May 17, 2018

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

Re: Docket No. LIFE-CYCLE 2017

Dear Ms. Bachman:

This letter provides the response to requests for the information listed below.

Response to CSC-02 Interrogatories dated 04/26/2018
CSC-034, 035, 036, 037, 038

Very truly yours,

Kathleen Shanley
Manager
Transmission, Siting
As Agent for CL&P
dba EversourceEnergy

cc: Service List

CL&P dba Eversource Energy
Docket No. LIFE-CYCLE 2017

Witness: **Eversource Panel**
Request from: **Connecticut Siting Council**

Question:
Referencing Eversource's May 23, 2017 responses to questions 3 and 5 of the Council interrogatories, why is the load growth rate -0.07 percent for overhead transmission and -0.70 percent for underground transmission? If the load growth rates were intended to be the same, provide the correct load growth rate.

Response:
The correct load growth rate for both overhead transmission and underground transmission is -0.07%. Please see the revised UG table attached.

Eversource Energy - Typical UG Transmission Types

Life-Cycle Cost Components - Estimated Underground Construction Costs/ Typical Mile

First Costs	XLPE 115-kV	HPFF 115-kV	XLPE 345-kV	HPFF 345-kV
	Single Circuit	Single Circuit	Single Circuit	Single Circuit
Ducts & Vaults	$ 5,050,285	$ 3,498,986	$ 5,400,873	$ 3,501,991
Cable & Hardware	$ 4,143,127	$ 3,421,151	$ 4,947,648	$ 3,936,850
Site Work	$ 1,549,416	$ 1,548,327	$ 1,549,449	$ 1,549,657
Construction	$ 2,506,270	$ 2,129,280	$ 2,564,069	$ 2,156,749
Engineering	$ 1,324,910	$ 1,059,774	$ 1,446,204	$ 1,114,524
Sales Tax (X%)	$ -	$ -	$ -	$ -
Project Management	$ 927,437	$ 794,831	$ 1,084,653	$ 891,620
Totals	**$ 15,501,445**	**$ 12,452,349**	**$ 16,992,896**	**$ 13,151,391**

Typical Underground - Electrical Loss and Cost Assumptions

Value	XLPE 115-kV	HPFF 115-kV	XLPE 345-kV	HPFF 345-kV
Cable Size & Type	3000 kcmil XLPE	2500 kcmil HPFF	3000 kcmil XLPE	2500 kcmil HPFF
Resistance	0.0268	0.0317	0.0268	0.0317
Peak Line Current	1000	1000	1000	1000
Load Growth	-0.07%	-0.07%	-0.07%	-0.07%
Loss Factor	0.38	0.38	0.38	0.38
Energy Cost	$ 100	$ 100	$ 100	$ 100
Energy Cost Escalation	-4%	-4%	-4%	-4%

Life Cycle Cost Component

Value	XLPE 115-kV	HPFF 115-kV	XLPE 345-kV	HPFF 345-kV
Carrying Costs	$ 23,124,577	$ 18,576,030	$ 25,349,476	$ 19,618,835
O&M Costs	$ 188,087	$ 188,087	$ 188,087	$ 188,087
Cost of Losses	$ 221,217	$ 261,663	$ 221,217	$ 261,663
Total Life Cycle Costs	**$ 23,533,881**	**$ 19,025,780**	**$ 25,758,780**	**$ 20,068,585**

Witness: **Eversource Panel**
Request from: **Connecticut Siting Council**

Question:
Does the Loss Factor of 0.3800 vary (i.e. increase or decrease) over the 40 year life cycle, or is it assumed constant? Explain.

Response:
The loss factor is not assumed to vary over the life of the project. The loss factor is based on the statistical distribution of hourly loads over the course of the year, which is not expected to vary over the forty-year period.

CL&P dba Eversource Energy
Docket No. LIFE-CYCLE 2017

Data Request CSC-02
Dated: 04/26/2018
Q-CSC-036

Witness: **Eversource Panel**
Request from: **Connecticut Siting Council**

Question:
Is the Capital Recovery Factor (CRF) of 0.1251 the same for overhead and underground and assumed constant for the 40 years?

Response:
It is the same for both overhead and underground construction and is assumed to be constant for the 40 year period.

Witness: **Eversource Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Eversource's May 23, 2017 responses to questions 3 and 5 of the Council interrogatories and the appendix of the Life-Cycle 2012 Report (2012 LC Report) dated November 15, 2012 on the Council's website under "Publications." Provide the complete Cost of Losses calculations for the four overhead configurations and the four underground configurations identified in the responses to questions 3 and 5, dated May 23, 2017. For example, provide a sample first year loss calculation similar to page APPDX-25 of the 2012 LC Report for each configuration, and provide the "Losses" column data for years 1 through 40 similar to pages APPDX-9 through APPDX-16 of the 2012 LC Report. Please utilize the load growth rate(s) determined in response to question 34.

Response:
Please see attached tables.

EVERSOURCE

Overhead Transmission Line Life Cycle Cost Calculator

Project Information		Finance Information		
Project Name	115-kV Delta Monopole	**Cost of Electricity**	$ 100.00	($/MWh)
Circuit Number	CSC 2017 LCC	**Construction FC Rate**	12.51%	%
Length (miles)	1	**Land FC Rate**	12.51%	%
Construction Type	115-kC SCSD	**O&M Costs**	$ 11,608	($/year)
Conductor Size	1272 kcmil ACSS 54/19 Pheasant	**O&M Escalation**	2.0%	%
# Subconductors	1	**First Year Peak Load**	1000	Amps/Phase
In Service Year	2017	**Load Growth**	-0.07%	%
Construction Costs ($)	$ 3,696,086	**Load Factor**	0.553	--
Land Costs ($)	$ -	**PV Discount Factor**	8.0%	%
Conductor Resistance (Ω/mile)	0.0741	**Energy Price Escalation**	-4.0%	%

Results	
Total Project LCC	**$ 6,174,106**
LCC per mile for Project	**$ 6,174,106**

