from the replacement of older residential structures with new structures that are built with improved or new building codes that can lead to energy savings when compared to older homes built to older codes. (Tr. 3, p. 199)

117. The Town has undertaken some of its own measures to improve energy efficiency including five recent projects that reduced load from Town facilities by 2.3 percent. (Tr. 2, p. 163)

118. In 2016, 36 businesses participated in Eversource sponsored energy efficiency programs and through June 2017, 33 businesses participated. (Tr. 2, pp. 165-166)

119. Eversource has been sponsoring a residential weatherization/efficiency program that averaged about 150 residences per year up to 2014. In 2015, Eversource created a new program, the Clean Energy Communities Pledge that increased participation to 225 customers in 2015, and 255 customers in 2016. For year to date (July 2017) 164 customers participated. (Tr. 2, p. 166)

120. Energy efficiency for businesses in Greenwich is mostly through LED lighting upgrades. Eversource currently has six projects underway with industrial and commercial users that would result in 108 kW of demand savings. (Tr. 2, p. 167)

121. Energy efficiency measure alone cannot solve electric system reliability issues and does not eliminate the need for the Project. These measures would extend the life of the Project so that additional projects necessary to accommodate future load growth would be delayed. (Eversource 9, Response Stacy 1, slide 2; Tr. 2, pp. 93-94)

122. Eversource has met with the Town five times to discuss energy efficiency within the Town and at Town facilities. (Tr. 2, pp. 90-91)

123. Measures undertaken so far include mailings to Town residences, identification of Town facilities that could be candidates for energy efficiency measures, and working with the Chamber of Commerce to establish a business outreach program. (Tr. 2, pp. 91-92)

124. Two light bulb swaps were conducted in Greenwich, one on October 25, 2016 and one on April 22, 2017. From the two events, 2,785 light bulbs were distributed and a total of 66 customers enrolled in the Home Energy Solutions program for energy efficiency services. (Eversource 12, response 13; Tr. 2, p. 112; Town 4, p. 6))

125. The Town of Greenwich has improved energy efficiency and reduced demand via the following:
    - 1,958-kW of renewable energy capacity has been installed between 2014 and 2016 (Ranks forty of Towns in Connecticut and third in Fairfield County)
    - The Town is a "Clean Energy Community" and it has committed to a 20 percent reduction in energy use by 2018.
    - Since 2008, the Town has participated in the CT Clean Energy Community, including the Solarize CT and C-PACE programs.
    - The Town participated in the Sunshot Grant program aimed at streamlining the process and lowering the cost for solar PV installation and local permitting.
    - The Town is working to identify distributed generation projects that produce clean energy and reduce loads and peak loads on the grid.
    - Since October 2016, the Town has been partnering with Eversource and Energize Connecticut to launch the Home Energy Solutions(HES) program and the Town is encouraging Town residents to take advantage of the services. By the end of April 2017 approximately 200 audits of residences were conducted.
    - Light bulb exchange program.

    (Town 1, pp. 20-21; Town 3, pp. 2-6, Town 4, Sched. B, p. 3).

126. The Town has reduced municipal building energy consumption as follows:
    - Over seventeen percent reduction in usage at the Grass Island Wastewater Treatment Plant for years 2011 to 2016.
    - the Town installed solar energy at two schools, including Greenwich High School, which experienced a usage reduction of eight percent in only one year from 2014 to 2015.
    - Eversource recently conducted an energy audit of the Greenwich Town Hall and expects to achieve a ten to 25 percent reduction in usage at Town Hall in the coming year.

    (Town 4, Schedule, A and Schedule B)

Demand Response – Distributed Generation

127. Non-transmission alternatives must be able to provide reliable power. For this project, non-transmission alternatives do not provide a viable alternative to improve the reliability issues that currently exist. (Eversource 13, response Stacy 3)

128. For distributed generation (DG), 15 customers representing approximately 0.12 MW of DG connected to Eversource's electric network from January through June 2016. There are 24 pending customer requests representing a total of 0.282 MW. (Eversource 9 - response Stacy 1, slide 14)

129. In 2015, the Council approved a 525-kW fuel cell installation at the Greenwich Hyatt Hotel. Fuel cells of this size are beneficial in reducing electric demand on a certain area since they operate as a base load unit. In comparison, a solar installation is too variable to rely on for base load reduction. (Tr. 2, pp. 131-133; Council Petition No. 1190)

130. Eversource did offer to facilitate the installation of a 10 to 15 MW fuel cell facility within the Town but the Town was not interested at this point in time. (Tr. 2, p. 133)

131. Eversource is advocating for legislation that would allow electric utilities to own and operate fuel cells. (Tr. 2, p 132)

132. Mr. Stacy requested that Eversource examine battery storage systems to provide for electrical capacity in Greenwich. Through legislative action in 2015, DEEP opened a docket requesting information on energy storage systems. As part of that docket, in 2016 Eversource requested information, including costs, from 19 manufactures of battery storage systems. Tesla was solicited for information but Eversource did not receive a response. Based on the information received, battery storage units would not be cost effective in meeting the needs of the Project. (Stacy 1; Eversource 13, Response Stacy 1, response 2; Tr. 4, pp. 13-14, 16)

133. Based on the DEEP docket, Eversource, along with United Illuminating, submitted proposals for energy storage projects in the State but the proposals were rejected for being too costly. (Tr. 4, pp. 30-31)

134. Eversource had a general discussion with the Town regarding battery systems on how to potentially use a better system in conjunction with industrial sized solar installations. No specific location or user was discussed. (Tr. 2, pp. 129-130)

Modified GSLP Description

135. The Modified GSLP consists of the installation of a new 115-kV bulk power substation, referred to as the Greenwich Substation, a new 115-kV electric transmission line, and modifications to the existing Cos Cob, and Prospect Substations. (Eversource 1, Motion to Reopen pp. 6-7)

136. The Modified GSLP proposes two new project designs for consideration; the PMP and the AMP. (Eversource 1, Motion to Reopen pp. 6-7)

137. The Modified GSLP does not include improvements to the Byram Substation. Although the equipment is obsolete, and was scheduled for removal in the original project with load transferred to the new Greenwich Substation, Eversource intends to replace aging equipment through future distribution projects not subject to Council jurisdiction. (Eversource 1, Motion to Reopen p. 6; Eversource 9, response Town 27)

138. The Modified GSLP does not include any improvements to the existing Tomac Substation. Tomac Substation is a single transformer bulk substation that serves a limited area of southeastern Greenwich and is not the subject of the Modified GSLP. Tomac is served by a 115-kV transmission line (#1750) and not from Cos Cob Substation. It was designed to be supplied from a single transmission source, therefore, it cannot supply load if this single source was lost. (Eversource 9, response Town 9, response 11, response 29; Tr. 3, pp. 71-72)

139. Although not part of the Modified GSLP, Eversource intends to upgrade the transmission line feed into Tomac by replacing the existing three terminal line with two, two terminal lines. Eversource, in accordance with a system priority list, would most likely undertake this project within 10 years (Tr. 4, pp. 38-39)

140. In addition to loads at 13.2-kV, Tomac serves approximately 1,100 customers in the Old Greenwich area at 4.8 kV with the ability for a backup of about half of the customers at peak load if the 4.8-kV transformer was lost. A project is currently proposed for 2018-2019, separate from the Modified GSLP, to improve distribution reliability by converting the 4.8-kV system to 13.2-kV, creating automatic and manual backup for customers. (Eversource 9, Response Town 17, response 29; Town 1, pp. 14-15; Tr. 3, pp. 72-76)

Proposed Modified Project

141. The PMP consists of an overhead-underground transmission line route and a new air insulated substation at 290 Railroad Avenue. (Eversource 1, Vol. 1, Ex. A, pp. A-5, A-11)

142. The PMP transmission line route consist of an overhead segment extending from Cos Cob Substation along the north side of the MNRR ROW to Indian Field Road, cross the MNRR and follows the south side of the MNRR to Steamboat Road. From Steamboat Road, the transmission line extends underground within Railroad Avenue to the new Greenwich Substation. (Eversource 1, Vol. 1, Ex. A, Fig. A-1)

143. Eversource developed the PMP based on direction from the Council in Docket 461 where the Council requested Eversource to examine in detail the feasibility of constructing an overhead route along portions of the MNRR. At the time of the Council's decision, this potential route was not engineered to a point where enough detail was available for full consideration by the Council. (Eversource 1, Vol. 1 Motion to Reopen p. 3)

144. The PMP design is consistent with the Federal Energy Regulatory Commission Guidelines for the Protection of Natural, Historic, Scenic and Recreational Values in the Design and Location of Rights-of-Way and Transmission Facilities (FERC Guidelines) as this proposed, alternate route jointly utilizes existing rights-of-way that are occupied by different kinds of utility services. (Council Administrative Notice 9)

145. Eversource consulted with the DOT during initial development of an overhead route along the MNRR ROW, referred to as the Hybrid Alternative, during the Docket 461 proceeding. At the time of the consultation, this potential route seemed feasible. (Eversource 4, p. 2)

146. After the Council's denial of Docket 461 without prejudice, Eversource held a series of meetings with DOT representatives from October 2016 through April 2017. On April 27, 2016, Eversource and DOT came to an agreement regarding co-location issues and it appeared a DOT license for Eversource's to use the MNRR ROW would be issued. (Eversource 4, p. 2)

147. After the filing of the Motion to Reopen, Eversource was contacted by DOT Rails informing Eversource that DOT opposes installation of the PMP transmission line within the MNRR ROW. (Eversource 4, pp. 2-3)

148. On June 14, 2017, Eversource met with a senior official at DOT Rails who indicated that the DOT would not grant Eversource a license for use of the MNRR in that such a license is inconsistent with DOT's needs and policies. (Eversource 4, Ex. A; Tr. 2, pp. 100-101)

