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May 17, 2024

Melanie Bachman, Esq.
Executive Director
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

Re: Petition No. 1605 - Hartford Underground Cable Replacement Project

Dear Attorney Bachman,

This letter provides an original and 15 copies of the responses to the requests for information listed below:

Responses to CSC-002 Interrogatories, dated March 11, 2024
CSC-002-43 through CSC-002-50.

Sincerely,

A handwritten signature in blue ink, appearing to read "Kathleen M. Shanley".

Kathleen M. Shanley
Manager – Transmission Siting

Date Filed: May 17, 2024

Request from: Connecticut Siting Council

Question: 43

Did Eversource consider high pressure gas filled (HPGF) cables as an alternative? If so, why was such alternative rejected? If HPGF was rejected on the basis of cost, provide the total estimated cost of an HPGF alternative to the proposed Project.

Response:

Eversource did not consider HPGF cables as an alternative. Cross linked polyethylene ("XLPE") type cables are a utility industry standard for modern underground transmission line installations. HPGF cables are an outdated technology with many similar drawbacks to HPFF cables when compared to XLPE, such as a scarcity of manufacturers of cables, system components, and replacement parts, fewer contractors doing maintenance and repair of HPGF cables, as well as a more costly maintenance procedure. Eversource does not have any HPGF cables in Connecticut. Eversource is replacing HPGF cables in Massachusetts with XLPE

Date Filed: May 17, 2024

Request from: Connecticut Siting Council

Question: 44

Provide the estimated life cycle costs of the proposed cable replacement Project based on the three primary cost components from the Council's 2022 Life Cycle Report: first costs, operations and maintenance costs and electrical loss costs. Include the net present value totals of these three components and any assumptions.

Response:

Please see table, below.

Eversource Energy - 1704 & 1722 Life Cycle Costs		
Life-Cycle Cost Components - Estimated Underground Construction		
Costs/ Typical Mile		
First Costs		
Net Present Value	1704	1722
	Single Circuit	Single Circuit
Ducts & Vaults	\$16,309,576	\$12,714,875
Cable & Hardware	\$7,516,065	\$8,635,942
Site Work	\$3,541,974	\$6,353,073
Construction	\$11,577,604	\$16,261,643
Engineering	\$951,230	\$1,215,947
Sales Tax (X %)	\$0	\$0
Project Management	\$2,889,025	\$2,333,968
Totals	\$42,785,474	\$47,515,448

Operations & Maintenance, and Loss Costs		
Annual O&M Cost (Per Mile)	\$8,560	\$8,560
Average Annual Loss Costs (Per Mile)	\$3,416	\$1,232
Totals	\$11,976	\$9,792

Electrical, Loss and Cost Assumptions		
Value	XLPE 115-kV	XLPE 115-kV
Cable Size & Type - 1 conductor per phase	5000 kcmil XLPE	5000 kcmil XLPE
Cable Resistance (Ω /mile)	0.016	0.016
Peak Line Current (Amps)	646	502
Load Growth	2.10%	2.10%
Load Factor	0.44	0.34
Energy Cost (\$/MWh)	\$100	\$100
Energy Cost Escalation	4.1%	4.1%

Note: Line 1704 is 3.84 miles. Line 1722 is 2.95 miles.

Assumptions:

- Peak Line Current and Load Factor are averages based on actual loads on the cable during the last 10 years.
- Load growth is based on 2024-2033 forecast information from the Independent System Operator – New England's 2024 Capacity Energy Loads and Transmission Report.

Date Filed: May 17, 2024

Request from: Connecticut Siting Council

Question: 45

Referencing response to Council interrogatory 6, given the proposed plans to replace the HPFF cables with cross-linked polyethylene (XLPE) cables, explain why the conductor size increased from 3000 kcmil to 5000 kcmil? Are the cables functionally equivalent in terms of capacity, or does the XLPE design have slightly higher capacity?

Response:

The conductor size increased from 3000 kcmil to 5000 kcmil and the conductor material changed from aluminum to copper to obtain operating ratings that are sufficient to serve the anticipated transmission system needs during the expected life of the cable. Additionally, Eversource has worked to standardize conductor sizes in an effort to maximize efficiencies with splice and termination repair kits. The proposed XLPE cables have a higher capacity as described in the Company's response to Council interrogatory 18.

Date Filed: May 17, 2024

Request from: Connecticut Siting Council

Question: 46

In the event that higher capacity cables than currently proposed are installed, what would the approximate capacity be (as compared to proposed capacity in response to Council interrogatory 18)? What would the incremental cost be relative to the proposed Project?

Response:

If higher capacity cables were required that are greater than the proposed single copper (Cu) cable per phase, Eversource would explore a design with two aluminum (Al) cables per phase. This would increase the size of the duct bank by approximately 70%, consequently requiring additional design considerations that may affect the alignment. Assuming 10 feet of cover above the duct bank, the potential capacity would be approximately 20% greater than that of a single copper cable per phase circuit yielding the following ratings:

1704 cable ratings (2 cables per phase Al): Normal: 317 MVA¹, LTE: 518 MVA, STE: 1224 MVA.