	Year	Carrying Costs	O&M Costs	Cost of Losses	Total Costs	PV Factor	PV Cost	Cumul PV
	--	$	$	$	$	--	$	$
1	2018	$ 462,380.36	$ 11,608.00	$ 59,551.65	$ 533,540.01	0.9259	$ 494,018.53	$ 494,018.53
2	2019	$ 462,380.36	$ 11,840.16	$ 57,089.58	$ 531,310.10	0.8573	$ 455,512.77	$ 949,531.30
3	2020	$ 462,380.36	$ 12,076.96	$ 54,729.29	$ 529,186.62	0.7938	$ 420,085.40	$ 1,369,616.70
4	2021	$ 462,380.36	$ 12,318.50	$ 52,466.59	$ 527,165.45	0.7350	$ 387,482.35	$ 1,757,099.05
5	2022	$ 462,380.36	$ 12,564.87	$ 50,297.44	$ 525,242.67	0.6806	$ 357,471.33	$ 2,114,570.38
6	2023	$ 462,380.36	$ 12,816.17	$ 48,217.96	$ 523,414.49	0.6302	$ 329,839.92	$ 2,444,410.30
7	2024	$ 462,380.36	$ 13,072.49	$ 46,224.46	$ 521,677.32	0.5835	$ 304,393.70	$ 2,748,804.00
8	2025	$ 462,380.36	$ 13,333.94	$ 44,313.38	$ 520,027.68	0.5403	$ 280,954.78	$ 3,029,758.77
9	2026	$ 462,380.36	$ 13,600.62	$ 42,481.31	$ 518,462.29	0.5002	$ 259,360.23	$ 3,289,119.00
10	2027	$ 462,380.36	$ 13,872.63	$ 40,724.98	$ 516,977.98	0.4632	$ 239,460.83	$ 3,528,579.83
11	2028	$ 462,380.36	$ 14,150.09	$ 39,041.27	$ 515,571.71	0.4289	$ 221,119.87	$ 3,749,699.70
12	2029	$ 462,380.36	$ 14,433.09	$ 37,427.16	$ 514,240.61	0.3971	$ 204,212.02	$ 3,953,911.72
13	2030	$ 462,380.36	$ 14,721.75	$ 35,879.79	$ 512,981.90	0.3677	$ 188,622.38	$ 4,142,534.11
14	2031	$ 462,380.36	$ 15,016.19	$ 34,396.40	$ 511,792.94	0.3405	$ 174,245.56	$ 4,316,779.66
15	2032	$ 462,380.36	$ 15,316.51	$ 32,974.33	$ 510,671.20	0.3152	$ 160,984.86	$ 4,477,764.52
16	2033	$ 462,380.36	$ 15,622.84	$ 31,611.05	$ 509,614.25	0.2919	$ 148,751.54	$ 4,626,516.06
17	2034	$ 462,380.36	$ 15,935.30	$ 30,304.14	$ 508,619.79	0.2703	$ 137,464.14	$ 4,763,980.20
18	2035	$ 462,380.36	$ 16,254.00	$ 29,051.26	$ 507,685.62	0.2502	$ 127,047.83	$ 4,891,028.03
19	2036	$ 462,380.36	$ 16,579.08	$ 27,850.18	$ 506,809.62	0.2317	$ 117,433.90	$ 5,008,461.94
20	2037	$ 462,380.36	$ 16,910.66	$ 26,698.75	$ 505,989.78	0.2145	$ 108,559.20	$ 5,117,021.14
21	2038	$ 462,380.36	$ 17,248.88	$ 25,594.93	$ 505,224.17	0.1987	$ 100,365.68	$ 5,217,386.82
22	2039	$ 462,380.36	$ 17,593.85	$ 24,536.75	$ 504,510.96	0.1839	$ 92,800.00	$ 5,310,186.82
23	2040	$ 462,380.36	$ 17,945.73	$ 23,522.31	$ 503,848.40	0.1703	$ 85,813.08	$ 5,395,999.91
24	2041	$ 462,380.36	$ 18,304.65	$ 22,549.82	$ 503,234.82	0.1577	$ 79,359.80	$ 5,475,359.71
25	2042	$ 462,380.36	$ 18,670.74	$ 21,617.53	$ 502,668.63	0.1460	$ 73,398.62	$ 5,548,758.33
26	2043	$ 462,380.36	$ 19,044.15	$ 20,723.78	$ 502,148.30	0.1352	$ 67,891.34	$ 5,616,649.66
27	2044	$ 462,380.36	$ 19,425.04	$ 19,866.99	$ 501,672.38	0.1252	$ 62,802.77	$ 5,679,452.43
28	2045	$ 462,380.36	$ 19,813.54	$ 19,045.62	$ 501,239.51	0.1159	$ 58,100.54	$ 5,737,552.97
29	2046	$ 462,380.36	$ 20,209.81	$ 18,258.20	$ 500,848.37	0.1073	$ 53,754.81	$ 5,791,307.78
30	2047	$ 462,380.36	$ 20,614.01	$ 17,503.35	$ 500,497.71	0.0994	$ 49,738.13	$ 5,841,045.91
31	2048	$ 462,380.36	$ 21,026.29	$ 16,779.70	$ 500,186.34	0.0920	$ 46,025.17	$ 5,887,071.08
32	2049	$ 462,380.36	$ 21,446.81	$ 16,085.96	$ 499,913.13	0.0852	$ 42,592.62	$ 5,929,663.70
33	2050	$ 462,380.36	$ 21,875.75	$ 15,420.91	$ 499,677.02	0.0789	$ 39,418.99	$ 5,969,082.69
34	2051	$ 462,380.36	$ 22,313.26	$ 14,783.36	$ 499,476.98	0.0730	$ 36,484.45	$ 6,005,567.13
35	2052	$ 462,380.36	$ 22,759.53	$ 14,172.16	$ 499,312.05	0.0676	$ 33,770.74	$ 6,039,337.88
36	2053	$ 462,380.36	$ 23,214.72	$ 13,586.23	$ 499,181.31	0.0626	$ 31,261.02	$ 6,070,598.89
37	2054	$ 462,380.36	$ 23,679.01	$ 13,024.53	$ 499,083.90	0.0580	$ 28,939.74	$ 6,099,538.63
38	2055	$ 462,380.36	$ 24,152.59	$ 12,486.05	$ 499,019.00	0.0537	$ 26,792.57	$ 6,126,331.20
39	2056	$ 462,380.36	$ 24,635.64	$ 11,969.83	$ 498,985.84	0.0497	$ 24,806.29	$ 6,151,137.49
40	2057	$ 462,380.36	$ 25,128.36	$ 11,474.96	$ 498,983.67	0.0460	$ 22,968.68	$ 6,174,106.17

EVERSOURCE

Overhead Transmission Line Life Cycle Cost Calculator

Project Information		Finance Information		
Project Name	115-kV H-Frame	**Cost of Electricity**	$ 100.00	($/MWh)
Circuit Number	CSC 2017 LCC	**Construction FC Rate**	12.51%	%
Length (miles)	1	**Land FC Rate**	12.51%	%
Construction Type	115-kV SCHF	**O&M Costs**	$ 11,608	($/year)
Conductor Size	1272 kcmil ACSS 54/19 Pheasant	**O&M Escalation**	2.0%	%
# Subconductors	1	**First Year Peak Load**	1000	Amps/Phase
In Service Year	2017	**Load Growth**	-0.07%	%
Construction Costs ($)	$ 3,951,553	**Load Factor**	0.553	--
Land Costs ($)	$ -	**PV Discount Factor**	8.0%	%
Conductor Resistance (Ω/mile)	0.0741	**Energy Price Escallation**	-4.0%	%

Results	
Total Project LCC	**$ 6,555,204**
LCC per mile for Project	**$ 6,555,204**