149. On July 5, 2017 the DOT's Assistant Rail Administrator provided written correspondence to Eversource confirming the DOT's new position. The correspondence indicated the DOT is specifically opposed to 1) rail outages that will impact rail service, 2) lack of manpower to support outages and transmission line construction, 3) lack of space on exiting catenaries to support new lines, and 4) the congested nature of the existing rail corridor where the placement of a non-rail related transmission line would encumber the future expansion of rail service. *lack of available space to support both a new transmission line and congested nature of the existing rail corridor which makes the installation of a transmission line and any future expansion of railroad infrastructure difficult.* (Eversource 4, Ex. A)

150. Due to the DOT's July 5, 2017 correspondence, Eversource notified the Council on July 10, 2017 that it is withdrawing the PMP transmission line route from consideration, but would continue to offer the AMP as a viable candidate for the Modified GSLP. (Eversource 5)

151. If the PMP was a viable option, its cost would have been approximately $78 million. (Eversource 1, Vol. 1, PFT p. 11)

152. The Council acknowledged withdrawal of the PMP transmission line route at the July 13, 2017 public hearing session. (Tr. 1, pp. 4-5)

Alternate Modified Project

153. The AMP consists of a 2.3 mile underground transmission route extending from Cos Cob Substation to a new "indoor substation" at 281 Railroad Avenue. A portion of the underground route extends through Town-owned Bruce Park. (Eversource 1, Ex. B, Fig A-1)

154. The AMP design is inconsistent with the FERC Guidelines as the use parks and recreation lands for ROWs are to be avoided, where practical, but if ROWs must be routed through parks and recreation lands, they should be placed in a manner so as to be least visible from public view. (Council Administrative Notice 9)

155. On July 17, 2017, Eversource submitted correspondence to the Council indicating that the AMP would now be referred to as the proposed Project and that both the 290 Railroad Avenue and 281 Railroad Avenue parcels are viable locations for the Project substation. Details of each portion of the proposed Project are described in the following sections. (Eversource 8)

Project Description

New Greenwich Substation – 290 Railroad Avenue

156. The proposed Greenwich Substation is located on a 0.81-acre parcel within a General Business Zone at 290 Railroad Avenue in Greenwich. (Council Admin. Notice Item 43, FOF #212)

157. The parcel is located on the corner of Railroad Avenue (to the north) and Field Point Road (to the west.), The site location and general substation layout is shown below:

(Eversource 2, response 55)

158. The parcel is approximately 40 feet above mean sea level and is generally flat. (Council Admin. Notice Item 43, FOF #214)

159. The parcel is almost entirely developed with a commercial building and associated parking lot. Developed commercial properties are located across both roads and abut the parcel directly to the east and south. (Council Admin. Notice Item 43, FOF #215)

160. The area in the vicinity of the site is heavily developed consisting of a mix of industrial, commercial and residential land uses. The MNRR and Interstate 95 are to the south. (Council Admin. Notice Item 43, FOF #216)

161. The proposed 290 Railroad Avenue substation would be of an open-air insulated design. It would contain two 60 MVA 115-kV/13.2-kV transformers, one 115-kV circuit breaker, two 115-kV termination structures, four circuit switches, two disconnect switches, two terminal structures, a switchgear enclosure, a control enclosure, one lightning mast and other associated equipment. (Eversource 1, Vol. 1, p. A-6, Vol. 2, App. 4)

162. The underground transmission lines would enter the substation along Railroad Avenue to the 115-kV termination structures. (Eversource 1, Vol. 1, p. A-6, Vol. 2, App. 4)

163. The distribution switchgear enclosure is located to the south of the two transformers and measures 24 feet wide by 85 feet long by 11.3 feet high. (Eversource 1, Vol. 1, p. A-6, Vol. 2, App. 4)

164. The control enclosure measures 14 feet wide by 42 feet long by 12 feet wide and would be located at the southwest end of the substation. (Eversource 1, Vol. 1, p. A-6, Vol. 2, App. 4)

165. Each transformer, approximately 21.5 feet in height, would be enclosed by 22.5-foot tall firewalls on three sides. The north side of each transformer would remain open for buswork connections to each transformer. The outer firewall at each transformer would be removable to allow for maintenance access. (Eversource 1, Vol. 2, App. 4)

166. The proposed lightning mast would be 65 feet in height and would be located in the northern end of the substation, between two circuit switchers. (Eversource 1, Vol. 1, p. A-6, Vol. 2, App. 4)

167. The substation would be enclosed by a 15-foot tall brick veneer wall. The wall would be decorative in that it would utilize columns and a sill to create horizontal separation between upper and lower sections as shown in the photo-simulation below.

View from corner of Railroad Ave. and Field Point Rd.
(Eversource 1, Vol. 2, App. 4, App. 5)

168. Eversource could move the wall fronting Railroad Avenue approximately 10 feet south to create more space between the wall and existing sidewalk. (Eversource 12, response 68)

169. Eversource would be willing to install simulated windows along the brick wall. The additional cost of incorporating simulated windows is minimal. (Tr. 2, p. 77)

170. Two substation access gates are proposed; one located in the northeast corner of the substation, exiting to Railroad Avenue; and the other in the western portion of the substation, exiting to Field Point Road. (Eversource 1, Vol. 2, App. 4)

171. The southwest portion of the substation yard would have space to accommodate a mobile transformer for use during emergency situations. The use of a mobile transformer is highly unlikely in that the new Greenwich Substation is being designed to handle the load with one transformer out. A mobile unit would only be used if both transformers were inoperable. (Eversource 1, Vol. 1, p. A-7; Tr. 2, pp. 75-76, 151)

172. An "indoor substation" could be constructed at the 290 Railroad Avenue site. It would be similar in design to the alternate substation location proposed at 281 Railroad Avenue. (Eversource 1, Vol. 1, pp. F-1, F-2)

173. The indoor substation is not designed for a mobile transformer. A temporary transformer could be set up on the parcel, outside of the indoor substation. Cables would have to be installed through or over the wall to connect the transformer to substation components. Temporary fencing would need to be installed to enclose the mobile transformer. (Tr. 2, pp. 81-82)

New Greenwich Substation – 281 Railroad Avenue

174. The 281 Railroad Avenue Substation site is located on a 0.75-acre parcel owned by Eversource and used to store utility infrastructure equipment. (Eversource 1, Vol. 1, pp. A-7, A-8)

175. Residential and mixed use development abut the site on the east and west sides. Three residential properties are located north of the site, across Woodland Avenue. A commercial plaza is located south of the site, across Railroad Avenue. The site location and general substation layout is shown below:

(Eversource 1, Vol. 1, pp. A-6 - A-8; Eversource 2, response 53)

176. Eversource proposes to construct an indoor substation on the parcel, measuring approximately 92 feet wide by 112.5 feet long. It would resemble a multiple unit residential building and feature a sloping, standing seam metal roof, with a maximum height of 20 feet above grade. (Eversource 1, Vol. 1 PFT, p. 15; Vol. 2, App. 9; Eversource 2, response 44)

177. Two 60 MVA 115-kV/13.2-kV transformers would be installed in the central portion of the structure and would not be covered by a roof. The roof opening above the transformers would measure approximately 80 feet by 40 feet. (Eversource 1, Vol. 2, App. 9)

178. A plug and switch system (PASS M0) would be used instead of a traditional air insulated circuit breaker. The PASS M0 design is a hybrid between a gas insulted and air insulated equipment and has a reduced footprint when compared to traditional open air components of similar function. It contains internal current transformers, disconnect switches, and the circuit breaker. (Eversource 2, response 45)

179. The PASS M0, switchgear and control equipment would be installed within the roofed portion of the structure. (Eversource 1, Vol. 2, App. 9; Eversource 2, response 45)

180. The underground transmission lines would enter the substation from Railroad Avenue to the 115-kV termination points. (Eversource 1, Vol. 1, p. A-6; Vol. 2, App. 9)

181. Each transformer would be enclosed by 24.5 foot tall concrete firewalls on three sides, leaving the south side open to allow for transformer connection to the circuit breaker. The firewalls would have removable panels to facilitate transformer access, when necessary. (Eversource 1, Vol. 1, p. A-6; Vol. 2, App. 9)

182. The open area above the transformers would be sufficient for air cooling. No fan units are necessary to provide additional transformer cooling during normal operations. (Tr. 2, p. 49)

183. Access to interior portions of the substation would be by six exterior doors and three roll-up doors. (Eversource 1, Vol. 2, App. 9)

184. The exterior of the substation would be designed to appear as a multistory condominium-style building with gabled roof lines, faux windows and doors and a nonflammable siding. The siding is pre-colored and may require periodic cleaning for maintenance. A photo-simulation of a potential exterior design is shown below:

View north from Railroad Avenue.
(Eversource 1, Vol. 2, App. 11; Eversource 2, response 44; Tr. 2, p. 48)

185. No perimeter fence around the substation building is proposed. All access doors would be secured from public entry. (Eversource 1, Vol. 2, App. 9; Tr. 2, pp. 51-52)

186. Lightning protection would be provided by 10-foot high air terminals around the perimeter of the roof. (Eversource 2, response 45)

187. Access to the substation would be from two paved driveways extending from Railroad Avenue to serve the east and west sides of the building. A third asphalt driveway would extend from Woodland Drive to serve the north side of the building. (Eversource 1, Vol. 2, App. 9)

188. A mobile transformer may be able to fit on the parcel adjacent to the indoor substation. If there is limited space, Eversource would have to obtain temporary easements on adjacent property to create enough space for the transformer, cabling, and temporary fencing. (Tr. 2, pp. 81-83, 85-86)

