Mr. Robert Stein Connecticut Siting Council 10 Franklin Square New Britain, CT 06051

Re: Docket No. 461 - CSC 461 Greenwich Substation and Line Project

Dear Mr. Stein:

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

 $\frac{Response\ to\ HD\text{-}03\ Late\ Filed\ Exhibits\ dated\ 01/14/2016}{LF\text{-}015,\ 016,\ 017,\ 018,\ 019,\ 020,\ 021,\ 022,\ 023,\ 024,\ 025}$ 

Very truly yours,

John Morissette Project Manager Siting As Agent for CL&P dba EversourceEnergy

cc: Service List

Late Filed Exhibit HD-03 Dated: 01/14/2016 Q-LF-015 Page 1 of 2

Witness: Witness Panel

Request from: Connecticut Siting Council

#### Question:

Provide a write-up of the overhead route and review the use of single circuit structures on each side of the RR with constrained conductors in place of a double circuit line.

#### **Response:**

At the request of the Council, the Company has reviewed a design to install structures on both sides of the right-of-way from the transition structures in the Metro-North parking lot just north of Cos Cob Substation to the transition structures near Steamboat Road. Near Steamboat Road the route would exit the railroad right-of-way along two separate paths. The path of the transmission line along the north side of the railroad would exit by crossing through private property to Railroad Avenue which would require an easement. The path of the transmission line along the south side of the railroad would exit onto Steamboat Road. The two paths are shown in the GoogleEarth screen shot attached.

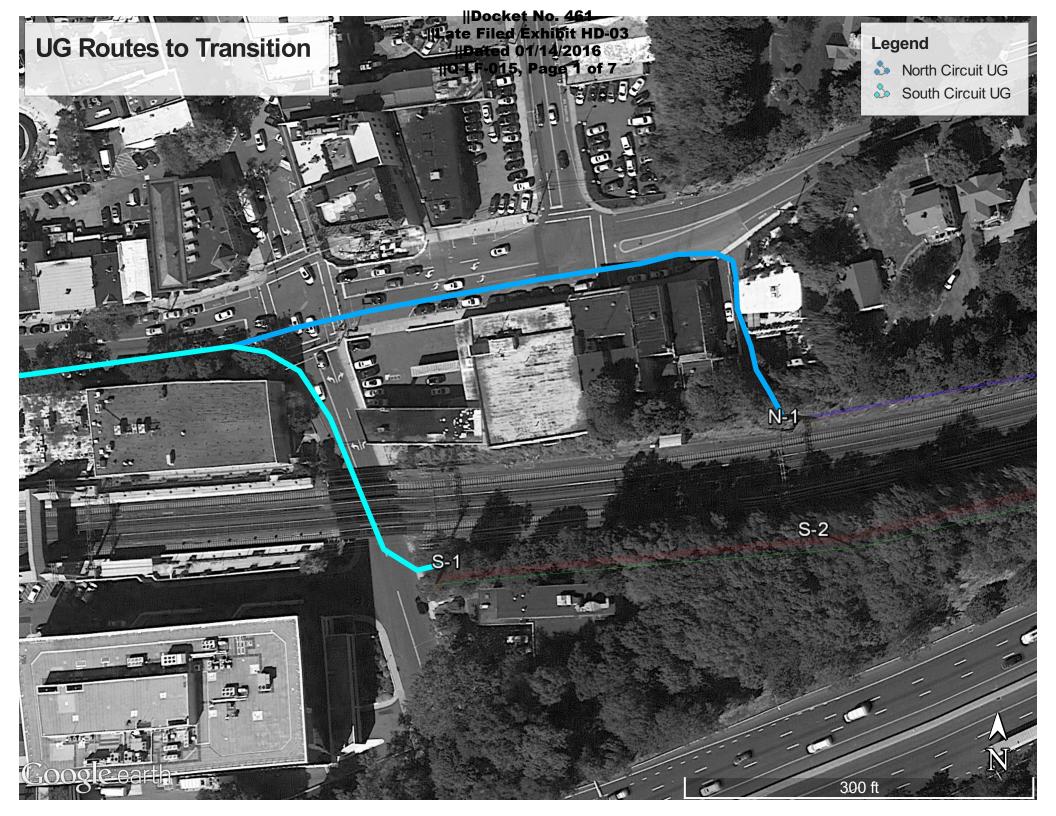
The transmission line design for the south side of the railroad is different than the design for the north side. The difference on the south side is due to the constraints between the Interstate 95 highway taking line and the railroad catenary supply lines. Therefore, some of the spans on the south side of the railroad would be longer than the spans on the north side. For the longer spans on the south side, rigid post insulators would not be used as these spans result in too much mechanical load. Accordingly, traditional insulator strings would be used instead. These longer spans do not create a concern with blowout (sway of the conductors) because this section is between the railroad and Interstate 95 where ample clearances exist.