	Year	Carrying Costs	O&M Costs	Cost of Losses	Total Costs	PV Factor	PV Cost	Cumul PV
	--	$	$	$	$	--	$	$
1	2018	$ 494,339.28	$ 11,608.00	$ 59,551.65	$ 565,498.93	0.9259	$ 523,610.12	$ 523,610.12
2	2019	$ 494,339.28	$ 11,840.16	$ 57,089.58	$ 563,269.02	0.8573	$ 482,912.40	$ 1,006,522.52
3	2020	$ 494,339.28	$ 12,076.96	$ 54,729.29	$ 561,145.54	0.7938	$ 445,455.42	$ 1,451,977.94
4	2021	$ 494,339.28	$ 12,318.50	$ 52,466.59	$ 559,124.37	0.7350	$ 410,973.11	$ 1,862,951.05
5	2022	$ 494,339.28	$ 12,564.87	$ 50,297.44	$ 557,201.59	0.6806	$ 379,222.04	$ 2,242,173.09
6	2023	$ 494,339.28	$ 12,816.17	$ 48,217.96	$ 555,373.41	0.6302	$ 349,979.46	$ 2,592,152.55
7	2024	$ 494,339.28	$ 13,072.49	$ 46,224.46	$ 553,636.24	0.5835	$ 323,041.43	$ 2,915,193.97
8	2025	$ 494,339.28	$ 13,333.94	$ 44,313.38	$ 551,986.60	0.5403	$ 298,221.19	$ 3,213,415.16
9	2026	$ 494,339.28	$ 13,600.62	$ 42,481.31	$ 550,421.21	0.5002	$ 275,347.64	$ 3,488,762.80
10	2027	$ 494,339.28	$ 13,872.63	$ 40,724.98	$ 548,936.90	0.4632	$ 254,264.00	$ 3,743,026.80
11	2028	$ 494,339.28	$ 14,150.09	$ 39,041.27	$ 547,530.64	0.4289	$ 234,826.50	$ 3,977,853.30
12	2029	$ 494,339.28	$ 14,433.09	$ 37,427.16	$ 546,199.53	0.3971	$ 216,903.35	$ 4,194,756.65
13	2030	$ 494,339.28	$ 14,721.75	$ 35,879.79	$ 544,940.82	0.3677	$ 200,373.61	$ 4,395,130.26
14	2031	$ 494,339.28	$ 15,016.19	$ 34,396.40	$ 543,751.86	0.3405	$ 185,126.33	$ 4,580,256.59
15	2032	$ 494,339.28	$ 15,316.51	$ 32,974.33	$ 542,630.12	0.3152	$ 171,059.64	$ 4,751,316.23
16	2033	$ 494,339.28	$ 15,622.84	$ 31,611.05	$ 541,573.17	0.2919	$ 158,080.05	$ 4,909,396.28
17	2034	$ 494,339.28	$ 15,935.30	$ 30,304.14	$ 540,578.72	0.2703	$ 146,101.64	$ 5,055,497.92
18	2035	$ 494,339.28	$ 16,254.00	$ 29,051.26	$ 539,644.54	0.2502	$ 135,045.52	$ 5,190,543.44
19	2036	$ 494,339.28	$ 16,579.08	$ 27,850.18	$ 538,768.54	0.2317	$ 124,839.17	$ 5,315,382.61
20	2037	$ 494,339.28	$ 16,910.66	$ 26,698.75	$ 537,948.70	0.2145	$ 115,415.93	$ 5,430,798.54
21	2038	$ 494,339.28	$ 17,248.88	$ 25,594.93	$ 537,183.09	0.1987	$ 106,714.51	$ 5,537,513.05
22	2039	$ 494,339.28	$ 17,593.85	$ 24,536.75	$ 536,469.88	0.1839	$ 98,678.54	$ 5,636,191.59
23	2040	$ 494,339.28	$ 17,945.73	$ 23,522.31	$ 535,807.32	0.1703	$ 91,256.18	$ 5,727,447.77
24	2041	$ 494,339.28	$ 18,304.65	$ 22,549.82	$ 535,193.74	0.1577	$ 84,399.70	$ 5,811,847.47
25	2042	$ 494,339.28	$ 18,670.74	$ 21,617.53	$ 534,627.55	0.1460	$ 78,065.19	$ 5,889,912.66
26	2043	$ 494,339.28	$ 19,044.15	$ 20,723.78	$ 534,107.22	0.1352	$ 72,212.24	$ 5,962,124.90
27	2044	$ 494,339.28	$ 19,425.04	$ 19,866.99	$ 533,631.31	0.1252	$ 66,803.61	$ 6,028,928.50
28	2045	$ 494,339.28	$ 19,813.54	$ 19,045.62	$ 533,198.44	0.1159	$ 61,805.01	$ 6,090,733.52
29	2046	$ 494,339.28	$ 20,209.81	$ 18,258.20	$ 532,807.29	0.1073	$ 57,184.88	$ 6,147,918.40
30	2047	$ 494,339.28	$ 20,614.01	$ 17,503.35	$ 532,456.63	0.0994	$ 52,914.12	$ 6,200,832.52
31	2048	$ 494,339.28	$ 21,026.29	$ 16,779.70	$ 532,145.26	0.0920	$ 48,965.90	$ 6,249,798.43
32	2049	$ 494,339.28	$ 21,446.81	$ 16,085.96	$ 531,872.05	0.0852	$ 45,315.52	$ 6,295,113.95
33	2050	$ 494,339.28	$ 21,875.75	$ 15,420.91	$ 531,635.94	0.0789	$ 41,940.19	$ 6,337,054.14
34	2051	$ 494,339.28	$ 22,313.26	$ 14,783.36	$ 531,435.90	0.0730	$ 38,818.90	$ 6,375,873.04
35	2052	$ 494,339.28	$ 22,759.53	$ 14,172.16	$ 531,270.97	0.0676	$ 35,932.27	$ 6,411,805.31
36	2053	$ 494,339.28	$ 23,214.72	$ 13,586.23	$ 531,140.23	0.0626	$ 33,262.43	$ 6,445,067.74
37	2054	$ 494,339.28	$ 23,679.01	$ 13,024.53	$ 531,042.82	0.0580	$ 30,792.90	$ 6,475,860.64
38	2055	$ 494,339.28	$ 24,152.59	$ 12,486.05	$ 530,977.92	0.0537	$ 28,508.46	$ 6,504,369.10
39	2056	$ 494,339.28	$ 24,635.64	$ 11,969.83	$ 530,944.76	0.0497	$ 26,395.07	$ 6,530,764.17
40	2057	$ 494,339.28	$ 25,128.36	$ 11,474.96	$ 530,942.60	0.0460	$ 24,439.78	$ 6,555,203.96

EVERSOURCE

Overhead Transmission Line Life Cycle Cost Calculator

Project Information		Finance Information		
Project Name	345-kV Delta Monopole	**Cost of Electricity**	$ 100.00	($/MWh)
Circuit Number	CSC 2017 LCC	**Construction FC Rate**	12.51%	%
Length (miles)	1	**Land FC Rate**	12.51%	%
Construction Type	345-kV SCSD	**O&M Costs**	$ 11,608	($/year)
Conductor Size	1590 kcmil ACSS 54-19 Falcon	**O&M Escalation**	2.0%	%
# Subconductors	2	**First Year Peak Load**	1000	Amps/Phase
In Service Year	2017	**Load Growth**	-0.07%	%
Construction Costs ($)	$ 5,463,190	**Load Factor**	0.553	--
Land Costs ($)	$ -	**PV Discount Factor**	8.0%	%
Conductor Resistance (Ω/mile)	0.0602	**Energy Price Escallation**	-4.0%	%

Results	
Total Project LCC	**$ 8,521,280**
LCC per mile for Project	**$ 8,521,280**

	Year	Carrying Costs	O&M Costs	Cost of Losses	Total Costs	PV Factor	PV Cost	Cumul PV
	--	$	$	$	$	--	$	$
1	2018	$ 683,445.07	$ 11,608.00	$ 24,190.35	$ 719,243.42	0.9259	$ 665,966.13	$ 665,966.13
2	2019	$ 683,445.07	$ 11,840.16	$ 23,190.23	$ 718,475.46	0.8573	$ 615,976.91	$ 1,281,943.03
3	2020	$ 683,445.07	$ 12,076.96	$ 22,231.47	$ 717,753.50	0.7938	$ 569,775.87	$ 1,851,718.90
4	2021	$ 683,445.07	$ 12,318.50	$ 21,312.34	$ 717,075.91	0.7350	$ 527,072.20	$ 2,378,791.10
5	2022	$ 683,445.07	$ 12,564.87	$ 20,431.21	$ 716,441.15	0.6806	$ 487,597.81	$ 2,866,388.92
6	2023	$ 683,445.07	$ 12,816.17	$ 19,586.51	$ 715,847.75	0.6302	$ 451,105.51	$ 3,317,494.43
7	2024	$ 683,445.07	$ 13,072.49	$ 18,776.74	$ 715,294.30	0.5835	$ 417,367.35	$ 3,734,861.78
8	2025	$ 683,445.07	$ 13,333.94	$ 18,000.44	$ 714,779.45	0.5403	$ 386,173.10	$ 4,121,034.88
9	2026	$ 683,445.07	$ 13,600.62	$ 17,256.24	$ 714,301.93	0.5002	$ 357,328.80	$ 4,478,363.68
10	2027	$ 683,445.07	$ 13,872.63	$ 16,542.81	$ 713,860.51	0.4632	$ 330,655.54	$ 4,809,019.22
11	2028	$ 683,445.07	$ 14,150.09	$ 15,858.87	$ 713,454.02	0.4289	$ 305,988.20	$ 5,115,007.43
12	2029	$ 683,445.07	$ 14,433.09	$ 15,203.21	$ 713,081.36	0.3971	$ 283,174.42	$ 5,398,181.85
13	2030	$ 683,445.07	$ 14,721.75	$ 14,574.65	$ 712,741.47	0.3677	$ 262,073.56	$ 5,660,255.41
14	2031	$ 683,445.07	$ 15,016.19	$ 13,972.09	$ 712,433.34	0.3405	$ 242,555.80	$ 5,902,811.20
15	2032	$ 683,445.07	$ 15,316.51	$ 13,394.43	$ 712,156.01	0.3152	$ 224,501.27	$ 6,127,312.48
16	2033	$ 683,445.07	$ 15,622.84	$ 12,840.66	$ 711,908.57	0.2919	$ 207,799.32	$ 6,335,111.80
17	2034	$ 683,445.07	$ 15,935.30	$ 12,309.78	$ 711,690.14	0.2703	$ 192,347.75	$ 6,527,459.55
18	2035	$ 683,445.07	$ 16,254.00	$ 11,800.85	$ 711,499.92	0.2502	$ 178,052.16	$ 6,705,511.71
19	2036	$ 683,445.07	$ 16,579.08	$ 11,312.96	$ 711,337.11	0.2317	$ 164,825.39	$ 6,870,337.11
20	2037	$ 683,445.07	$ 16,910.66	$ 10,845.24	$ 711,200.98	0.2145	$ 152,586.89	$ 7,022,924.00
21	2038	$ 683,445.07	$ 17,248.88	$ 10,396.86	$ 711,090.81	0.1987	$ 141,262.28	$ 7,164,186.28
22	2039	$ 683,445.07	$ 17,593.85	$ 9,967.02	$ 711,005.94	0.1839	$ 130,782.79	$ 7,294,969.07
23	2040	$ 683,445.07	$ 17,945.73	$ 9,554.95	$ 710,945.75	0.1703	$ 121,084.93	$ 7,416,054.00
24	2041	$ 683,445.07	$ 18,304.65	$ 9,159.91	$ 710,909.63	0.1577	$ 112,109.98	$ 7,528,163.97
25	2042	$ 683,445.07	$ 18,670.74	$ 8,781.21	$ 710,897.02	0.1460	$ 103,803.69	$ 7,631,967.67
26	2043	$ 683,445.07	$ 19,044.15	$ 8,418.16	$ 710,907.39	0.1352	$ 96,115.93	$ 7,728,083.60
27	2044	$ 683,445.07	$ 19,425.04	$ 8,070.13	$ 710,940.23	0.1252	$ 89,000.35	$ 7,817,083.95
28	2045	$ 683,445.07	$ 19,813.54	$ 7,736.48	$ 710,995.09	0.1159	$ 82,414.09	$ 7,899,498.03
29	2046	$ 683,445.07	$ 20,209.81	$ 7,416.63	$ 711,071.50	0.1073	$ 76,317.54	$ 7,975,815.57
30	2047	$ 683,445.07	$ 20,614.01	$ 7,110.00	$ 711,169.07	0.0994	$ 70,674.09	$ 8,046,489.66
31	2048	$ 683,445.07	$ 21,026.29	$ 6,816.04	$ 711,287.40	0.0920	$ 65,449.86	$ 8,111,939.51
32	2049	$ 683,445.07	$ 21,446.81	$ 6,534.24	$ 711,426.12	0.0852	$ 60,613.54	$ 8,172,553.05
33	2050	$ 683,445.07	$ 21,875.75	$ 6,264.10	$ 711,584.91	0.0789	$ 56,136.17	$ 8,228,689.22
34	2051	$ 683,445.07	$ 22,313.26	$ 6,005.12	$ 711,763.45	0.0730	$ 51,990.98	$ 8,280,680.20
35	2052	$ 683,445.07	$ 22,759.53	$ 5,756.84	$ 711,961.44	0.0676	$ 48,153.19	$ 8,328,833.39
36	2053	$ 683,445.07	$ 23,214.72	$ 5,518.83	$ 712,178.62	0.0626	$ 44,599.88	$ 8,373,433.27
37	2054	$ 683,445.07	$ 23,679.01	$ 5,290.67	$ 712,414.75	0.0580	$ 41,309.88	$ 8,414,743.15
38	2055	$ 683,445.07	$ 24,152.59	$ 5,071.93	$ 712,669.59	0.0537	$ 38,263.57	$ 8,453,006.73
39	2056	$ 683,445.07	$ 24,635.64	$ 4,862.24	$ 712,942.95	0.0497	$ 35,442.82	$ 8,488,449.55
40	2057	$ 683,445.07	$ 25,128.36	$ 4,661.22	$ 713,234.64	0.0460	$ 32,830.86	$ 8,521,280.41