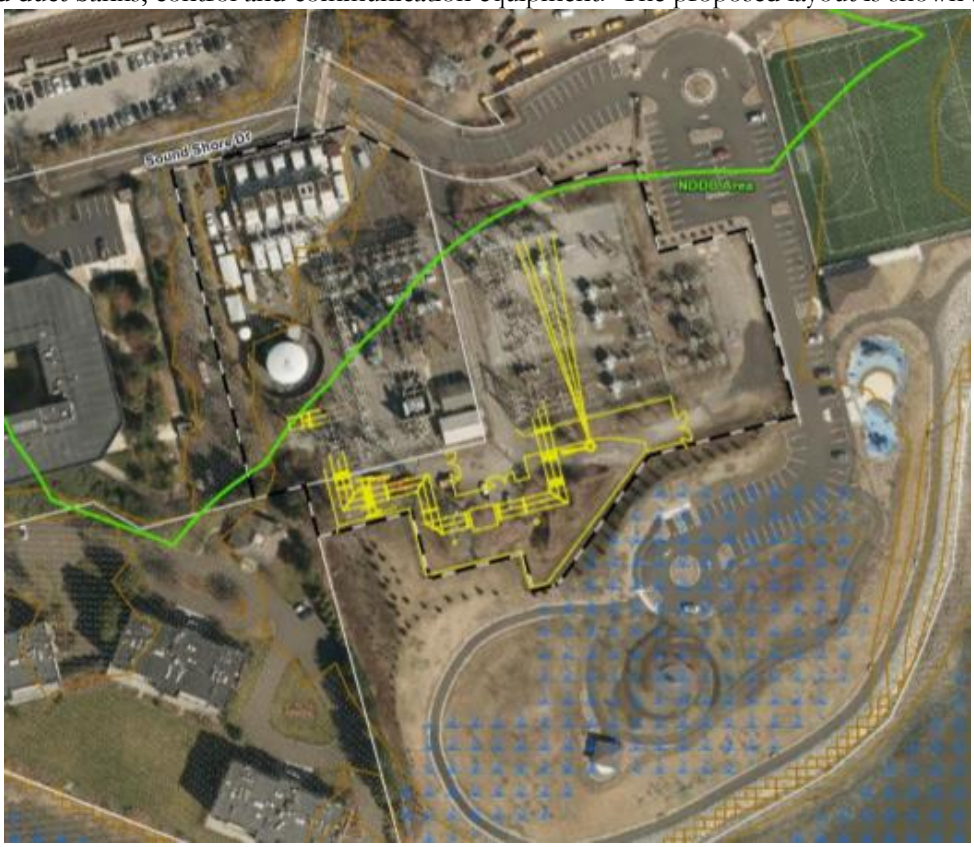
189. An all open air insulated substation could be constructed at the 281 Railroad Avenue site. The site is approximately 3,000 square feet smaller than the 290 Railroad Avenue site. (Eversource 1, Vol. 1, p. F-1; Tr. 2, p. 61)

Cos Cob Substation Modifications

190. Cos Cob Substation is located off Sound Shore Drive and abuts Cos Cob Park to the east and south, a shared access driveway that serves the substation and park to the north, and a developed commercial property to the west. (Eversource 1, Vol. 2, App. 8)

191. Modifications to the Cos Cob Substation would require the substation to be expanded by 0.8-acre to the south. (Eversource 1, Vol. 1, p. A-7, Vol. 2, App. 4)

192. Modifications include, but are not limited to, the addition of the following: expansion of the ring bus to install a new underground termination position, one new monopole line structure (90 feet tall), one new A-frame line structure (58 feet tall), reconstruction of the mobile transformer position, underground conduits and duct banks, control and communication equipment. The proposed layout is shown below:



(Eversource 1, Vol. 1, pp. A-8, B-4, B-17; Eversource 1, Vol. 2, App. 4)

193. Existing equipment that would be removed includes, but is not limited to, the following: two steel A-frames, one wood A-frame, one line trap bus section, one disconnect switch, one wood pole, and one lattice structure. (Eversource 1, Vol. 1, p. A-8)

194. A new 7-foot tall perimeter chain link fence would be installed to enclose the expansion area. The fence would be located 6 feet from the existing Town park fence. (Eversource 2, response 30)

195. Access to the expanded portion of the substation would be from four new gates installed within the existing substation perimeter fence. (Eversource 1, Vol. 2, App. 4, App. 6)

Prospect Substation Modifications

196. Modifications at the Prospect Substation include the removal of four 27.6 kV to 13.2-kV transformers and associated 13.2-kV switchgear. The ties to the 27.6-kV feeders serving certain large customers would remain. (Eversource 1, Vol. 2, App. 4; Eversource 1, p. 9; Tr. 2, pp. 135-136)

197. The remaining equipment would not be damaged if flooding occurred. (Tr. 2, p. 147)

198. The project would require reconfiguration of the 13.2-kV feeder network in the area of the new Greenwich Substation and Prospect Substation so that the new substation connects to the existing feeders presently served from the Prospect Substation. (Eversource 9, response Town 28)

199. Seven existing 13.2-kV underground feeders serving the Prospect Substation would be relocated to the proposed Greenwich Substation. (Eversource 1, p. 9; Eversource 9, response Town 64)

115-kV Underground Transmission Line

200. The new substation would be supplied by a new underground 115-kV double circuit transmission line extending approximately 2.3 miles from the Cos Cob Substation. (Eversource 1, Vol. 1, p. A-8)

201. The underground route would extend from the north side of the Cos Cob Substation, head west on Sound Shore Drive, head south on Indian Field Road, crossing Interstate 95 either above ground or below ground, then head west on Bruce Park Drive, Woods Road, Davis Avenue and across Indian Harbor, then continuing west on Indian Harbor Drive, Museum Drive, Arch Street and Railroad Avenue to the new Greenwich Substation (refer to Attachment 2). (Eversource 1, Vol. 1, pp. A-3, A-10, A-11)

202. The underground transmission line would consist of two cross-linked polyethylene (XLPE) cable circuits, each composed of three phases. (Eversource 1, Vol. 1, p. A-8)

203. Each phase would consist of one 3500-kcmil copper conductor cable insulated with 0.75 inches of insulation. Each cable is approximately 4.5 to 4.6 inches in diameter. (Eversource 1, Vol. 1, p. A-8; Eversource 9, response Town 56)

204. The 115-kV transmission line would provide 192 megavolt amperes (MVA) of summer normal line capacity. (Eversource 1, Vol. 1, p. A-10)

205. The capacity of the transmission line (192 MVA) is being sized for the potential future installation of two 80 MVA transformers at the Greenwich Substation if the need arises. If two 80 MVA transformers were eventually installed, they could serve 120 percent of their normal rating (192 MVA) for up to two hours in the event of a contingency at the Cos Cob Substation. (Eversource 9, response Town 58)

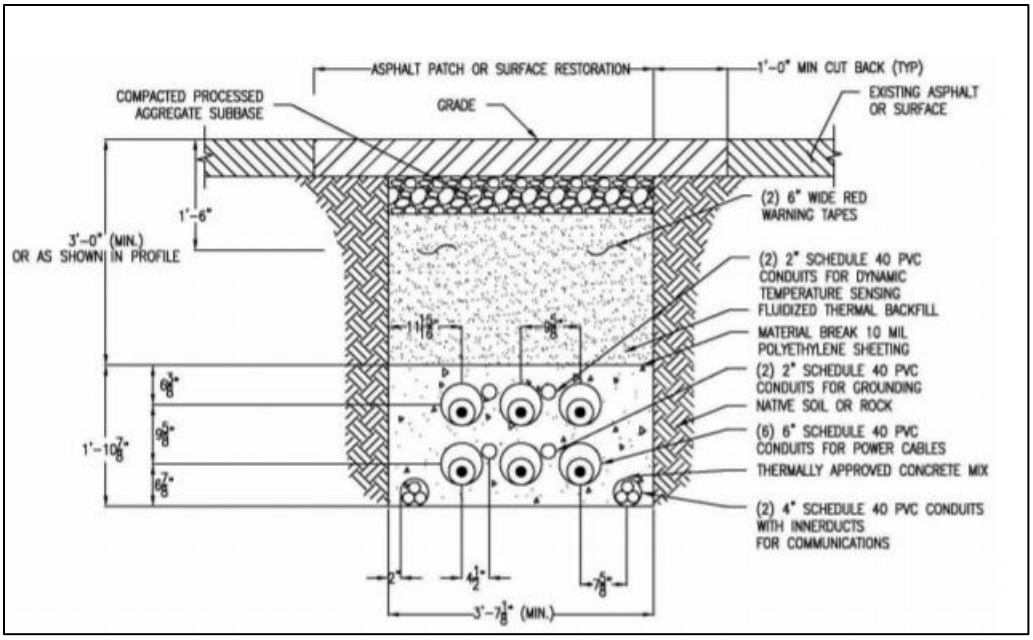
206. The size of the conductors would enable Eversource to eventually loop feed the Cos Cob Substation and the Tomac Substation. A smaller cable could be used (3,000 kcmil) to supply only the needs of the new Substation, but would not allow for a future loop feed. This proactive installation at a nominal cost (approx. $120,000) is consistent with other Eversource projects, such as Docket 474, to reduce the potential for more costly upgrades in the future. (Tr. 3, pp. 93-95)

207. For the underground installation, each cable would be installed in 6 inch diameter PVC ducts that are encased in a concrete duct bank, measuring approximately 3.6 feet wide by 4.9 feet deep. The concrete duct bank would enclose both circuits for most of the transmission line length, except near each substation where the circuits diverge from each other to reach different terminal points. (Eversource 1, Vol. 1, p. A-8; Eversource 9, response Town 59a, response Town 5c)

208. Smaller conduits would also be installed within the duct banks for communication, temperature monitoring and grounding. (Eversource 1, Vol. 1, p. A-8)

209. Installation of the transmission line would require a five foot deep trench that is approximately 3.6 feet wide for the double circuit duct bank, and two feet wide for the single circuit duct bank. (Eversource 1, Vol. 1, p. A-13; Eversource 9, response Town 5c)

210. A schematic of the duct bank with approximate dimensions is shown below:



Eversource 1, Vol. 1, App. B, Figure A-3)

211. Open trenches would be covered by steel plates during non-work hours. (Tr. 2, p. 139)

212. The length of trenching and duct bank that could be installed per day would vary depending on specific subsurface conditions. Conditions could include the presence of existing subsurface infrastructure and utilities, rock and groundwater. Traffic management, material delivery and spoil removal are other site specific factors. In some areas, crews could install 50 to 75 linear feet per day but in other areas it would be significantly less. (Eversource 2, response 47)