The line along the north side of the railroad would require 22 structures. The line along the south side would require 18 structures. The design for the two lines is depicted in the attached drawings; plan and profile drawings and cross section drawings are included in the attachments. This split design would require clearing on both sides of the railroad, including the removal of vegetation that currently provides a buffer between the residential properties on Bruce Park Avenue and Circle Drive and the railroad to the south. In addition, construction of the transmission line using this split design would require approximately 50 permanent easements. In the plan and profile drawings, preliminary structure heights and cross section references are identified in the rotated text area above each structure.

This text area includes the following information in the listed formats:

S-1; sta=0+00.00	Indicates structure number and station, or distance along
	alignment
Ht=120.00; ele=23.22	Indicates Structure Height and ground elevation above mean
	sea level
Transition Monopole	Generic Structure Description
Foundation	Footing Description either directly embedded pole or concrete
	foundation
Cross Section B	Reference to illustrative cross section drawings attached
	separately

The estimated cost for this split design option would be \$57.9 million, which is \$8.7 million more than the hybrid route along only the south side of the railroad.



||Docket No. 461 ||Late Filed Exhibit HD-03 ||Dated 01/14/2016 ||Q-LF-015, Page 2 of 7 OF RIGHT-OF-WAY OF RIGHT-OF-WAY R.R. STRUCTURE EDGE EDGE **EVERSURCE ENERGY** 10' 15'-10' GREENWICH S/S AND LINE PROJECT RAILROAD SPLIT OPTION