Overhead Transmission Line Life Cycle Cost Calculator

Project Information		Finance Information		
Project Name	345-kV H-Frame	Cost of Electricity	$ 100.00	($/MWh)
Circuit Number	CSC 2017 LCC	Construction FC Rate	12.51%	%
Length (miles)	1	Land FC Rate	12.51%	%
Construction Type	345-kV SCHF	O&M Costs	$ 11,608	($/year)
Conductor Size	1590 kcmil ACSS 54-19 Falcon	O&M Escalation	2.0%	%
# Subconductors	2	First Year Peak Load	1000	Amps/Phase
In Service Year	2017	Load Growth	-0.07%	%
Construction Costs ($)	$ 5,422,517	Load Factor	0.553	--
Land Costs ($)	$ -	PV Discount Factor	8.0%	%
Conductor Resistance (Ω/mile)	0.0602	Energy Price Escallation	-4.0%	%

Results	
Total Project LCC	$ 8,460,606
LCC per mile for Project	$ 8,460,606

	Year	Carrying Costs	O&M Costs	Cost of Losses	Total Costs	PV Factor	PV Cost	Cumul PV
	--	$	$	$	$	--	$	$
1	2018	$ 678,356.88	$ 11,608.00	$ 24,190.35	$ 714,155.22	0.9259	$ 661,254.84	$ 661,254.84
2	2019	$ 678,356.88	$ 11,840.16	$ 23,190.23	$ 713,387.27	0.8573	$ 611,614.60	$ 1,272,869.44
3	2020	$ 678,356.88	$ 12,076.96	$ 22,231.47	$ 712,665.31	0.7938	$ 565,736.70	$ 1,838,606.14
4	2021	$ 678,356.88	$ 12,318.50	$ 21,312.34	$ 711,987.72	0.7350	$ 523,332.23	$ 2,361,938.37
5	2022	$ 678,356.88	$ 12,564.87	$ 20,431.21	$ 711,352.96	0.6806	$ 484,134.87	$ 2,846,073.24
6	2023	$ 678,356.88	$ 12,816.17	$ 19,586.51	$ 710,759.56	0.6302	$ 447,899.09	$ 3,293,972.33
7	2024	$ 678,356.88	$ 13,072.49	$ 18,776.74	$ 710,206.11	0.5835	$ 414,398.44	$ 3,708,370.77
8	2025	$ 678,356.88	$ 13,333.94	$ 18,000.44	$ 709,691.26	0.5403	$ 383,424.11	$ 4,091,794.88
9	2026	$ 678,356.88	$ 13,600.62	$ 17,256.24	$ 709,213.74	0.5002	$ 354,783.44	$ 4,446,578.32
10	2027	$ 678,356.88	$ 13,872.63	$ 16,542.81	$ 708,772.32	0.4632	$ 328,298.72	$ 4,774,877.04
11	2028	$ 678,356.88	$ 14,150.09	$ 15,858.87	$ 708,365.83	0.4289	$ 303,805.96	$ 5,078,683.00
12	2029	$ 678,356.88	$ 14,433.09	$ 15,203.21	$ 707,993.17	0.3971	$ 281,153.83	$ 5,359,836.83
13	2030	$ 678,356.88	$ 14,721.75	$ 14,574.65	$ 707,653.28	0.3677	$ 260,202.64	$ 5,620,039.47
14	2031	$ 678,356.88	$ 15,016.19	$ 13,972.09	$ 707,345.15	0.3405	$ 240,823.47	$ 5,860,862.94
15	2032	$ 678,356.88	$ 15,316.51	$ 13,394.43	$ 707,067.82	0.3152	$ 222,897.26	$ 6,083,760.20
16	2033	$ 678,356.88	$ 15,622.84	$ 12,840.66	$ 706,820.37	0.2919	$ 206,314.13	$ 6,290,074.33
17	2034	$ 678,356.88	$ 15,935.30	$ 12,309.78	$ 706,601.95	0.2703	$ 190,972.57	$ 6,481,046.90
18	2035	$ 678,356.88	$ 16,254.00	$ 11,800.85	$ 706,411.73	0.2502	$ 176,778.85	$ 6,657,825.75
19	2036	$ 678,356.88	$ 16,579.08	$ 11,312.96	$ 706,248.92	0.2317	$ 163,646.39	$ 6,821,472.15
20	2037	$ 678,356.88	$ 16,910.66	$ 10,845.24	$ 706,112.78	0.2145	$ 151,495.23	$ 6,972,967.38
21	2038	$ 678,356.88	$ 17,248.88	$ 10,396.86	$ 706,002.62	0.1987	$ 140,251.48	$ 7,113,218.86
22	2039	$ 678,356.88	$ 17,593.85	$ 9,967.02	$ 705,917.75	0.1839	$ 129,846.87	$ 7,243,065.72
23	2040	$ 678,356.88	$ 17,945.73	$ 9,554.95	$ 705,857.56	0.1703	$ 120,218.33	$ 7,363,284.05
24	2041	$ 678,356.88	$ 18,304.65	$ 9,159.91	$ 705,821.44	0.1577	$ 111,307.57	$ 7,474,591.63
25	2042	$ 678,356.88	$ 18,670.74	$ 8,781.21	$ 705,808.83	0.1460	$ 103,060.73	$ 7,577,652.35
26	2043	$ 678,356.88	$ 19,044.15	$ 8,418.16	$ 705,819.19	0.1352	$ 95,428.00	$ 7,673,080.35
27	2044	$ 678,356.88	$ 19,425.04	$ 8,070.13	$ 705,852.04	0.1252	$ 88,363.37	$ 7,761,443.72
28	2045	$ 678,356.88	$ 19,813.54	$ 7,736.48	$ 705,906.89	0.1159	$ 81,824.29	$ 7,843,268.02
29	2046	$ 678,356.88	$ 20,209.81	$ 7,416.63	$ 705,983.31	0.1073	$ 75,771.44	$ 7,919,039.46
30	2047	$ 678,356.88	$ 20,614.01	$ 7,110.00	$ 706,080.88	0.0994	$ 70,168.43	$ 7,989,207.89
31	2048	$ 678,356.88	$ 21,026.29	$ 6,816.04	$ 706,199.21	0.0920	$ 64,981.66	$ 8,054,189.55
32	2049	$ 678,356.88	$ 21,446.81	$ 6,534.24	$ 706,337.93	0.0852	$ 60,180.02	$ 8,114,369.57
33	2050	$ 678,356.88	$ 21,875.75	$ 6,264.10	$ 706,496.72	0.0789	$ 55,734.77	$ 8,170,104.34
34	2051	$ 678,356.88	$ 22,313.26	$ 6,005.12	$ 706,675.25	0.0730	$ 51,619.31	$ 8,221,723.66
35	2052	$ 678,356.88	$ 22,759.53	$ 5,756.84	$ 706,873.25	0.0676	$ 47,809.05	$ 8,269,532.70
36	2053	$ 678,356.88	$ 23,214.72	$ 5,518.83	$ 707,090.43	0.0626	$ 44,281.24	$ 8,313,813.94
37	2054	$ 678,356.88	$ 23,679.01	$ 5,290.67	$ 707,326.56	0.0580	$ 41,014.84	$ 8,354,828.78
38	2055	$ 678,356.88	$ 24,152.59	$ 5,071.93	$ 707,581.40	0.0537	$ 37,990.39	$ 8,392,819.17
39	2056	$ 678,356.88	$ 24,635.64	$ 4,862.24	$ 707,854.76	0.0497	$ 35,189.87	$ 8,428,009.04
40	2057	$ 678,356.88	$ 25,128.36	$ 4,661.22	$ 708,146.45	0.0460	$ 32,596.64	$ 8,460,605.68