213. Construction within Davis Avenue would require the closure of a 200 to 300-foot segment of the road each workday. There is not enough space to accommodate both traffic and construction equipment. (Tr. 2, pp. 74, 139)

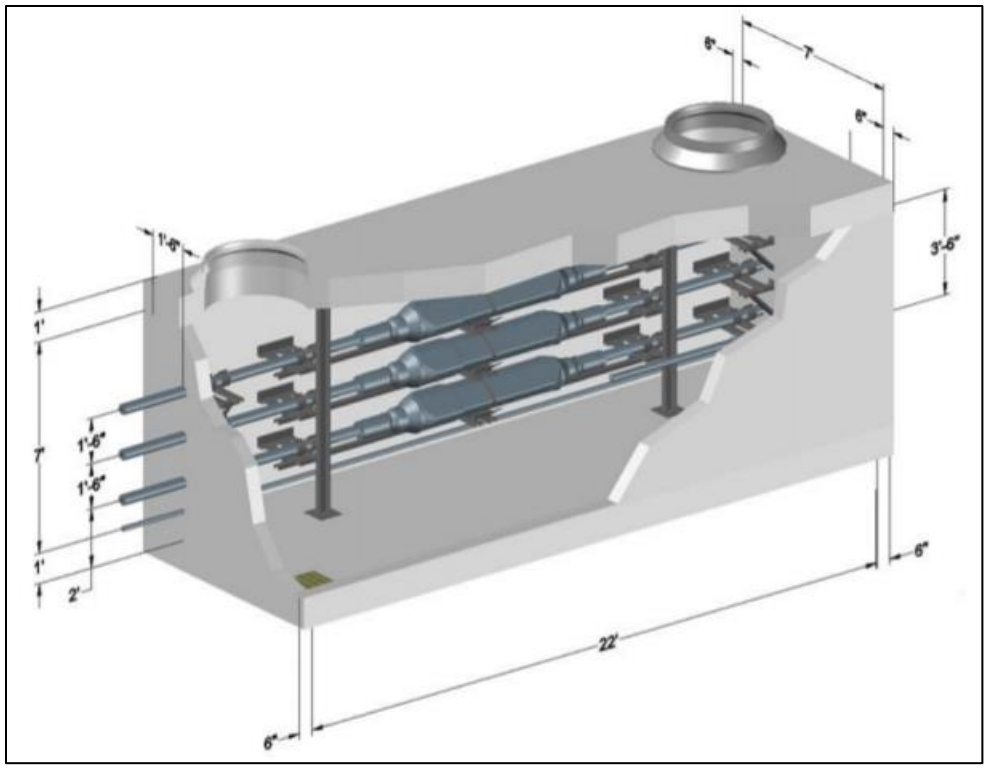
214. If work was conducted through Bruce Park in the winter, Woods Road could be closed entirely during construction to facilitate the trench installation as well as for use as a staging area. (Tr. 2, pp. 140-141)

215. The underground transmission line would require approximately six splice vault locations along the 2.3 mile route to connect segments of the transmission line. Additionally, there are two "pull through" vaults where splicing is not required but are used to facilitate connection to each substation. (Eversource 1, Vol. 2, App. 11; Eversource 9, response Town 25)

216. The average cable pull length between splice vaults is 1,800 feet (excluding "pull through" vaults). (Eversource 9, response Town 25)

217. Cable splicing would begin after the duct banks and splice vaults have been installed. One or two phases could be pulled through to each vault location per day. Cable splicing is expected to take up to two weeks at each vault location. (Eversource 2, response 47)

218. Each splice vault location consists of two separate vaults, once for each circuit, with each measuring approximately 22-feet long, by 7 feet wide by eight feet high. A schematic showing the approximate dimensions of a splice vault is shown below:



(Eversource 1, Vol. 1, pp. A-9, A-10)

219. The splice vaults would be located within road rights-of-way or on private property adjacent to road rights-of-way. Excavation for the vaults would reach about nine feet. (Eversource 1, Vol. 1, p. A-9; Tr. 2, p. 138)

220. Tentative locations for splice vaults include the following; Cos Cob Substation property; off road location on Sound Shore Drive, Indian Field Road south of I-95 Exit 4, Woods Road, Davis Avenue west of Indian Harbor, Museum Drive near the Indian Harbor Drive intersection, Arch Street, south of I-95 Exit 3, Railroad Avenue near new Greenwich Substation. (Eversource 1, Vol. 2, App. 11)

221. Eversource would coordinate road closures with the Town and any affected residents. (Tr. 2, pp. 75, 140)

222. The DOT recommends installing splice vaults outside traveling roadways. (DOT comments of August 31, 2017)

223. The DOT recommends installing the splice vaults at Sound Shore Drive as close to the road as possible, thus maximizing the distance between the splice vaults and I-95. The splice vaults in this location are on DOT property and a DOT encroachments agreement would be required. (DOT comments of August 31, 2017; Tr. 2, p. 33)

224. The Town considers Bruce Park Drive, Woods Road, Davis Avenue, Indian Harbor Drive and Museum Drive as part of Bruce Park. The Town requests that splice vaults be installed within the roadways in the park to avoid having permanent manhole cover visible within lawn area and possibly having tree roots being restrained by a subsurface structure. (Eversource 1, Vol. 1, p. 2; Tr. 3, pp. 228-231)

225. The Town requests the complete repaving of all roads within Bruce Park that are disturbed during trench installation. Utility cuts within paved roads shorten their service life and reduce the investment made by the Town in paving the roads prior to the project. The roadways in Bruce Park were most likely paved five years ago and are currently in very good condition. (Tr. 3, pp. 244, 246-247)

Interstate 95 Crossing

226. Two options to cross I-95 at Field Point Road were initially presented; an above ground crossing where the transmission line is attached to the underside of the I-95 overpass bridge or a pipe jacking crossing where the transmission line would be installed under the highway. (Eversource 1, Vol. 1, App. B, pp. A-11, A-12)

227. After the Modified GSLP was submitted, the DOT submitted correspondence on August 31, 2017 stating that it is opposed to any attachment of the transmission line to the Indian Field Road bridge. (DOT comments of August 31, 2017)

228. DOT also commented on the pipe jacking installation, stating that it requests an in-depth review of the transmission line crossing and associated jacking pit locations to ensure such installations are as far away from the I-95 travel way as possible. (DOT comments of August 31, 2017)

229. The pipe jacking installation would require 0.5-acre staging areas on each side of I-95, between the Exit 4 on and off-ramps. Vertical shafts, approximately 15 feet wide, 50 feet long, and up to 15 feet deep, would be excavated to accommodate a boring machine within the shaft pit. A 42-inch diameter bore would be made under the highway between the trench pits. A 42-inch diameter casing pipe would then be installed between the bore pits and the cable ducts pulled into the casing pipe. The remaining voids in the casing would be filled with thermal concrete. (Eversource 1, Vol. 1, Ex. B, p. A-12)

230. The pipe jacking installation is anticipated to take 30 days. No highway ramp shutdowns are anticipated as the bore pit locations would be located as far from paved roadways as possible. (Tr. 2, p. 46)

231. To avoid the Exit 4 area of I-95, Eversource examined the feasibility of extending the transmission line along the south side of I-95. Due to limited space, an overhead route would not conform to DOT specifications. An underground route in this area would be challenging and costly to construct due to steep embankments. The existing tree buffer between the highway and abutting residences would have to be removed. (Eversource 12, response 66)

232. An option to cross under I-95 from Sound Shore Drive to Cobb Island Drive was examined and determined to be unfeasible given terrain challenges and the necessary acquisition of easements for the crossing of private property as well as along privately owned Cobb Island Drive. (Eversource 12, response 66)

233. An overhead highway crossing option was examined using tall transmission structures located in the grassed areas between the exit ramps and highway. Eversource did not pursue this option because DOT was not initially receptive and no cost savings would be gained given the structures required and highway-related construction constraints. (Tr. 2, pp. 36-36)

Indian Harbor Crossing

234. Two options were presented to cross Indian Harbor within Bruce Park, a trench crossing utilizing a coffer dam, or an above ground crossing utilizing a new transmission line/pedestrian bridge. Either crossing would be located to the north of the existing Davis Avenue bridge over Indian Harbor. The exact location of either crossing would be determined upon consultation with the Town. (Eversource 1, Vol. 1, p. A-11; Tr. 2, p. 63)

235. The existing Davis Avenue bridge has a concrete sidewalk on both sides of the road. (Tr. 3, p. 246)

236. The Town requested the transmission line/pedestrian bridge crossing to avoid disturbance to Indian Harbor. The bridge would be composed of steel and concrete and would require on-site assembly. The bridge itself would have a lifespan of 50 years. The wood pedestrian decking would be approximately eight feet wide and would have a lifespan of 10 years. (Eversource 1, Vol. 1, p. A-11; Eversource 1, Vol. 2, App. 11; Eversource 2, response 48; Tr. 2, pp. 67, 69, 87)

237. The trench installation through Indian Harbor would also be located to the north of the Davis Avenue bridge. Construction through the harbor would require a coffer dam to facilitate excavation of harbor sediments and installation of the duct bank. (Eversource 2, response 49)

238. The Town is not opposed to a coffer dam installation as long as it can be accomplished without the use of large cranes placed along the shoreline. (Tr. 3, p. 242)

239. Under the FERC Guidelines, when necessary, cofferdam techniques to lay pipe or cable across streams or bodies of water should be used and banks should be stabilized to prevent erosion. (Council Administrative Notice 9)

Environmental Considerations

Soil and Earthwork

240. Eversource would deploy erosion and sedimentation controls in accordance with the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control* at the limits of work, adjacent to sensitive areas, and around adjacent catch basins. Erosion controls would be maintained until construction is completed and exposed soils in the work area have stabilized. (Eversource 1, Vol. 1, Ex. B, p. C-3)

241. Minimal grading would be required at the proposed substation locations. (Eversource 1, Vol. 1, Ex, A, p. B-7, Ex. B, p. C-5)