R.O.W. CROSS SECTION — SECTION B

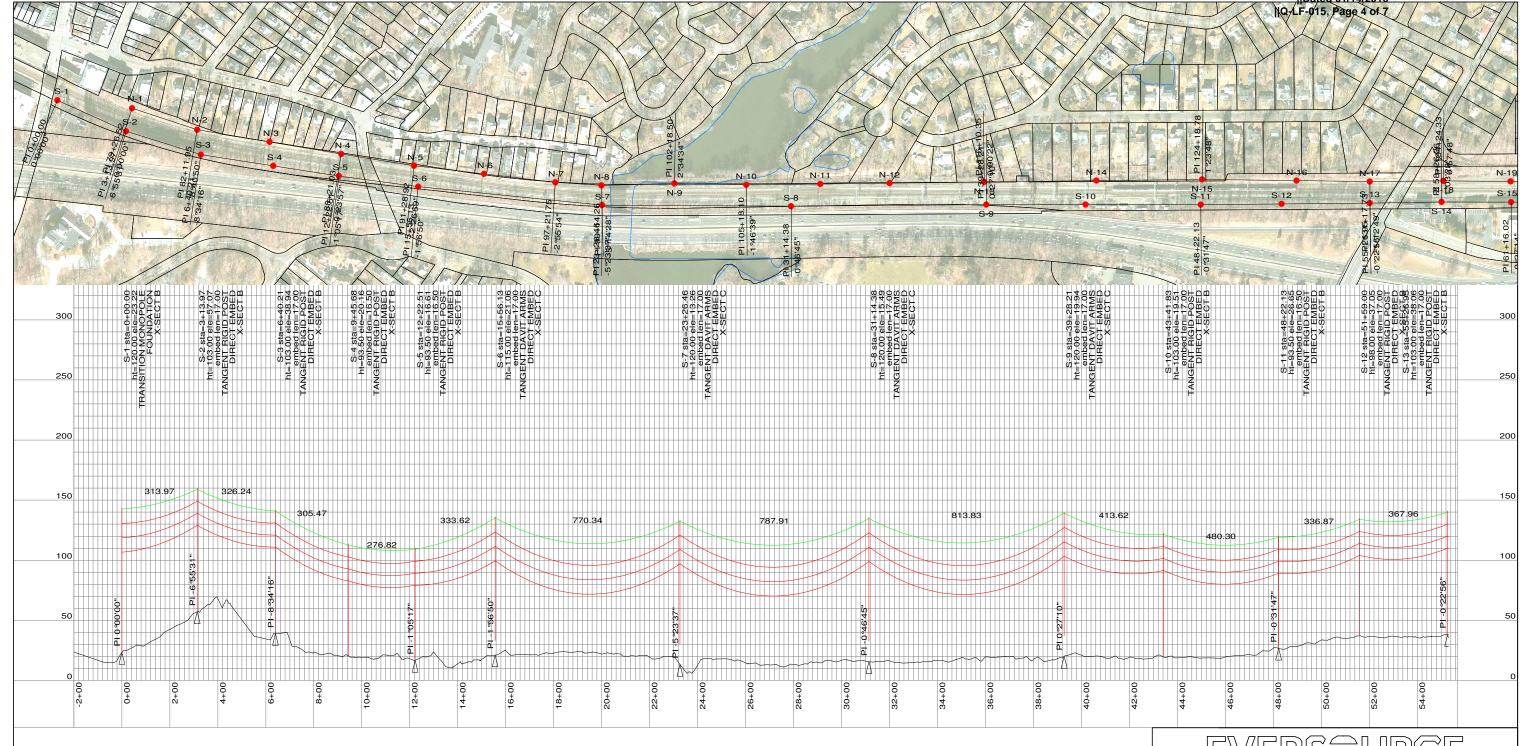
GREENWICH, CT CPS CPS 1/29/2016 FIELD BOOK & PAGES N.T.S. V-SCALE N.T.S. DWG NO. SPLIT - SECTION B 403813RA

||Docket No. 461 ||Late Filed Exhibit HD-03 ||Dated 01/14/2016 ||Q-LF-015, Page 3 of 7 95 CORRIDOR RIGHT-OF-WAY R.R. STRUCTURE INTERSTATE OF EDGE **EVERSURCE ENERGY** GREENWICH S/S AND LINE PROJECT RAILROAD SPLIT OPTION

R.O.W. CROSS SECTION — SECTION C

GREENWICH, CT 10' <del>-15'--</del> CPS CPS 1/29/2016 FIELD BOOK & PAGES N.T.S. V-SCALE N.T.S. DWG NO. SPLIT - SECTION C 403813RA

||Docket No. 461 ||Late Filed Exhibit HD-03 ||Dated 01/14/2016



### **PRELIMINARY**

PARCELS BASED ON GIS DATA
TERRAIN BASED ON PUBLICALLY AVAILABLE
DIGITAL ELEVATION MODEL
http://clear2.uconn.edu/ct\_lidar/ct\_lidar\_processed-001/index.html
AERIAL PHOTOGRAPHY BASED ON ESRI DOWNLOAD