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Underground Transmission Line Life Cycle Cost Calculator

Project Information		Finance Information		
Project Name	115-kV HPFF	Cost of Electricity	$ 100.00	($/MWh)
Circuit Number	2017 LCC Docket	Construction FC Rate	12.51%	%
Length (miles)	1	Land FC Rate	12.51%	%
Construction Type	115-kV HPFF 1 Cable	O&M Costs	$ 12,562.00	($/year)
Cable Size	2500	O&M Escalation	2.0%	%
Cables per Phase	1	First Year Peak Load	1000	Amps/Phase
In Service Year	2017	Load Growth	-0.07%	%
Construction Costs ($)	$ 12,452,349.00	Load Factor	0.62	--
Land Costs ($)	$ -	PV Discount Factor	8.0%	%
Cable Resistance (Ω/mile)	0.0317	Energy Price Escallation	-4%	%

Results	
Total Project LCC	$ 19,025,780.13
LCC per mile for Project	$ 19,025,780.13

Year	Carrying Costs	O&M Costs	Cost of Losses	Total Costs	PV Factor	PV Cost	Cumul PV
--	$	$	$	$	--	$	$
2018	$ 1,557,788.86	$ 12,562.00	$ 32,023.44	$ 1,602,374.30	0.9259	$ 1,483,679.91	$ 1,483,679.91
2019	$ 1,557,788.86	$ 12,813.24	$ 30,699.48	$ 1,601,301.58	0.8573	$ 1,372,858.01	$ 2,856,537.92
2020	$ 1,557,788.86	$ 13,069.50	$ 29,430.25	$ 1,600,288.62	0.7938	$ 1,270,360.70	$ 4,126,898.62
2021	$ 1,557,788.86	$ 13,330.89	$ 28,213.50	$ 1,599,333.26	0.7350	$ 1,175,557.69	$ 5,302,456.31
2022	$ 1,557,788.86	$ 13,597.51	$ 27,047.06	$ 1,598,433.43	0.6806	$ 1,087,866.93	$ 6,390,323.24
2023	$ 1,557,788.86	$ 13,869.46	$ 25,928.84	$ 1,597,587.16	0.6302	$ 1,006,750.90	$ 7,397,074.15
2024	$ 1,557,788.86	$ 14,146.85	$ 24,856.85	$ 1,596,792.56	0.5835	$ 931,713.12	$ 8,328,787.27
2025	$ 1,557,788.86	$ 14,429.79	$ 23,829.18	$ 1,596,047.83	0.5403	$ 862,294.98	$ 9,191,082.25
2026	$ 1,557,788.86	$ 14,718.39	$ 22,844.00	$ 1,595,351.24	0.5002	$ 798,072.81	$ 9,989,155.06
2027	$ 1,557,788.86	$ 15,012.75	$ 21,899.54	$ 1,594,701.16	0.4632	$ 738,655.19	$ 10,727,810.25
2028	$ 1,557,788.86	$ 15,313.01	$ 20,994.14	$ 1,594,096.01	0.4289	$ 683,680.45	$ 11,411,490.70
2029	$ 1,557,788.86	$ 15,619.27	$ 20,126.17	$ 1,593,534.30	0.3971	$ 632,814.39	$ 12,044,305.10
2030	$ 1,557,788.86	$ 15,931.65	$ 19,294.08	$ 1,593,014.59	0.3677	$ 585,748.16	$ 12,630,053.26
2031	$ 1,557,788.86	$ 16,250.29	$ 18,496.40	$ 1,592,535.54	0.3405	$ 542,196.31	$ 13,172,249.56
2032	$ 1,557,788.86	$ 16,575.29	$ 17,731.69	$ 1,592,095.84	0.3152	$ 501,895.01	$ 13,674,144.57
2033	$ 1,557,788.86	$ 16,906.80	$ 16,998.60	$ 1,591,694.26	0.2919	$ 464,600.38	$ 14,138,744.95
2034	$ 1,557,788.86	$ 17,244.93	$ 16,295.82	$ 1,591,329.61	0.2703	$ 430,086.99	$ 14,568,831.94
2035	$ 1,557,788.86	$ 17,589.83	$ 15,622.09	$ 1,591,000.78	0.2502	$ 398,146.40	$ 14,966,978.34
2036	$ 1,557,788.86	$ 17,941.63	$ 14,976.22	$ 1,590,706.71	0.2317	$ 368,585.93	$ 15,335,564.27
2037	$ 1,557,788.86	$ 18,300.46	$ 14,357.05	$ 1,590,446.37	0.2145	$ 341,227.42	$ 15,676,791.69
2038	$ 1,557,788.86	$ 18,666.47	$ 13,763.48	$ 1,590,218.81	0.1987	$ 315,906.11	$ 15,992,697.80
2039	$ 1,557,788.86	$ 19,039.80	$ 13,194.45	$ 1,590,023.11	0.1839	$ 292,469.66	$ 16,285,167.45
2040	$ 1,557,788.86	$ 19,420.60	$ 12,648.94	$ 1,589,858.40	0.1703	$ 270,777.18	$ 16,555,944.64
2041	$ 1,557,788.86	$ 19,809.01	$ 12,125.99	$ 1,589,723.86	0.1577	$ 250,698.40	$ 16,806,643.04
2042	$ 1,557,788.86	$ 20,205.19	$ 11,624.66	$ 1,589,618.71	0.1460	$ 232,112.79	$ 17,038,755.83
2043	$ 1,557,788.86	$ 20,609.29	$ 11,144.05	$ 1,589,542.21	0.1352	$ 214,908.91	$ 17,253,664.74
2044	$ 1,557,788.86	$ 21,021.48	$ 10,683.32	$ 1,589,493.66	0.1252	$ 198,983.65	$ 17,452,648.39
2045	$ 1,557,788.86	$ 21,441.91	$ 10,241.63	$ 1,589,472.40	0.1159	$ 184,241.66	$ 17,636,890.05
2046	$ 1,557,788.86	$ 21,870.75	$ 9,818.21	$ 1,589,477.81	0.1073	$ 170,594.71	$ 17,807,484.76
2047	$ 1,557,788.86	$ 22,308.16	$ 9,412.29	$ 1,589,509.31	0.0994	$ 157,961.20	$ 17,965,445.96
2048	$ 1,557,788.86	$ 22,754.32	$ 9,023.15	$ 1,589,566.34	0.0920	$ 146,265.61	$ 18,111,711.57
2049	$ 1,557,788.86	$ 23,209.41	$ 8,650.10	$ 1,589,648.37	0.0852	$ 135,438.11	$ 18,247,149.69
2050	$ 1,557,788.86	$ 23,673.60	$ 8,292.48	$ 1,589,754.94	0.0789	$ 125,414.07	$ 18,372,563.75
2051	$ 1,557,788.86	$ 24,147.07	$ 7,949.64	$ 1,589,885.57	0.0730	$ 116,133.68	$ 18,488,697.43
2052	$ 1,557,788.86	$ 24,630.01	$ 7,620.97	$ 1,590,039.84	0.0676	$ 107,541.62	$ 18,596,239.05
2053	$ 1,557,788.86	$ 25,122.61	$ 7,305.89	$ 1,590,217.36	0.0626	$ 99,586.69	$ 18,695,825.74
2054	$ 1,557,788.86	$ 25,625.06	$ 7,003.84	$ 1,590,417.77	0.0580	$ 92,221.52	$ 18,788,047.26
2055	$ 1,557,788.86	$ 26,137.57	$ 6,714.28	$ 1,590,640.70	0.0537	$ 85,402.26	$ 18,873,449.52
2056	$ 1,557,788.86	$ 26,660.32	$ 6,436.69	$ 1,590,885.86	0.0497	$ 79,088.36	$ 18,952,537.88
2057	$ 1,557,788.86	$ 27,193.52	$ 6,170.57	$ 1,591,152.95	0.0460	$ 73,242.26	$ 19,025,780.13