242. Trench construction in roads would be similar to other types of construction projects that occur in roads such as water main replacements or natural gas line installations. (Council Administrative Notice 43, FOF #384)

243. Trench and splice vault excavation would have minimal environmental effect as construction activities would be temporary and limited to the area in and adjacent to the trench. Suitable erosion and sedimentation controls for road excavation would be deployed, if necessary. (Eversource 1, Vol. 1 , Ex. B, p. C-3)

244. Trench backfill would be compacted to avoid subsidence. In road areas, backfilling and compaction would have to meet DOT standards. In non-paved areas, 12 to 18-inches of topsoil would be included to allow for enough soil for re-vegetation. (Council Administrative Notice 43, FOF #389)

245. Excess excavated materials and materials not suitable for trench backfill would be disposed of in accordance with applicable regulations. (Eversource 1, Vol. 1 , Ex. B, p. C-3)

246. Some road may be encountered during trench construction in off-roadway areas. Rock removal, if required, would be accomplished by mechanical chipping. (Tr. 2, p. 73)

Flood Zones

247. Both the 281 Railroad Avenue and 290 Railroad Avenue Substations are not within the 100 year or 500 year flood zones. (Eversource 1, Vol. 1, Ex. A, p. B-8, Ex. B, p. B-2)

248. Both the 281 Railroad Avenue and 290 Railroad Avenue Substations are not within a Hurricane Surge Inundation Area as demarcated by the National Hurricane Center. (Eversource 1, Vol. 1, Ex. A, pp. B-8, B-9, Vol. 2, p. B-8)

249. The Cos Cob Substation expansion area is not within a 100-year or 500-year flood zone or within a Hurricane Surge Inundation Area. (Eversource 1, Vol. 1, Ex. A, p. B-8)

250. The Project underground route would cross the 100 year flood zone in two different areas; generally along a substantial portion of Arch Street, between Steamboat Avenue and Railroad Avenue, and along Davis Avenue east and west of Indian Harbor. (Eversource 1, Vol. 2, App. 11)

251. Two splice vaults would be located within the flood zone areas. Vault components would be designed to be able to withstand flooding and saltwater intrusion. (Eversource 1, Vol. 2, App. 11; Tr. 2, p. 163)

252. The underground transmission line route would extend approximately 780 feet through the 100-year flood zone and approximately 6,655 feet through Hurricane Surge Inundation Areas. The transmission lines and associated equipment would be designed to be protected from inundation. (Eversource 1, Vol. 1, Ex. B, p. C-6)

Wetlands and Watercourses

253. Both the 281 Railroad Avenue and 290 Railroad Avenue Substation locations are used for commercial purposes and do not contain wetlands or watercourses. (Eversource 1, Vol. 1, Ex. A, p. B-21, Ex. B, p. B-2, C-4)

254. The expansion of the Cos Cob Substation would not affect any wetlands or watercourses. (Eversource 1, Vol. 1, App. A, Fig. B-2)

255. The Project underground route would not directly affect any inland wetlands. (Eversource 1, Vol. 1, Ex. B, p. C-4)

Coastal Area Resources

256. The Project is located within the coastal resource boundary, as defined by the Connecticut Coastal Management Act (CCMA). The goals and policies of the act are to "ensure that the development, preservation or use of the land and water resources of the coastal area proceeds in a manner consistent with the rights of private property owners and the capability of the land and water resources to support development, preservation or use without significantly disrupting either the natural environment or sound economic growth". (Eversource 1, Vol. 1, Ex. B, p. B-9)

257. None of the coastal resources identified by the CCMA would be adversely affected by construction or operation of the Project. (Eversource 1, Vol. 1, Ex. A, pp. C-5, C-6, Ex. B, p. B-9)

258. The Project transmission line route would cross Indian Harbor, a coastal resource within Brue Park, either by a new transmission line/pedestrian bridge installation that spans the harbor or by a trench installation through the harbor. Both proposed installations would cross to the north of the Davis Avenue bridge crossing. (Eversource 1, Vol. 1, Ex. B, pp. A-11, C-4)

259. The existing Davis Avenue bridge provides some protection of areas north of the bridge from storm surge due to the presence of several culverts that restrict incoming flows. (Tr. 2, p. 64)

260. The banks of the harbor consist of stone armoring, maintained lawn, and bedrock outcrops. All disturbed areas along the banks of Indian Harbor would be protected from erosion and restored once construction is completed. (Eversource 1. Vol. 1, Ex. B, Fig. B-2, pp. B-9, C-3)

261. Construction of the transmission line/pedestrian bridge may require the installation of sheet piles of coffer dams on both banks of the harbor crossing to facilitate the installation of bridge abutment foundations. The bridge would be approximately 165 feet long. (Eversource 1, Vol. 1, Ex. B, pp. A-5, C-4)

262. The trench crossing would require coffer dams to allow for the excavation of approximately seven feet of harbor sediment to reach bedrock. The sediment displaced by the conduit/duct bank would trucked off-site, temporarily stockpiled, and characterized prior to disposal. (Eversource 1, Vol. 1, Ex. B, p. C-8; Tr. 2, p. 72)

263. The trench installation would have no effect on submarine topography or the current defined shoreline. Some leveling of the bedrock may be necessary to create a suitable surface for the duct bank. (Eversource 1, Vol. 1, Ex. B, p. C-8; Tr. 2, p. 72)

264. The trench would be installed in two parts, using two different coffer dams that extend from each shore so that the harbor would only be partially blocked at any given time, allowing for unimpeded tidal fluctuations. (Eversource 2, response 49; Tr. 2, pp. 65-66)

265. Floating work platforms would be used to install the coffer dams. (Tr. 2, pp. 67-68)

266. The proposed transmission line/ pedestrian bridge would be designed to match the existing park environment. (Eversource 1, Vol. 1, Ex. B, p. C-14)

267. Trench work within the tidal ponds would require a permit from DEEP Office of Long Island Sound Programs. The permit would detail the effects on benthic habitats and typically requires a three to one mitigation ratio for restoration activities. (Council Administrative Notice 43, FOF #415)

Groundwater

268. Groundwater in the Project area is classified as GA or GB. GA groundwater - fit for human consumption without treatment - is located primarily within the central portion of the transmission line route. GB groundwater - not fit for human consumption without treatment - is located in the western and eastern portions of the Project area. (Eversource 1, Vol. 1, Ex. B, p. B-8)

269. The Project route and facilities are not within a designated Aquifer Protection area or near any known water supply wells. (Eversource 1, Vol. 1, Ex. A, B-8, Ex. B, p. B-8)

270. Due to the highly urbanized nature of the Greenwich area, construction of the Project may encounter contaminated soils and/or contaminated groundwater. (Council Administrative Notice 43, FOF #390)

271. Groundwater may be encountered during installation of the transmission line, pipe jacking pits, or substation equipment foundations. If groundwater is encountered, appropriate sampling and dewatering would be performed in accordance with applicable regulatory agencies. Depending on the water characterization, groundwater may be discharged to catch basins, or pumped to temporary storage tanks for disposal off-site. (Eversource 1, Vol. 1, Ex. B, p. C-5)

272. Groundwater recharge would not be significantly altered by the construction of the Project. The two proposed substation sites currently consist of impervious and highly compacted surfaces. These surfaces would be replaced with trap rock in the substation yard, improving existing on-site drainage. The construction of the transmission line route would not substantially change existing drainage patterns or alter groundwater flow and recharge. (Eversource 1, Vol. 1, Ex. B, pp. C-7, C-8)

Fish, Wildlife and Habitat

273. Both the 281 Railroad Avenue and 290 Railroad Avenue Substation locations are used for commercial proposes and do not contain sensitive environmental features such as wildlife habitat, wetlands, watercourses or woodlands. (Eversource 1, Vol. 1, Ex. A, p. B-1, B-14, Ex. B, p. B-2, C-9)

274. The Cos Cob Substation area provides minimal wildlife habitat, although ospreys and other birds may use the taller structures to perch or nest. (Eversource 1, Vol. 1, Ex. A, p. B-14)

275. No State listed endangered, threatened or special concern species would be impacted by construction of the Project. (Eversource 1, Vol. 1, Ex. B, p. B-9, Vol. 2, App. 3)

276. Two federally-listed threatened species occur within the general area of the Project; the northern long-eared bat (NLEB) and the red knot, a shorebird. There are no known NLEB hibernacula or known maternity roost trees in close proximity to the Project area and adverse impacts to the NLEB are not anticipated. The red knot is found along the coastline, mostly in the intertidal zone where it forages for food or on barrier islands. Neither habitat type would be affected by the Project. (Eversource 1, Vol. 1, Ex. B, p. B-10, C-9)

277. The proposed Project would not impact any DEEP designated critical habitats. (Eversource 1, Vol. 1, Ex. A, p. B-14, Ex. B, p. B-9)

278. The proposed Project would not affect any DEEP Fisheries Management Areas. The nearest designated fishery area is associated with the Mianus River, approximately 1.2 miles northeast of the Cos Cob Substation. (Eversource 1, Vol. 1, Ex. A, p. B-16, Ex. B, pp. B-10, C-10)

279. The Project underground transmission line route would follow existing roadways adjacent to developed commercial, residential, transportation, and parkland uses. (Eversource 1, Vol. 1, Ex. A, p. B-3, Fig. B-3, Ex. B, p. C-9)

280. Use of the roadways within the park would lessen the impact on species that inhabit park grounds. (Tr. 2, p. 186)

Historic and Archeological Resources

281. No historic resources would be affected by construction of the Project. Due to previous impacts to subsurface areas, the Project would have a low probability of affecting subsurface archeological deposits. (Eversource 1, Vol. 1, Ex. A, p. C-10, Ex. B, pp. B-11, C-10, C-11)

Statutory Facilities

282. The Project area contains numerous statutory facilities that are defined under C.G.S § 16-50p(a)(3)(D) to include residential areas, private or public schools, licensed child day care facilities, licensed youth camps or public playgrounds. (Eversource 1, Vol. 1, Ex. A, p. B-17, Ex. B, p. B-12, Vol. 2, Ex. 11)