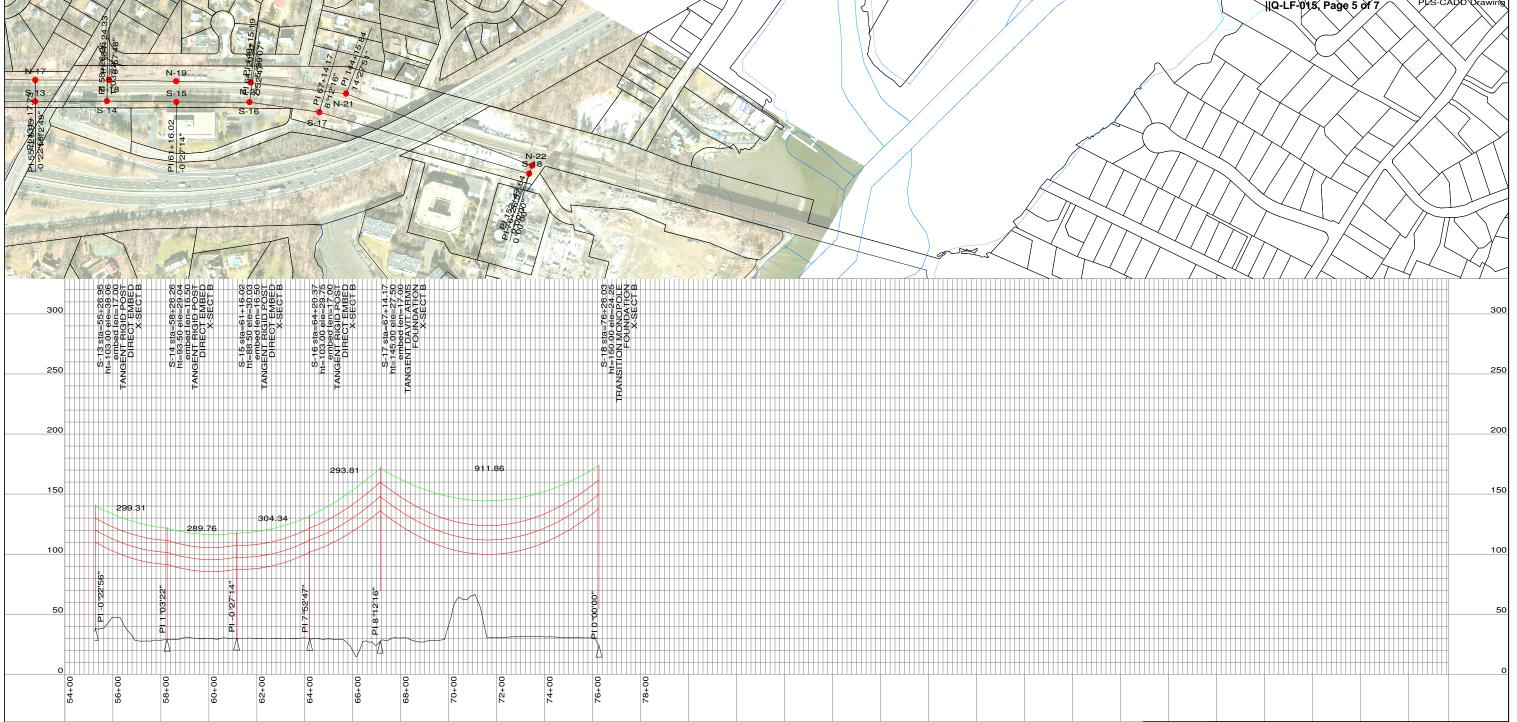


# EVERSOURCE ENERGY

GREENWICH - COS COB 115-kV TRANSMISSION LINE "RAILROAD SPLIT OPTION" PLAN & PROFILE DRAWING

BY CPS	CHKD	APP	APP
DATE 1/29/2016	DATE	DATE	DATE
H-SCALE 1":400`	SIZE B	FIELD BOOK & PAGES	
V-SCALE 1":80`	V.S.	R.E. DWG	
R.E. PROJ. NUMBER		DWG NO. GREEN	-RRSPL-PP

||Docket No. 461 ||Late Filed Exhibit HD-03 ||Dated 01/14/2016 ||Q-LF-015, Page 5 of 7