EVERSOURCE

Underground Transmission Line Life Cycle Cost Calculator

Project Information		Finance Information		
Project Name	115-kV XLPE	**Cost of Electricity**	$ 100.00	($/MWh)
Circuit Number		**Construction FC Rate**	12.51%	%
Length (miles)	1	**Land FC Rate**	12.51%	%
Construction Type	115-kV XLPE 1 Cable	**O&M Costs**	$ 12,562.00	($/year)
Cable Size	3000	**O&M Escalation**	2.0%	%
Cables per Phase	1	**First Year Peak Load**	1000	Amps/Phase
In Service Year	2017	**Load Growth**	-0.07%	%
Construction Costs ($)	$ 15,501,445.00	**Load Factor**	0.62	--
Land Costs ($)	$ -	**PV Discount Factor**	8.0%	%
Cable Resistance (Ω/mile)	0.0268	**Energy Price Escallation**	-4%	%

Results	
Total Project LCC	**$ 23,533,881.04**
LCC per mile for Project	**$ 23,533,881.04**

Year	Carrying Costs	O&M Costs	Cost of Losses	Total Costs	PV Factor	PV Cost	Cumul PV
--	$	$	$	$	--	$	$
2018	$ 1,939,230.77	$ 12,562.00	$ 27,073.45	$ 1,978,866.22	0.9259	$ 1,832,283.53	$ 1,832,283.53
2019	$ 1,939,230.77	$ 12,813.24	$ 25,954.13	$ 1,977,998.14	0.8573	$ 1,695,814.59	$ 3,528,098.13
2020	$ 1,939,230.77	$ 13,069.50	$ 24,881.10	$ 1,977,181.37	0.7938	$ 1,569,550.32	$ 5,097,648.45
2021	$ 1,939,230.77	$ 13,330.89	$ 23,852.43	$ 1,976,414.09	0.7350	$ 1,452,723.36	$ 6,550,371.81
2022	$ 1,939,230.77	$ 13,597.51	$ 22,866.28	$ 1,975,694.56	0.6806	$ 1,344,624.52	$ 7,894,996.33
2023	$ 1,939,230.77	$ 13,869.46	$ 21,920.91	$ 1,975,021.14	0.6302	$ 1,244,598.34	$ 9,139,594.67
2024	$ 1,939,230.77	$ 14,146.85	$ 21,014.62	$ 1,974,392.24	0.5835	$ 1,152,038.91	$ 10,291,633.58
2025	$ 1,939,230.77	$ 14,429.79	$ 20,145.80	$ 1,973,806.36	0.5403	$ 1,066,386.16	$ 11,358,019.74
2026	$ 1,939,230.77	$ 14,718.39	$ 19,312.90	$ 1,973,262.06	0.5002	$ 987,122.31	$ 12,345,142.04
2027	$ 1,939,230.77	$ 15,012.75	$ 18,514.44	$ 1,972,757.96	0.4632	$ 913,768.64	$ 13,258,910.69
2028	$ 1,939,230.77	$ 15,313.01	$ 17,748.99	$ 1,972,292.77	0.4289	$ 845,882.56	$ 14,104,793.25
2029	$ 1,939,230.77	$ 15,619.27	$ 17,015.18	$ 1,971,865.22	0.3971	$ 783,054.81	$ 14,887,848.06
2030	$ 1,939,230.77	$ 15,931.65	$ 16,311.72	$ 1,971,474.14	0.3677	$ 724,906.95	$ 15,612,755.01
2031	$ 1,939,230.77	$ 16,250.29	$ 15,637.33	$ 1,971,118.39	0.3405	$ 671,089.02	$ 16,283,844.02
2032	$ 1,939,230.77	$ 16,575.29	$ 14,990.83	$ 1,970,796.89	0.3152	$ 621,277.37	$ 16,905,121.40
2033	$ 1,939,230.77	$ 16,906.80	$ 14,371.06	$ 1,970,508.62	0.2919	$ 575,172.68	$ 17,480,294.08
2034	$ 1,939,230.77	$ 17,244.93	$ 13,776.90	$ 1,970,252.61	0.2703	$ 532,498.11	$ 18,012,792.19
2035	$ 1,939,230.77	$ 17,589.83	$ 13,207.32	$ 1,970,027.92	0.2502	$ 492,997.57	$ 18,505,789.76
2036	$ 1,939,230.77	$ 17,941.63	$ 12,661.28	$ 1,969,833.68	0.2317	$ 456,434.23	$ 18,962,223.99
2037	$ 1,939,230.77	$ 18,300.46	$ 12,137.82	$ 1,969,669.05	0.2145	$ 422,588.96	$ 19,384,812.95
2038	$ 1,939,230.77	$ 18,666.47	$ 11,636.00	$ 1,969,533.24	0.1987	$ 391,259.10	$ 19,776,072.05
2039	$ 1,939,230.77	$ 19,039.80	$ 11,154.93	$ 1,969,425.50	0.1839	$ 362,257.12	$ 20,138,329.18
2040	$ 1,939,230.77	$ 19,420.60	$ 10,693.74	$ 1,969,345.11	0.1703	$ 335,409.57	$ 20,473,738.75
2041	$ 1,939,230.77	$ 19,809.01	$ 10,251.63	$ 1,969,291.40	0.1577	$ 310,555.95	$ 20,784,294.70
2042	$ 1,939,230.77	$ 20,205.19	$ 9,827.79	$ 1,969,263.74	0.1460	$ 287,547.77	$ 21,071,842.46
2043	$ 1,939,230.77	$ 20,609.29	$ 9,421.47	$ 1,969,261.53	0.1352	$ 266,247.63	$ 21,338,090.10
2044	$ 1,939,230.77	$ 21,021.48	$ 9,031.95	$ 1,969,284.20	0.1252	$ 246,528.42	$ 21,584,618.52
2045	$ 1,939,230.77	$ 21,441.91	$ 8,658.54	$ 1,969,331.22	0.1159	$ 228,272.51	$ 21,812,891.03
2046	$ 1,939,230.77	$ 21,870.75	$ 8,300.57	$ 1,969,402.08	0.1073	$ 211,371.04	$ 22,024,262.07
2047	$ 1,939,230.77	$ 22,308.16	$ 7,957.39	$ 1,969,496.32	0.0994	$ 195,723.29	$ 22,219,985.36
2048	$ 1,939,230.77	$ 22,754.32	$ 7,628.41	$ 1,969,613.50	0.0920	$ 181,236.05	$ 22,401,221.41
2049	$ 1,939,230.77	$ 23,209.41	$ 7,313.02	$ 1,969,753.20	0.0852	$ 167,823.06	$ 22,569,044.47
2050	$ 1,939,230.77	$ 23,673.60	$ 7,010.67	$ 1,969,915.04	0.0789	$ 155,404.49	$ 22,724,448.96
2051	$ 1,939,230.77	$ 24,147.07	$ 6,720.83	$ 1,970,098.67	0.0730	$ 143,906.46	$ 22,868,355.42
2052	$ 1,939,230.77	$ 24,630.01	$ 6,442.97	$ 1,970,303.75	0.0676	$ 133,260.59	$ 23,001,616.02
2053	$ 1,939,230.77	$ 25,122.61	$ 6,176.59	$ 1,970,529.97	0.0626	$ 123,403.61	$ 23,125,019.62
2054	$ 1,939,230.77	$ 25,625.06	$ 5,921.23	$ 1,970,777.06	0.0580	$ 114,276.93	$ 23,239,296.55
2055	$ 1,939,230.77	$ 26,137.57	$ 5,676.42	$ 1,971,044.76	0.0537	$ 105,826.34	$ 23,345,122.89
2056	$ 1,939,230.77	$ 26,660.32	$ 5,441.74	$ 1,971,332.83	0.0497	$ 98,001.67	$ 23,443,124.56
2057	$ 1,939,230.77	$ 27,193.52	$ 5,216.76	$ 1,971,641.05	0.0460	$ 90,756.48	$ 23,533,881.04