283. The 290 Railroad Avenue Substation site is approximately 560 feet north of the Boys & Girls Club of Greenwich at 4 Horseneck Lane. The substation site predominately abuts commercial uses with the exception of a residential/commercial building located on the north side of Railroad Avenue, across from the site. (Eversource 1, Vol. 1, Ex. A, pp. B-17, C-12)

284. The 281 Railroad Avenue Substation is approximately 480 feet north of the Boys & Girls Club of Greenwich at 4 Horseneck Lane. The site abuts developed residential areas to the east and west. (Eversource 1, Vol. 2, Ex. 11)

285. The Cos Cob Substation expansion area would remain on Eversource and State of Connecticut property and would not affect recreational facilities in Cos Cob Park. (Eversource 1, Vol. 1, Ex. A, p. B-2)

286. The Project transmission line route would be installed within existing roadways adjacent to residential areas and through Bruce Park. It would be approximately 375 feet north of The Boys & Girls Club of Greenwich where it extends along Railroad Avenue and 225 feet east of a child daycare within the Putnam Indian Field School at 101 Field Point Road. (Eversource 1, Vol. 1, p. B-12, Vol. 2, Ex. 11)

287. Construction of the transmission line route within Bruce Park roadways is not expected to require the removal of any trees. Tree trimming, when necessary, would be conducted in consultation with the Town arborist. (Tr. 3, pp. 238-239)

288. Trees that overhang the perimeter substation fence would be trimmed as necessary. Trees that are deemed a hazard to the substation would be removed. (Eversource 12, response 67)

289. Under the FERC Guidelines, clearing of natural vegetation should be limited to that which poses a hazard to the transmission line and determination of a hazard in critical areas, such as a park, should be a joint endeavor of the utility company and the land manager consistent with the National Electric Safety Code and other electric safety and reliability requirements. (Council Administrative Notice 9)

290. The original Project route through Bruce Park would have disturbed recreational park areas and used fluid filled piping beneath water resources. The Modified GSLP follows the existing roadways through the park to the extent practical, lessening disturbance on park lawn and recreational areas. The cable is solid, not containing any fluids that could leak if the cable was compromised. (Tr. 2, pp. 154-155)

291. The Town requests that the Project be constructed within the park in a way that is safe for the public and not detrimental to the aesthetics or use of the park. (Tr. 3, p. 141)

292. Eversource has worked with the Town to lessen the impact on the park and would continue to develop the logistics of the Project with the Town prior to and during construction. (Tr. 2, pp. 184-188)

293. Construction and operation of the Project would have no long term permanent effects on adjacent statutory facilities. Temporary effects would include the disruption of land use such as park and recreation facilities proximate to construction activities. (Eversource 1, Vol. 1, p. C-12, Vol. 2, pp. C-12, C-13)

294. A fully-enclosed indoor substation would have less visual impact than an open-air substation. (Eversource 14, Response Town 82)

Air Quality

295. Construction of the Project would have short-term, localized effect on air quality, mostly from dust and equipment emissions. In order to minimize dust, Eversource would limit the extent of exposed/disturbed areas and install temporary gravel tracking pads wherever necessary to prevent dirt from being tracked onto public roadways. Water may be used to control dust emissions, as needed. (Eversource 1, Vol. 1, Ex. A, p. C-12)

296. Construction vehicle emissions would be limited by requiring contractors to properly maintain construction equipment and vehicles, and by minimizing the idling time of diesel construction equipment in accordance with DEEP regulatory standards. (Eversource 1, Vol. 1, Ex. B, p. C-13)

Noise

297. The existing noise environment along the Project route is dominated by urban noise related to local and highway traffic, the MNRR rail corridor and residential and commercial land uses. (Eversource 1, Vol. 1, Ex. B, p. B-11)

298. Pursuant to R.C.S.A. §22a-69-1.8(h), noise created from construction activities is exempt from the State Noise Control Regulations. (Eversource 1, Vol. 1, Ex. B, p. C-12)

299. Post-construction noise from the new substations would be predominately from the new transformers. Additional noise would originate from infrequent switching and circuit breaker operations. (Eversource 1, Vol. 1, Ex. A, p. C-11, Ex. B, p. C-12)

300. Post-construction noise levels adjacent to the 290 Railroad Avenue open air substation would not exceed regulatory levels at abutting commercial properties (62 dBA) or abutting residential properties (55 dBA daytime/45 dBA nighttime). (Eversource 1, Vol. 1, Ex. A, p. C-11)

301. Post-construction noise levels adjacent to the 281 Railroad Avenue "indoor substation" would not exceed regulatory levels at abutting commercial properties (62 dBA) or abutting residential properties (55 dBA daytime/45 dBA nighttime). The transformer firewalls and a sound attenuation baffle installed along the north edge of the roof opening above the transformers would mitigate sound levels at adjacent

residential properties. (Eversource 1, Vol. 1, Ex. B, p. C-12; Eversource 1, Vol. 2, App. 9; Eversource 2, response 54)

302. A fully-enclosed indoor substation would be significantly more effective at reducing sound levels from substation equipment than an open air substation surrounded by a brick wall. (Eversource 14, Response Town 82; Tr. 2, pp. 84-85)

303. An emergency generator would operate during emergencies such as "black out" conditions. The emergency generator would also operate occasionally for maintenance and testing purposes during normal business hours. According to R.C.S.A. §22a-69-1.8, noise created as a result of, or relating to, an emergency, such as an emergency backup generator, is exempt from the State Noise Control Regulations. (Eversource 1, Vol. 1, Ex. B, p. C-12)

304. Post-construction noise at the Cos Cob Substation would not increase current steady state noise emissions. (Eversource 1, Vol. 1, Ex. A, p. C-12)

Public Safety

305. The proposed 290 Railroad Avenue open air substation would be enclosed by a 15-foot tall perimeter brick wall. The wall would serve as both a security fence and as a fire barrier. (Eversource 1, PFT, p. 9; Tr. 4, p. 45)

306. The proposed 281 Railroad Avenue "indoor substation" would have outer doors and roll up gates, preventing access. The exterior siding of the substation would be fireproof. (Eversource 1, Vol. 2, App. 9; Eversource 2, response 44)

307. A fully-enclosed indoor substation would have a higher level of security than an open air substation. (Eversource 14, Response Town 82)

308. The transformers at both substations would be enclosed by firewalls that extend slightly above the top of the transformers. (Eversource 1, Vol. 2, App. 4, App. 9)

309. The indoor substation would be designed in accordance with applicable safety codes. Additional training for Town emergency responders would be necessary to ensure safe entry into the indoor substation and for proper response to certain emergencies. (Tr. 2, pp. 49-50)

310. The indoor substation would feature heat detectors and water and chemical fire suppression systems. The type of system would depend on the components being protected as well as the on-site drainage system's ability to contain released water. (Tr. 2, pp. 50-51)

311. A pole-mounted transformer caught fire in June 2015 at the Cos Cob Substation. The fire was localized to the pole-mounted transformer. Protective systems de-energized the transformer and adjacent bus. The fire did not affect operation of Eversource's large bulk power transformers, DOT's MNRR transformers or equipment within an adjacent NRG substation. (Eversource 2, response 56; Tr. 2, pp. 52-53)

312. Emergency response to a substation requires an Eversource representative to be on-site to properly de-energize system components to ensure safety of the local emergency responders. Eversource's response time to the Cos Cob substation for the June 2015 pole-mounted transformer fire was over an hour. Since that time, Eversource has modified personnel dispatch times and has altered worker shifts to ensure there is more timely response to emergency calls at substations. (Tr. 2, pp. 53-55)

313. There are no codes that would prevent an open air substation at from being constructed at 290 Railroad Avenue, adjacent to the AIRGAS commercial property. (Tr. 2, pp. 58-61, 126; Tr. 3, pp. 244-245)

314. In December 2009, President Obama proclaimed power grids as critical infrastructure vital to the United States. The Department of Homeland Security, in collaboration with other federal stakeholders, state, local, and tribal governments, and private sector partners, has developed the National Infrastructure Protection Plan to establish a framework for securing our resources and maintaining their resilience from all hazards during an event or emergency. (Council Administrative Notice 3)

315. On February 12, 2013, President Obama signed Executive Order 13636 on Improving Cyber Security for Critical Infrastructure, along with an accompanying Presidential Policy Directive on Critical Infrastructure Security and Resilience. The order established the U.S. policy to "enhance the security and resilience of the nation's critical infrastructure." The Secretary of Homeland Security has been given the overall responsibility for critical infrastructure protection, and identifies the Department of Energy as the sector-specific agency responsible for the energy sector. The Department of Energy may draw upon the North American Electric Reliability Corporation's (NERC) expertise. (Council Administrative Notice 4; Council Administrative Notice 58)

316. NERC developed Physical Security Reliability Standard CIP-014-1 to address threats and vulnerabilities to the physical security of critical infrastructure on the bulk power system. CIP-014-1 consists of standards and requirements related to security of electronic perimeters, protection of critical cyber assets including personnel, training, security management and disaster recovery planning. CIP-014-1 requires transmission owners to deploy systems for monitoring security events and to have comprehensive contingency plans for cyberattacks, natural disasters and other unplanned events. (Council Administrative Notice 8; Council Administrative Notice 58, p. 9)

Electric and Magnetic Fields

317. 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. In North America, electric utilities provide power at 60 hertz (oscillates 60 times per second). (Council Administrative Notice Item 27; Eversource 1, Vol. 1, Ex. A, p. D-1)

318. Electric fields result from voltages applied to electrical conductors and equipment. Appliances within homes and the workplace are the major sources of electric fields indoors, and power lines are the major sources of electric fields outdoors. EF levels decrease rapidly with distance from the source, diminishing even faster when interrupted by conductive materials, such as buildings and vegetation. The scientific community does not regard EF levels to be a concern to the general public and thus studies of health effects from electrical transmission lines and equipment has focused on MF. (Council Administrative Notice Item 27; Eversource 1, Vol. 1, Ex. A, p. D-1)