### **PRELIMINARY**

PARCELS BASED ON GIS DATA TERRAIN BASED ON PUBLICALLY AVAILABLE DIGITAL ELEVATION MODEL http://clear2.uconn.edu/ct\_lidar/ct\_lidar\_processed-001/index.html AERIAL PHOTOGRAPHY BASED ON ESRI DOWNLOAD



# EVERSOURCE

GREENWICH - COS COB 115-kV TRANSMIOSSION LINE "RAILROAD SPLIT OPTION" PLAN & PROFILE DRAWING

BY CPS	CHKD	APP	APP
DATE 1/29/2016	DATE	DATE	DATE
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V-SCALE 1":80`	V.S.	R.E. DWG	
R.E. PROJ. NUMBER		DWG NO. GREEN	-RRSPL-PP

||Docket No. 461 ||Late Filed Exhibit HD-03 ||Dated 01/14/2016 Q-LF-015, Page 6 of 7 N-18 sta=134+24.33 ht=103.00 ete=27.36 embed ten=17.00 NGENT RIGID POST DIRECT EMBED X-SECT B 200 299.14 302.88 307.89 ERS **PRELIMINARY** 

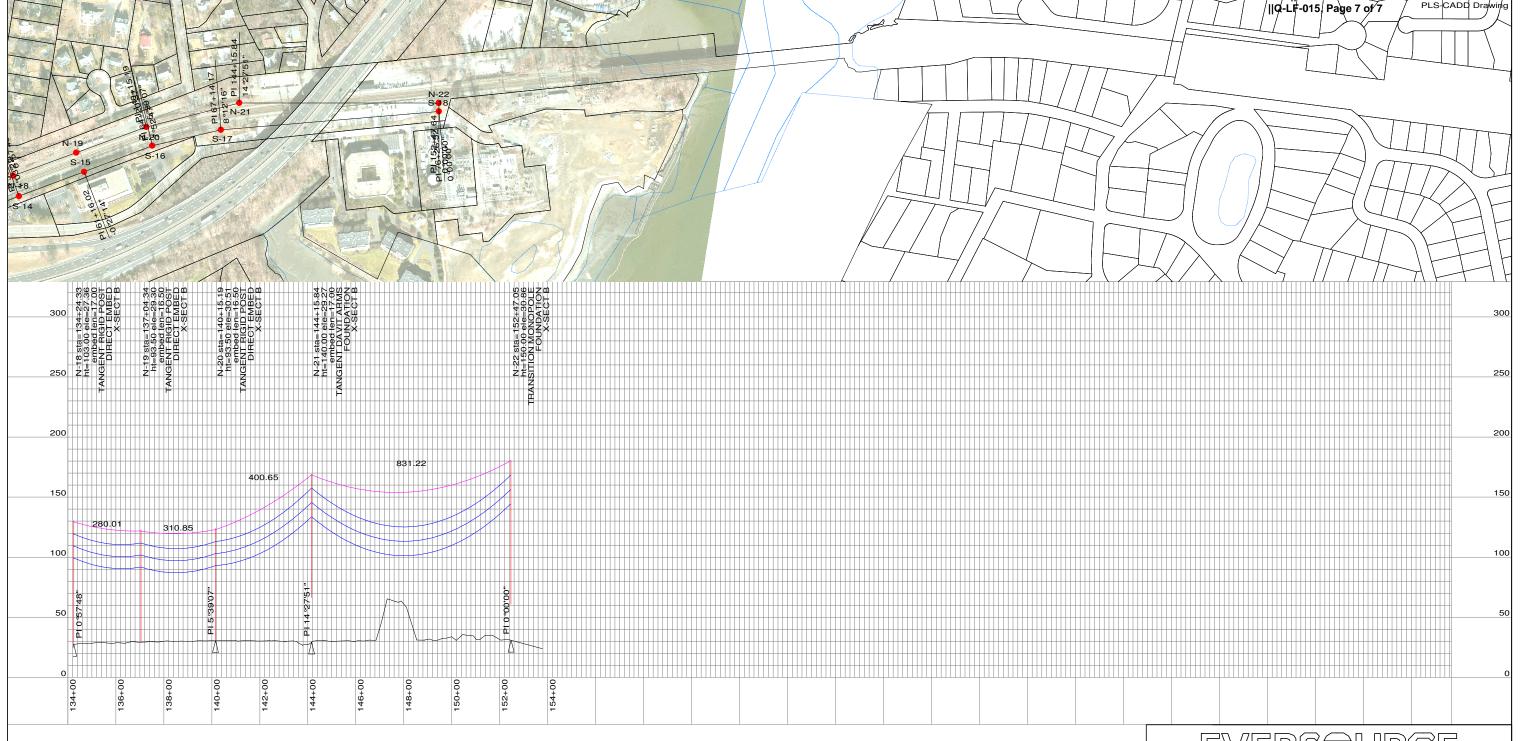
PARCELS BASED ON GIS DATA
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http://clear2.uconn.edu/ct\_lidar/ct\_lidar\_processed-001/index.html
AERIAL PHOTOGRAPHY BASED ON ESRI DOWNLOAD