1722 cable ratings (2 cables per phase Al): Normal: 367 MVA, LTE: 518 MVA, STE: 1222 MVA.

Compared to the ratings of the proposed cables:

1704 cable ratings (1 cable per phase Cu): Normal: 264 MVA, LTE: 432 MVA, STE: 1020 MVA.

1722 cable ratings (1 cable per phase Cu): Normal: 307 MVA, LTE: 432 MVA, STE: 1018 MVA.

The actual increase in capacity would be affected by factors along the alignment such as depth of installation, adjacent heat sources from other underground facilities, and thermal resistivity of the soil surrounding the cables. Due to a number of variables, the resulting incremental cost is estimated to be between 20 and 50 percent greater than the proposed cables. This range is heavily influenced by the larger duct bank and splice vaults, which may necessitate significant deviations and utility relocations to accommodate installation.

1. MVA: Megavolt Ampere; LTE: Long Time Emergency; STE: Short Time Emergency

Date Filed: May 17, 2024

Request from: Connecticut Siting Council

Question: 47

Referencing the response to Council interrogatory 15, and assuming an estimated replacement cable cost of approximately \$40 million per mile as noted in response to Council interrogatory 13, why is the 1704 Line Colt Park Deviation incremental cost projection of about \$410k approximately one-half of the cost of a 100-foot long segment that would cost approximately \$758k based on its length?

Response:

Eversource utilizes \$40 million per mile as a high-level estimate for conceptual design and estimating purposes. This encompasses the physical construction and material costs, as well as the engineering, siting, permitting, outreach, utility relocations, trenchless crossings and other project costs. For the specific deviation in Colt Park, Eversource was able to provide a detailed cost estimate of the incremental materials and construction labor. Other incremental costs for engineering, siting, and outreach are negligible for this specific small deviation.

Date Filed: May 17, 2024

Request from: Connecticut Siting Council

Question: 48

Referencing the response to Council interrogatory 16, generally, which portions of the Project are associated with the \$1.4 million in non-Pool Transmission Facility costs?

Response:

The costs associated with the decommissioning and in-place retirement of the Capital District Energy Center Cogeneration Associates transmission line tap comprise the costs of the non-Pool Transmission Facilities included within the Project scope.

Date Filed: May 17, 2024

Request from: Connecticut Siting Council

Question: 49

Referencing the response to Council interrogatory 24, are there other methods for retiring HPFF cables that does not include pressurized nitrogen requiring long term monitoring and maintenance?

Response:

Yes, there are two other methods for retiring HPFF cables that do not include pressurized nitrogen. These options include the injection of vapor corrosion inhibitors and soluble corrosion inhibitors. These technologies involve the injection of various chemicals in a water soluble phase or a vapor phase to create a coating on the surface of the metal to slow the oxidation process. These methods do not provide a mechanism to monitor the integrity of the pipe in real time. Eversource selected the pressurized nitrogen solution because in addition to preventing internal corrosion, a positive pressure is maintained. This positive pressure prevents contaminants from entering the pipe as well as alerting operations personnel if the pipe were to become compromised so it can be repaired. If the pipe develops a leak, the inert nitrogen would not result in any environmental contamination. Eversource also considered complete removal of the cable pipe system; however, that option was dismissed as prohibitively more expensive and disruptive to the environment, residents and businesses than other options.

Date Filed: May 17, 2024

Request from: Connecticut Siting Council

Question: 50

Referencing the response to Council interrogatory 11, provide a more detailed breakdown of each line replacement estimate based on the following components, and include any assumptions and approximate accuracy band:

- a. Engineering and Indirect
- b. Cable installation
- c. Duct bank installation
- d. Micro-tunneling
- e. Jack and Bore
- f. Substation work
- g. Commissioning
- h. Land Rights
- i. Environmental
- j. AFUDC
- k. Contingency

Response:

The overall estimate has an accuracy band of +/- 25%.

Assumptions:

- Labor estimates are based on a 10 hour workday, Monday through Saturday, (no premium or night work).
- Duct bank construction productivity is presumed to be 10-15 feet, per crew, per day (this presumed productivity reflects the impacts of underground utility congestion, traffic control measures and installation depth of duct bank).

Rounded (\$s in Millions)				
Item	Description	Total	Line 1722	Line 1704
A	Engineering and Indirect	\$32.80	\$11.86	\$20.94
B	Cable installation	\$50.19	\$21.09	\$29.11
C	Duct bank installation	\$153.14	\$65.98	\$87.17
D	Micro-tunneling	\$4.69	\$-	\$4.69

E	Jack and Bore	\$16.22	\$-	\$16.22
F	Substation work	\$18.92	\$10.10	\$8.81
G	Commissioning	\$3.19	\$1.59	\$1.60
H	Land Rights	\$8.94	\$8.57	\$0.37
I	Environmental	\$1.48	\$1.04	\$0.44
J	AFUDC	\$13.94	\$12.22	\$1.72
K	Contingency	\$12.29	\$5.35	\$6.94
Total		\$315.80	\$137.79	\$178.01

- Line 1722 is 2.95 miles long and Line 1704 is 3.84 miles long.