319. Magnetic fields are produced by the flow of electric currents. The level of a magnetic field is commonly expressed as magnetic flux density in units called gauss, or in milliGauss (mG). The magnetic field level at any point depends on characteristics of the source, which can include the arrangement of conductors, the amount of current flow through the source, and its distance from the point of measurement. MF levels decrease rapidly with distance from the source but are not easily interrupted as they pass through most materials. ((Council Administrative Notice Item 27; Eversource 1, Vol. 1, Ex. A, p. D-1)

320. In the United States, no state or federal exposure standards for 60-hertz MF based on demonstrated health effects have been established. Nor are there any such standards established world-wide. However, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) has established a level of 2,000 mG, based on extrapolation from scientific experimentation, and the International Committee on

Electromagnetic Safety (ICES) has calculated a guideline of 9,040 mG for exposure to workers and the general public. (Council Administrative Notice Item 27; Eversource 1, Vol. 1, Ex. A, p. D-1)

321. 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 Administrative Notice Item 27; Eversource 1, Vol. 1, Ex. A, p. D-1)

322. In accordance with the Council's EMF BMPs, Eversource is required to provide an analysis of recent scientific literature regarding MF exposure, an analysis of pre and post construction MF levels, and develop a Field Management Design Plan and associated MF reduction strategies in areas of particular interest, as long as such designs do not compromise system reliability or worker safety, or environmental and aesthetic project goals. (Council Administrative Notice Item 27)

323. Eversource has complied with the Council's EMF BMP by reviewing recent scientific literature and exposure standards related to MF in Docket 461, provided pre- construction measurement and post construction calculations, and reviewed the need for a Field Management Design Plan with MF reduction strategies. (Council Administrative Notice Item 27; Eversource 1, Vol. 1, Ex. A, p. D-19)

324. The existing distribution lines are the major source of MF in the project area. For example, measurements of existing MF collected near 281 Railroad Avenue range from 3.7 to 9.3 mG. Another source is the MNRR where measurements collected at the Indian Field Road overpass range from 1.5 to 23.1 mG. (Eversource 1, Vol. 1, Ex. A, pp. D-4, D-5, Ex. B, p. D-1)

325. MF from the Project underground transmission line during average annual load would be a maximum of 6.7 mG directly above the duct bank within the road, decreasing to 0.6 mG along the edge of the road. For splice vault locations, the MF would be a maximum of 28.7 mG above the vault decreasing to 8.1 mG along the edge of the road. (Eversource 1, Vol. 1, Ex. B, p. D-1)

326. MF for the transmission line installed within the optional pedestrian bridge over Indian Harbor would be 49.4 mG directly above the bridge travel surface during average annual load conditions. (Eversource 10a, pp. D-4)

327. Transformers and other equipment at the Cos Cob Substation and proposed Greenwich Substation are potential EMF sources. These sources, however, would be expected to cause little or no exposure to the general public because the strength of fields from typical substation equipment decreases rapidly with distance and reaches very low levels at relatively short distances beyond the substation perimeter. The exception to the normally low levels of EMF associated with substations is where transmission and distribution lines enter the substation. (Council Administrative Notice 43, FOF #456)

Project Cost and Cost Allocation

328. The estimated costs of the Modified GSLP with certain variations are summarized below :

a) Transmission line with pipe jacking and coffer dam installation to 281 Railroad Avenue - Indoor Substation is approx. $99.4 million.

b) Transmission line with pipe jacking and coffer dam installation to 290 Railroad Avenue - Open Air Substation is approx. $97.8 million.

c) Transmission line with the pipe jacking and coffer dam installation to 290 Railroad Avenue - Indoor Substation is approx. $99.2 million

The Table below presents a breakdown of the Modified GSLP with variations. Please note the "XLPE AMP Route" cost includes attachment to the Indian Field Road overpass (DOT is opposed) and the pedestrian bridge over Indian Harbor:

Component	Currently Proposed GSLP (XLPE AMP Route) - Term at 281 RR Ave (Pole Yard)	Currently Proposed GSLP (XLPE AMP Route)- Term at 290 RR Ave (Pet Pantry)
Transmission Line	$52,515,678	$53,415,678
Cos Cob Modifications / Distribution upgrades (incl Prospect)	$18,208,282	$16,512,750
New Greenwich S/S	$28,992,801	$28,136,749
Total	**$99,716,761**	**$98,065,177**
Project Component	**Additional Cost to GSLP**	**Additional Cost to GSLP**
Pipejacking Underneath I-95 (Vol 1, Ex. B, sec. A.5.1.1)	$1.5M	$1.5M
Architectural Building to replace wall enclosure	$0 (incl)	$1.4M
Project Component	**Reduced Cost to GSLP**	**Reduced Cost to GSLP**
Cofferdam Variation (Vol 1, Ex. B, sec. A.4)	$1.8M	$1.8M
Wall Enclosure only - no architectural building	$1.2M	$0 (incl)

(Eversource 14, response 69)

329. Costs of the Project would be recovered through regionalized and localized cost allocation. Project costs are regionalized among the ISO-NE states if the project will improve reliability and provide a benefit throughout the New England region. A State's share of the regionalized costs is proportionate to its electricity demand. Project costs, or portions of project costs, are localized if they do not provide a regional reliability benefit and are typically recovered through local transmission and distribution rates of the transmission owner. (Eversource 2, response 59)

330. The Cos Cob Substation modifications are considered to be ISO-NE Pool Transmission Facilities (PTF) and as such, costs would be regionalized with Connecticut ratepayers responsible for approximately 20 percent of the costs. (Eversource 2, response 4)

331. The 115-kV transmission lines are non-PTF and costs would be recovered through Eversource's Local Network Service rates with Connecticut ratepayers responsible for approximately 60 percent of the cost. (Eversource 2, response 4; Tr. 2, pp. 115-117)

332. Distribution costs -bulk power transformers and switchgear at the new Greenwich Substation and the 13.2-kV interconnection - would be recovered 100 percent from Connecticut ratepayers. (Eversource 2, response 4; Tr. 2, pp. 115-117, 157-158)

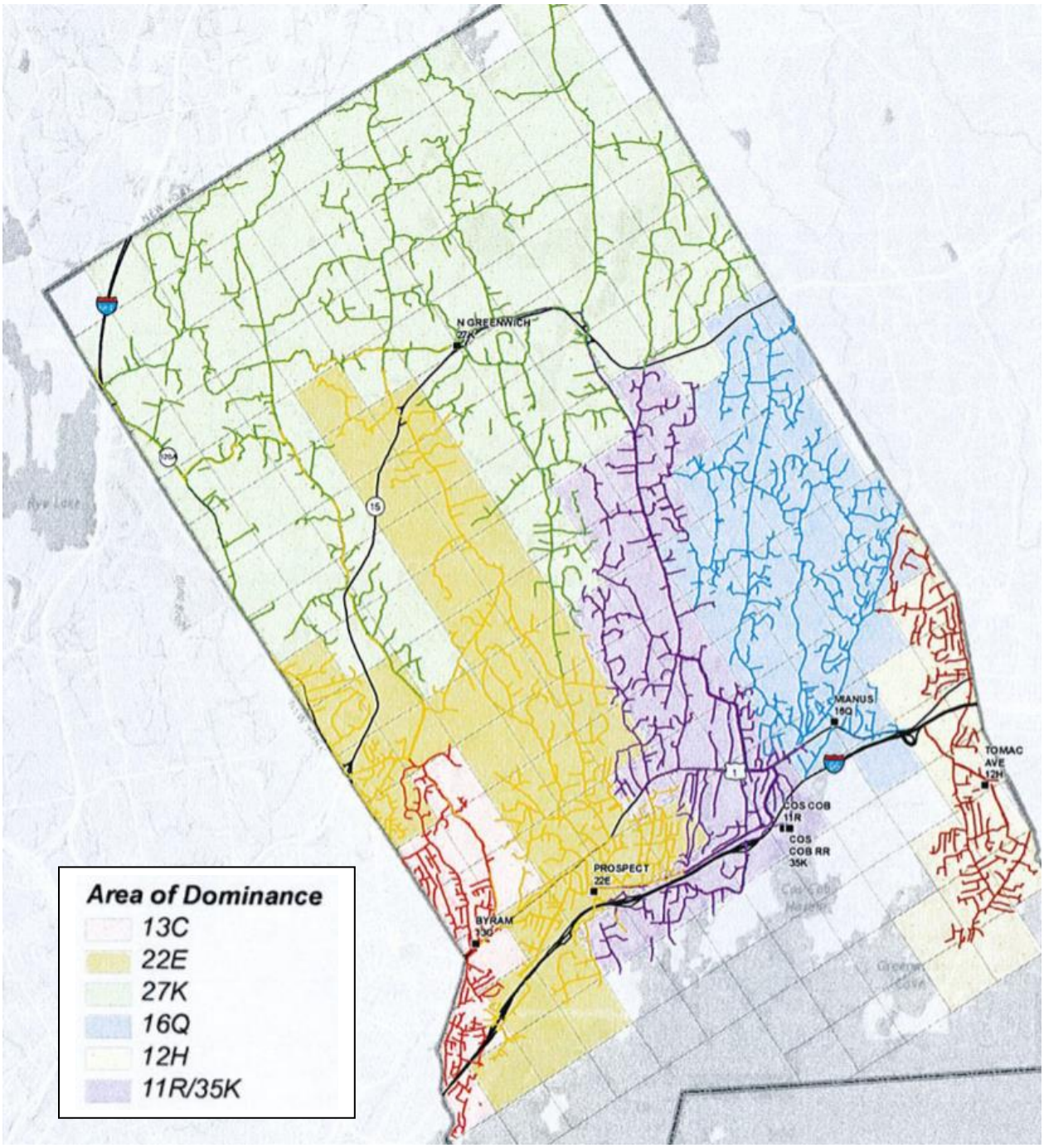
333. Distribution costs for the 281 Railroad Avenue site are slightly higher than the 290 Railroad Avenue site (approx. $1.7 million) since the feeder connection is slightly longer (approx. 250 feet). (Tr. 2, p. 125, 178-179)