GREENWICH - COS COB 115-kV TRANSMIOSSION LINE "RAILROAD SPLIT OPTION" PLAN & PROFILE DRAWING

BY CPS				
H-SCALE 1":400' SIZE B FIELD BOOK & PAGES  V-SCALE 1":80' V.S. R.E. DWG	BY CPS	CHKD	APP	APP
V-SCALE 1":80' V.S. R.E. DWG	DATE 1/29/2016	DATE	DATE	DATE
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R.E. PROJ. NUMBER DWG NO. GREEN-RRSPL-PP	V-SCALE 1":80`	V.S.	R.E. DWG	
	R.E. PROJ. NUMBER		DWG NO. GREEN	-RRSPL-PP

||Docket No. 461 ||Late Filed Exhibit HD-03 ||Dated 01/14/2016



### **PRELIMINARY**

PARCELS BASED ON GIS DATA
TERRAIN BASED ON PUBLICALLY AVAILABLE
DIGITAL ELEVATION MODEL
http://clear2.uconn.edu/ct\_lidar/ct\_lidar\_processed-001/index.html
AERIAL PHOTOGRAPHY BASED ON ESRI DOWNLOAD



## EVERSOURCE

GREENWICH - COS COB 115-kV TRANSMIOSSION LINE "RAILROAD SPLIT OPTION" PLAN & PROFILE DRAWING

BY CPS	CHKD	APP	APP
DATE 1/29/2016	DATE	DATE	DATE
H-SCALE 1":400`	SIZE B	FIELD BOOK & PAGES	
V-SCALE 1":80`	V.S.	R.E. DWG	
R.E. PROJ. NUMBER		DWG NO. GREEN	-RRSPL-PP

Late Filed Exhibit HD-03 Dated: 01/14/2016 Q-LF-016 Page 1 of 1

Witness: Witness Panel

Request from: Connecticut Siting Council

#### Question:

Provide a simple table outlining the costs of who pays for the Preferred Route and the OH variation.

#### **Response:**

Please see Attachments 1 and 2 for tables outlining the allocation of costs for the preferred route and the hybrid overhead/underground route respectively.