EVERSOURCE

Underground Transmission Line Life Cycle Cost Calculator

Project Information		Finance Information		
Project Name	345-kV HPFF 2500 kcmil	**Cost of Electricity**	$ 100.00	($/MWh)
Circuit Number		**Construction FC Rate**	12.51%	%
Length (miles)	1	**Land FC Rate**	12.51%	%
Construction Type	(Select)	**O&M Costs**	$ 12,562.00	($/year)
Cable Size	2500	**O&M Escalation**	2.0%	%
Cables per Phase	1	**First Year Peak Load**	1000	Amps/Phase
In Service Year	2017	**Load Growth**	-0.07%	%
Construction Costs ($)	$ 13,151,388.00	**Load Factor**	0.62	--
Land Costs ($)	$ -	**PV Discount Factor**	8.0%	%
Cable Resistance (Ω/mile)	0.0317	**Energy Price Escallation**	-4%	%

Results	
Total Project LCC	**$ 20,068,584.93**
LCC per mile for Project	**$ 20,068,584.93**

Year	Carrying Costs	O&M Costs	Cost of Losses	Total Costs	PV Factor	PV Cost	Cumul PV
--	$	$	$	$	--	$	$
2018	$ 1,645,238.64	$ 12,562.00	$ 32,023.44	$ 1,689,824.08	0.9259	$ 1,564,651.93	$ 1,564,651.93
2019	$ 1,645,238.64	$ 12,813.24	$ 30,699.48	$ 1,688,751.36	0.8573	$ 1,447,832.10	$ 3,012,484.02
2020	$ 1,645,238.64	$ 13,069.50	$ 29,430.25	$ 1,687,738.40	0.7938	$ 1,339,781.15	$ 4,352,265.18
2021	$ 1,645,238.64	$ 13,330.89	$ 28,213.50	$ 1,686,783.04	0.7350	$ 1,239,835.89	$ 5,592,101.07
2022	$ 1,645,238.64	$ 13,597.51	$ 27,047.06	$ 1,685,883.21	0.6806	$ 1,147,383.78	$ 6,739,484.85
2023	$ 1,645,238.64	$ 13,869.46	$ 25,928.84	$ 1,685,036.94	0.6302	$ 1,061,859.10	$ 7,801,343.95
2024	$ 1,645,238.64	$ 14,146.85	$ 24,856.85	$ 1,684,242.34	0.5835	$ 982,739.23	$ 8,784,083.18
2025	$ 1,645,238.64	$ 14,429.79	$ 23,829.18	$ 1,683,497.61	0.5403	$ 909,541.37	$ 9,693,624.55
2026	$ 1,645,238.64	$ 14,718.39	$ 22,844.00	$ 1,682,801.02	0.5002	$ 841,819.47	$ 10,535,444.02
2027	$ 1,645,238.64	$ 15,012.75	$ 21,899.54	$ 1,682,150.94	0.4632	$ 779,161.36	$ 11,314,605.38
2028	$ 1,645,238.64	$ 15,313.01	$ 20,994.14	$ 1,681,545.79	0.4289	$ 721,186.16	$ 12,035,791.55
2029	$ 1,645,238.64	$ 15,619.27	$ 20,126.17	$ 1,680,984.07	0.3971	$ 667,541.90	$ 12,703,333.45
2030	$ 1,645,238.64	$ 15,931.65	$ 19,294.08	$ 1,680,464.37	0.3677	$ 617,903.26	$ 13,321,236.71
2031	$ 1,645,238.64	$ 16,250.29	$ 18,496.40	$ 1,679,985.32	0.3405	$ 571,969.55	$ 13,893,206.27
2032	$ 1,645,238.64	$ 16,575.29	$ 17,731.69	$ 1,679,545.62	0.3152	$ 529,462.82	$ 14,422,669.09
2033	$ 1,645,238.64	$ 16,906.80	$ 16,998.60	$ 1,679,144.04	0.2919	$ 490,126.14	$ 14,912,795.23
2034	$ 1,645,238.64	$ 17,244.93	$ 16,295.82	$ 1,678,779.39	0.2703	$ 453,721.95	$ 15,366,517.17
2035	$ 1,645,238.64	$ 17,589.83	$ 15,622.09	$ 1,678,450.56	0.2502	$ 420,030.62	$ 15,786,547.80
2036	$ 1,645,238.64	$ 17,941.63	$ 14,976.22	$ 1,678,156.49	0.2317	$ 388,849.10	$ 16,175,396.90
2037	$ 1,645,238.64	$ 18,300.46	$ 14,357.05	$ 1,677,896.15	0.2145	$ 359,989.61	$ 16,535,386.51
2038	$ 1,645,238.64	$ 18,666.47	$ 13,763.48	$ 1,677,668.59	0.1987	$ 333,278.51	$ 16,868,665.02
2039	$ 1,645,238.64	$ 19,039.80	$ 13,194.45	$ 1,677,472.89	0.1839	$ 308,555.21	$ 17,177,220.23
2040	$ 1,645,238.64	$ 19,420.60	$ 12,648.94	$ 1,677,308.18	0.1703	$ 285,671.22	$ 17,462,891.45
2041	$ 1,645,238.64	$ 19,809.01	$ 12,125.99	$ 1,677,173.64	0.1577	$ 264,489.17	$ 17,727,380.62
2042	$ 1,645,238.64	$ 20,205.19	$ 11,624.66	$ 1,677,068.49	0.1460	$ 244,882.03	$ 17,972,262.65
2043	$ 1,645,238.64	$ 20,609.29	$ 11,144.05	$ 1,676,991.99	0.1352	$ 226,732.27	$ 18,198,994.92
2044	$ 1,645,238.64	$ 21,021.48	$ 10,683.32	$ 1,676,943.44	0.1252	$ 209,931.21	$ 18,408,926.14
2045	$ 1,645,238.64	$ 21,441.91	$ 10,241.63	$ 1,676,922.18	0.1159	$ 194,378.29	$ 18,603,304.43
2046	$ 1,645,238.64	$ 21,870.75	$ 9,818.21	$ 1,676,927.59	0.1073	$ 179,980.48	$ 18,783,284.90
2047	$ 1,645,238.64	$ 22,308.16	$ 9,412.29	$ 1,676,959.09	0.0994	$ 166,651.72	$ 18,949,936.62
2048	$ 1,645,238.64	$ 22,754.32	$ 9,023.15	$ 1,677,016.11	0.0920	$ 154,312.40	$ 19,104,249.02
2049	$ 1,645,238.64	$ 23,209.41	$ 8,650.10	$ 1,677,098.15	0.0852	$ 142,888.84	$ 19,247,137.86
2050	$ 1,645,238.64	$ 23,673.60	$ 8,292.48	$ 1,677,204.71	0.0789	$ 132,312.89	$ 19,379,450.75
2051	$ 1,645,238.64	$ 24,147.07	$ 7,949.64	$ 1,677,335.35	0.0730	$ 122,521.47	$ 19,501,972.22
2052	$ 1,645,238.64	$ 24,630.01	$ 7,620.97	$ 1,677,489.62	0.0676	$ 113,456.24	$ 19,615,428.46
2053	$ 1,645,238.64	$ 25,122.61	$ 7,305.89	$ 1,677,667.14	0.0626	$ 105,063.19	$ 19,720,491.66
2054	$ 1,645,238.64	$ 25,625.06	$ 7,003.84	$ 1,677,867.54	0.0580	$ 97,292.36	$ 19,817,784.01
2055	$ 1,645,238.64	$ 26,137.57	$ 6,714.28	$ 1,678,090.48	0.0537	$ 90,097.48	$ 19,907,881.50
2056	$ 1,645,238.64	$ 26,660.32	$ 6,436.69	$ 1,678,335.64	0.0497	$ 83,435.78	$ 19,991,317.28
2057	$ 1,645,238.64	$ 27,193.52	$ 6,170.57	$ 1,678,602.73	0.0460	$ 77,267.65	$ 20,068,584.93