334. A breakdown of the approximate cost allocation for the AMP (Indoor Substation at 281 Railroad Ave, Field Point Rd. Bridge Attachment, pedestrian bridge crossing over Indian Harbor), is summarized in the chart below:

Project Estimates		GSLP Cost Component Allocation		
Project Component	**Currently Proposed GSLP**	**Transmission PTF (regional)**	**Transmission non-PTF (Network Service)**	**Distribution**
Transmission Line	$52,515,678		$52,515,678	
Greenwich Substation	$28,992,801			
Transmission Component	$12,291,549		$12,291,549	
Distribution Component	$16,701,252			$16,701,252
Cos Cob Substation	$12,669,170	$12,669,170		
Prospect Substation Modifications	$952,837			$952,837
Distribution Feeder Relocation	$4,586,275			$4,586,275
Project Total	**$99,716,760**	**$12,669,170**	**$64,807,227**	**$22,240,364**
Project Estimates		**Rate Impact**		
Percent of Project	100.00%	12.71%	64.99%	22.30%
CL&P Customer - % of Load		19.42%	60.44%	100.00%
Estimated Annual Retail Cost to CL&P Customers	9,849,000	$ 418,000	$ 5,719,000	$ 3,712,000
Average CL&P Retail Rate ($/kWh)	$ 0.000441	$ 0.000019	$ 0.000256	$ 0.000166
Estimated Average Monthly Impact to 700 kWh CL&P Retail Customer	**$ 0.309**	**$ 0.013**	**$ 0.179**	**$ 0.116**

(Eversource 14, response 63)

Attachment 1 – Approximate Substation Service Territories



13C = Bryam
27K =North Greenwich
12 H = Tomac
22E = Prospect
16Q = Mianus
11R/35K = Cos Cob

(Eversource 14, response 79)

Attachment 2: Project Route

(Eversource 1, Vol. 1, App. B, Fig. A-1)

Attachment 3

Distribution Alternatives Analyzed			
Distribution Alternatives	Scope	Explanation for Dismissal	Cost[1]
Distribution Option 1: Reconductoring of existing feeders from Cos Cob to Existing Prospect SS	*Reconductor four (4) existing underground feeders from Cos Cob to Existing Prospect SS *Feeders would be reconductored from 500 kcmil Cu to 750 kcmil Cu	*Due to the length and impedance differences of the parallel feeders, the upgraded feeders continue to be overloaded. To avoid overload in contingency, the normal load on the feeders must be reduced. Because of this fatal flaw, no cost estimate for this option was developed	N/A
Distribution Option 2: Addition of fifth feeder from Cos Cob to Existing Prospect SS	*Addition of fifth feeder from Cos Cob to Existing Prospect SS in an underground configuration utilizing 1000 kcmil Cu conductor	*Addition of a fifth feeder did not alleviate overloads on other feeders due to the length and impedance differences of the parallel feeders. Because of this fatal flaw, no cost estimate for this option was developed	N/A
Distribution Option 3: Two Feeders from Cos Cob to Byram & New Prospect S/S	*Install (2) 27.6-kV feeders from Cos Cob Substation to Byram Substation in an underground/overhead configuration. The overhead portion would utilize 750 AL aerial insulated cable for 3.5 miles, while the underground portion would utilize 1000 kcmil Cu conductor for 0.7 miles *Add 27.6-kV switchgear at Cos Cob Substation to accommodate new feeders. *Reconfigure existing feeders *Build new 27.6/13.2-kV Substation on Railroad Ave; Install two 80 MVA 27.6/13.2-kV transformers *Remove existing Prospect Substation *Upgrade two transformers at Byram Substation from 12.5 MVA to 25 MVA.	*This configuration does not avoid loss of load in the event of loss of two or more transformers at Cos Cob. The loss of load in that event could be up to 92% of the Cos Cob 27.6 kV system *In addition, in order to reconfigure the 27.6 kV design at Cos Cob, a new bulk substation is needed	$102M
Distribution Option 4: Four feeders from Cos Cob SS to Prospect SS	*Install (4) 27.6-kV feeders from Cos Cob SS to New Prospect SS in an underground configuration utilizing 1000 kcmil Cu Conductor for approximately 3 miles *Build new 27.6/13.2-kV indoor substation on Railroad Ave with two 80 MVA transformers *Reconfigure existing 2-27.6-kV feeders and 7-13.2kV feeders from Prospect to the new substation *Reconfigure and up-grade the existing 13.2-kV feeders that currently initiate at Byram SS and existing Prospect SS to initiate at the new Prospect SS *Re-route and up-grade existing 11R58 27.6-kV feeder to new Prospect SS *Remove existing Prospect *Remove existing Byram	*This configuration does not avoid loss of load in the event of loss of two or more transformers at Cos Cob. The loss of load in that event could be up to 92% of the Cos Cob 27.6 kV system *In addition, in order to reconfigure the 27.6 kV design at Cos Cob, a new bulk substation is needed	$122M
Distribution Option 5: Two Feeders from Cos Cob to Byram, One Feeder from Cos Cob to New Prospect S/S	*Install (2) 27.6-kV feeders from Cos Cob to Substation to Byram Substation and install (1) 27.6-kV feeder from Cos Cob Substation to New Prospect Substation in an underground configuration utilizing 1000 kcmil Cu conductor for 4.6 miles. All feeders would utilize the same ductbank *Add 27.6-kV switchgear at Cos Cob Substation to accommodate new feeders. *Reconfigure existing feeders *Build a new 27.6/13.2-kV Substation on Railroad Ave; Install two 80 MVA 27.6/13.2-kV transformers *Remove existing Prospect *Upgrade two transformers at Byram Substation from 12.5 MVA to 25 MVA.	*This configuration does not avoid loss of load in the event of loss of two or more transformers at Cos Cob. The loss of load in that event could be up to 92% of the Cos Cob 27.6 kV system *In addition, in order to reconfigure the 27.6 kV design at Cos Cob, a new bulk substation is needed	$109M
Distribution Option 6: Three Feeders from Waterside to New Prospect S/S	*Install (3) 27.6-kV feeders from Waterside Substation to New Prospect Substation in an underground configuration utilizing 1000 kcmil Cu conductor for 6.2 miles *Waterside Substation Modifications; expand 115-kV ring bus and add two 115/27.6-kV transformers and switchgear *Build a new 27.6/13.2-kV Substation on Railroad Ave; Install three 25 MVA 27.6/13.2-kV transformers *Remove four 27.6/13.2-kV transformers and 13.2-kV switchgear at Existing Prospect *Upgrade two transformers at Byram Substation from 12.5 MVA to 25 MVA.	*This option was dismissed for the following reasons: **Significantly higher cost compared to other alternatives **This configuration does not avoid loss of load in the event of loss of two or more transformers at Cos Cob. The loss of load in that event could be up to 39% of the Cos Cob 27.6 kV system	$163M

Attachment 3 (cont.)

Distribution Option 7: Fifth Feeder from Cos Cob to New Prospect S/S & Three Feeders from Cedar Heights to North Greenwich	*Add a fifth 27.6-kV feeder from Cos Cob Substation to New Prospect Substation in an underground configuration utilizing 1000 kcmil Cu conductor for 3.1 miles *Install (3) 27.6-kV feeders from Cedar Heights Substation to North Greenwich Substation in an underground configuration utilizing 1000 kcmil Cu conductor for 10.3 miles *Install one 115/27.6-kV transformer and switchgear at Cedar Heights Substation *Build new 27.6/13.2-kV Substation on Railroad Ave; Install three 25 MVA 27.6/13.2-kV transformers *Remove existing Prospect Substation *Upgrade two transformers at Byram Substation from 12.5 MVA to 25 MVA *Rebuild two 115-kV circuits from Cedar Heights Substation to Glenbrook Substation in an underground configuration utilizing 1000 kcmil Cu conductor for 4.9 miles	*This option was dismissed for the following reasons: **Significantly higher cost compared to other alternatives **This configuration does not avoid loss of load in the event of loss of two or more transformers at Cos Cob. The loss of load in that event could be up to 38% of the Cos Cob 27.6 kV system ** Community impact, which includes acquiring multiple easements, expansion of Cedar Heights Substation	$303M
Distribution Option 7A Variation: Fifth Feeder from Cos Cob to New Prospect S/S & Three Aerial Feeders from Cedar Heights to North Greenwich	*Addition of a fifth 27.6-kV feeder from Cos Cob Substation to New Prospect Substation in an underground configuration utilizing 1000 kcmil Cu for 3.1 miles *Install (3) 27.6-kV feeders from Cedar Heights Substation to North Greenwich Substation in an underground/overhead configuration. The underground portion would utilize 1000 kcmil Cu conductor for 3.1 miles, while the overhead portion would utilize 750 AL aerial insulated cable for 7.2 miles *Rebuild two 115-kV circuits from Cedar Heights Substation to Glenbrook Substation in an underground configuration utilizing 1000 kcmil Cu conductor for 4.9 miles *Expand Cedar Heights Substation, install two 115kV-27.6kV transformers and add two (2) 13.2-kV Feeder Positions *Build new 27.6/13.2-kV Substation on Railroad Ave; Install three 25 MVA 27.6/13.2-kV transformers *Upgrade two transformers at Byram Substation from 12.5 MVA to 25 MVA *Remove existing Prospect Substation	*This option was dismissed for the following reasons: **Significantly higher cost compared to other alternatives **This configuration does not avoid loss of load in the event of loss of two or more transformers at Cos Cob. The loss of load in that event could be up to 38% of the Cos Cob 27.6 kV system ** Community impact, which includes acquiring multiple easements, expansion of Cedar Heights Substation	$253M
Notes			
1	The above estimated costs were rough "order of magnitude" costs developed in the fall of 2016 for use in comparing the various conceptual distribution solutions against one another and against the estimated transmission costs. Since these comparisons were made, the estimated costs for the PMP and AMP have been refined		