## Greenwich Substation and Line Project Allocation of Estimated Costs of the Preferred Project (\$ In Millions)

(A)	(B)	(C)	(D)				
Rate	Estimated Total Project Costs	Estimated Annual Revenue Requirements	% of Rate				
Distribution	\$21	\$4	% of Distribution CL&P 100.00%				
Local Network Service ("LNS")	\$107	\$16	% of LNS CL&P 60.85% Total CT 63.41% Other 36.59%				
Regional Network Service ("RNS")	\$12	\$2	% of RNS CL&P 19.409 Total CT 25.319 Other 74.699				
Sub Total	\$140	\$22					
Estima	Estimated Annual Cost to CT and Non-CT Retail Customers						

(E)=(C)*(D)	(F)=(C)*(D)	(G)=(C)*(D)
Estimated Annual Cost to CL&P Retail Customers	Estimated Annual Cost to Connecticut Retail Customers (Including CL&P)	Estimated Annual Cost to Other Non-CT Retail Customers
\$4.0	\$4.0	\$0.0
\$9.7	\$10.1	\$5.9
\$0.4	\$0.5	\$1.5
\$14.1	\$14.6	\$7.4
		\$22.0

## Greenwich Substation and Line Project Allocation of Estimated Costs of the Hybrid Overhead/Underground Route (\$ In Millions)

(A)	(B)	(C)	(D)				
Rate	Estimated Total Project Costs	Estimated Annual Revenue Requirements	% of Rate				
Distribution	\$21	\$4	% of Distribution CL&P 100.00%				
Local Network Service ("LNS")	\$85	\$13	% of LNS CL&P 60.85% Total CT 63.41% Other 36.59%				
Regional Network Service ("RNS")	\$12	\$2	% of RNS CL&P 19.40% Total CT 25.31% Other 74.69%				
Sub Total	\$118	\$19					
Estima	Estimated Annual Cost to CT and Non-CT Retail Customers						

(E)=(C)*(D)	(F)=(C)*(D)	(G)=(C)*(D)
Estimated Annual Cost to CL&P Retail Customers	Estimated Annual Cost to Connecticut Retail Customers (Including CL&P)	Estimated Annual Cost to Other Non-CT Retail Customers
\$4.0	\$4.0	\$0.0
\$7.9	\$8.2	\$4.8
\$0.4	\$0.5	\$1.5
\$12.3	\$12.7	\$6.3
		\$19.0

Late Filed Exhibit HD-03 Dated: 01/14/2016 Q-LF-017 Page 1 of 1

Witness: Witness Panel

Request from: Connecticut Siting Council

#### Question:

Provide a table comparing Towns energy efficiency participation in Greenwich, Darien, New Canaan, Stamford, Hartford, Waterbury, Danbury, New Britain, Norwalk, Bristol, Manchester, and West Hartford.

#### **Response:**

The following table provides energy efficiency participation rates (in percent) from January 1, 2010 through November 30, 2015 by town.

	Residential		
	Program	Residential Rebate	Business and Municipal
Town	Participation	Participation	Program Participation
Hartford	25.20%	0.20%	15.40%
Manchester	22.60%	1.40%	15.50%
Waterbury	20.90%	0.70%	14.00%
New Britain	18.40%	0.60%	19.00%
Bristol	15.00%	1.50%	17.10%
West Hartford	13.70%	3.40%	16.50%
New Canaan	13.00%	3.10%	7.80%
Norwalk	11.80%	1.70%	8.30%
Danbury	11.30%	2.70%	14.60%
Darien	11.20%	3.00%	10.50%
Stamford	9.90%	1.50%	12.60%
Greenwich	5.80%	1.60%	8.80%

Late Filed Exhibit HD-03 Dated: 01/14/2016 Q-LF-018 Page 1 of 1

Witness: Witness Panel

Request from: Connecticut Siting Council

#### Question:

Clarify the differences in energy numbers provided in the responses to OCC-030 and OCC-064.

#### **Response:**

The data shown on the table provided in the Company's response to Q-OCC-030 show the total kWh <u>supplied</u> by the bulk power transformers that are owned by Eversource and located in the Town of Greenwich. However, there are some Greenwich customers that are supplied by bulk power transformers owned by Eversource and located in the City of Stamford (at Cedar Heights and Waterside Substations). The customers fed by transformers in Stamford are not included in the response to OCC-030. In addition, the response to OCC-030 does not include the energy used by customers that are supplied by customer-owned transformers. In contrast, the table provided in the Company's response to Q-OCC-064 lists the total kWh usage by all Greenwich customers.