EVERSOURCE

Underground Transmission Line Life Cycle Cost Calculator

Project Information		Finance Information		
Project Name	345-kV XLPE 3000 kcmil	Cost of Electricity	$ 100.00	($/MWh)
Circuit Number		Construction FC Rate	12.51%	%
Length (miles)	1	Land FC Rate	12.51%	%
Construction Type	(Select)	O&M Costs	$ 12,562.00	($/year)
Cable Size	3000	O&M Escalation	2.0%	%
Cables per Phase	1	First Year Peak Load	1000	Amps/Phase
In Service Year	2017	Load Growth	-0.07%	%
Construction Costs ($)	$ 16,992,895.00	Load Factor	0.62	--
Land Costs ($)	$ -	PV Discount Factor	8.0%	%
Cable Resistance (Ω/mile)	0.0268	Energy Price Escallation	-4%	%

Results	
Total Project LCC	$ 25,758,780.10
LCC per mile for Project	$ 25,758,780.10

Year	Carrying Costs	O&M Costs	Cost of Losses	Total Costs	PV Factor	PV Cost	Cumul PV
--	$	$	$	$	--	$	$
2018	$ 2,125,811.16	$ 12,562.00	$ 27,073.45	$ 2,165,446.61	0.9259	$ 2,005,043.16	$ 2,005,043.16
2019	$ 2,125,811.16	$ 12,813.24	$ 25,954.13	$ 2,164,578.54	0.8573	$ 1,855,777.21	$ 3,860,820.37
2020	$ 2,125,811.16	$ 13,069.50	$ 24,881.10	$ 2,163,761.77	0.7938	$ 1,717,663.85	$ 5,578,484.22
2021	$ 2,125,811.16	$ 13,330.89	$ 23,852.43	$ 2,162,994.49	0.7350	$ 1,589,865.52	$ 7,168,349.74
2022	$ 2,125,811.16	$ 13,597.51	$ 22,866.28	$ 2,162,274.96	0.6806	$ 1,471,608.01	$ 8,639,957.74
2023	$ 2,125,811.16	$ 13,869.46	$ 21,920.91	$ 2,161,601.54	0.6302	$ 1,362,175.63	$ 10,002,133.38
2024	$ 2,125,811.16	$ 14,146.85	$ 21,014.62	$ 2,160,972.64	0.5835	$ 1,260,906.78	$ 11,263,040.16
2025	$ 2,125,811.16	$ 14,429.79	$ 20,145.80	$ 2,160,386.76	0.5403	$ 1,167,189.74	$ 12,430,229.90
2026	$ 2,125,811.16	$ 14,718.39	$ 19,312.90	$ 2,159,842.45	0.5002	$ 1,080,458.96	$ 13,510,688.86
2027	$ 2,125,811.16	$ 15,012.75	$ 18,514.44	$ 2,159,338.36	0.4632	$ 1,000,191.47	$ 14,510,880.32
2028	$ 2,125,811.16	$ 15,313.01	$ 17,748.99	$ 2,158,873.16	0.4289	$ 925,903.69	$ 15,436,784.02
2029	$ 2,125,811.16	$ 15,619.27	$ 17,015.18	$ 2,158,445.62	0.3971	$ 857,148.45	$ 16,293,932.47
2030	$ 2,125,811.16	$ 15,931.65	$ 16,311.72	$ 2,158,054.53	0.3677	$ 793,512.17	$ 17,087,444.64
2031	$ 2,125,811.16	$ 16,250.29	$ 15,637.33	$ 2,157,698.78	0.3405	$ 734,612.37	$ 17,822,057.02
2032	$ 2,125,811.16	$ 16,575.29	$ 14,990.83	$ 2,157,377.29	0.3152	$ 680,095.29	$ 18,502,152.31
2033	$ 2,125,811.16	$ 16,906.80	$ 14,371.06	$ 2,157,089.02	0.2919	$ 629,633.72	$ 19,131,786.03
2034	$ 2,125,811.16	$ 17,244.93	$ 13,776.90	$ 2,156,833.00	0.2703	$ 582,924.99	$ 19,714,711.03
2035	$ 2,125,811.16	$ 17,589.83	$ 13,207.32	$ 2,156,608.32	0.2502	$ 539,689.14	$ 20,254,400.16
2036	$ 2,125,811.16	$ 17,941.63	$ 12,661.28	$ 2,156,414.08	0.2317	$ 499,667.16	$ 20,754,067.32
2037	$ 2,125,811.16	$ 18,300.46	$ 12,137.82	$ 2,156,249.45	0.2145	$ 462,619.45	$ 21,216,686.77
2038	$ 2,125,811.16	$ 18,666.47	$ 11,636.00	$ 2,156,113.64	0.1987	$ 428,324.37	$ 21,645,011.14
2039	$ 2,125,811.16	$ 19,039.80	$ 11,154.93	$ 2,156,005.89	0.1839	$ 396,576.82	$ 22,041,587.96
2040	$ 2,125,811.16	$ 19,420.60	$ 10,693.74	$ 2,155,925.50	0.1703	$ 367,187.06	$ 22,408,775.02
2041	$ 2,125,811.16	$ 19,809.01	$ 10,251.63	$ 2,155,871.80	0.1577	$ 339,979.55	$ 22,748,754.58
2042	$ 2,125,811.16	$ 20,205.19	$ 9,827.79	$ 2,155,844.14	0.1460	$ 314,791.84	$ 23,063,546.42
2043	$ 2,125,811.16	$ 20,609.29	$ 9,421.47	$ 2,155,841.93	0.1352	$ 291,473.63	$ 23,355,020.05
2044	$ 2,125,811.16	$ 21,021.48	$ 9,031.95	$ 2,155,864.60	0.1252	$ 269,885.83	$ 23,624,905.88
2045	$ 2,125,811.16	$ 21,441.91	$ 8,658.54	$ 2,155,911.61	0.1159	$ 249,899.74	$ 23,874,805.62
2046	$ 2,125,811.16	$ 21,870.75	$ 8,300.57	$ 2,155,982.48	0.1073	$ 231,396.25	$ 24,106,201.87
2047	$ 2,125,811.16	$ 22,308.16	$ 7,957.39	$ 2,156,076.72	0.0994	$ 214,265.15	$ 24,320,467.02
2048	$ 2,125,811.16	$ 22,754.32	$ 7,628.41	$ 2,156,193.89	0.0920	$ 198,404.44	$ 24,518,871.46
2049	$ 2,125,811.16	$ 23,209.41	$ 7,313.02	$ 2,156,333.60	0.0852	$ 183,719.72	$ 24,702,591.18
2050	$ 2,125,811.16	$ 23,673.60	$ 7,010.67	$ 2,156,495.44	0.0789	$ 170,123.62	$ 24,872,714.80
2051	$ 2,125,811.16	$ 24,147.07	$ 6,720.83	$ 2,156,679.06	0.0730	$ 157,535.28	$ 25,030,250.08
2052	$ 2,125,811.16	$ 24,630.01	$ 6,442.97	$ 2,156,884.14	0.0676	$ 145,879.87	$ 25,176,129.96
2053	$ 2,125,811.16	$ 25,122.61	$ 6,176.59	$ 2,157,110.37	0.0626	$ 135,088.12	$ 25,311,218.08
2054	$ 2,125,811.16	$ 25,625.06	$ 5,921.23	$ 2,157,357.46	0.0580	$ 125,095.92	$ 25,436,314.00
2055	$ 2,125,811.16	$ 26,137.57	$ 5,676.42	$ 2,157,625.15	0.0537	$ 115,843.93	$ 25,552,157.94
2056	$ 2,125,811.16	$ 26,660.32	$ 5,441.74	$ 2,157,913.22	0.0497	$ 107,277.22	$ 25,659,435.16
2057	$ 2,125,811.16	$ 27,193.52	$ 5,216.76	$ 2,158,221.45	0.0460	$ 99,344.95	$ 25,758,780.10

Witness: **Eversource Panel**
Request from: **Connecticut Siting Council**

Question:
Do the First Capital Costs numbers identified in the response to question 5 dated May 23, 2017 for High-pressure Fluid Filled (HPFF) transmission neglect fluid pumping and cooling equipment for a given line because it is considered line termination equipment at the endpoints of the line (e.g. located at a substation), or are such equipment costs included in the first costs on an average per-mile basis?

Response:
The cost of pressurization plants and cooling equipment are not included as part of the First Capital Costs for these calculations. Cooling equipment is not deployed on every installation and is used only when additional capacity is needed. Pressurization plants are not included as they are associated with the stations.