Late Filed Exhibit HD-03 Dated: 01/14/2016 Q-LF-019 Page 1 of 1

Witness: Witness Panel

Request from: Connecticut Siting Council

#### Question:

Provide details concerning the faults referenced footnote "c" in the table attached to OCC-065 that caused the switching of temporary load onto the substation.

#### Response:

Footnote "c" in the table provided in the Company's response to Q-OCC-065 refers to the peak loads of Byram Substation in 2014 and 2015.

In 2014, a temporary load transfer to Byram Substation occurred due to the failure of a manual switchgear disconnect switch at Prospect Substation. When the switch failed, the load was transferred via loop scheme to Byram Substation.

In 2015, a temporary load transfer to Byram Substation occurred due to an overload of one of the distribution feeders connected to Prospect Substation.

These load transfers would not have have occurred if the proposed Project had been constructed and the proposed facilities placed in service prior to these events.

Late Filed Exhibit HD-03 Dated: 01/14/2016 Q-LF-020 Page 1 of 1

Witness: Witness Panel

Request from: Connecticut Siting Council

#### Question:

Add 2015 numbers to the tables in responses OCC-046 and OCC-030.

#### **Response:**

Revised OCC-030 table with year 2015 data is attached. The table represents the annual usages for both the Project Area (Cos Cob 27.6 kV) and for the Forecast Area.

Revised table OCC-046 with year 2015 data for Eversource in Connecticut.

	Connecticut Electric Actual Annual Calendar Sales - Eversource						
			MWH				
Year	Year Residential Commercial Industrial						
2010	10,196,086	9,716,200	2,467,288				
2011	10,092,687	9,524,740	2,413,631				
2012	9,977,975	9,414,412	2,425,907				
2013	10,313,528	9,482,894	2,319,835				
2014	10,025,847	9,378,287	2,376,675				
2015	10,094,057	9,372,146	2,341,962				

	Annual substation usage in kWhrs:								
Substation	Substation kV 2010 2011 2012 2013 2014 2015								
Cedar Heights	13.2	252,538,354	260,944,592	254,762,596	257,755,708	253,326,890	256,114,310		
Compo	13.8	164,342,208	167,467,549	164,377,521	152,834,074	137,954,214	102,809,653		
Cos Cob 13.2kV	13.2	78,876,428	97,949,602	60,304,797	92,810,721	96,711,098	96,009,760		
Cos Cob 27.6kV	27.6	202,277,230	478,812,970	464,887,551	475,093,662	470,489,183	457,879,975		
Darien	13.2	220,102,426	225,712,211	221,916,108	228,480,872	228,330,012	230,296,859		
Flax Hill	27.6	0	7,789,511	177,817,056	189,487,160	120,516,185	718,525		
Flax Hill	13.8	187,743,289	202,163,592	156,631,445	23,995,516	204,911,412	<sup>a</sup> 165,500,893		
Glenbrook	13.2	442,448,193	452,708,021	340,942,253	315,285,263	327,750,141	316,085,301		
Norwalk	13.8	211,989,009	248,893,934	171,125,847	214,140,754	250,119,159	245,057,210		
Norwalk	27.6	424,143,475	391,927,586	373,042,507	365,591,958	296,691,258	308,624,152		
Norwalk	4.8	22,780,354	21,849,941	21,018,911	21,018,911	20,113,730	22,561,088		
Peaceable	13.8	117,227,086	116,230,728	113,594,216	118,980,388	96,008,094	61,002,282		
Sherwood	13.8	0	0	264,830	13,663,592	69,500,054	136,495,527		
South End	13.2	416,524,653	406,507,510	400,473,716	412,733,007	525,197,607	515,644,436		
Tomac	27.6	155,018,137	125,598,885	129,840,849	139,940,888	129,800,102	129,558,666		
Waterside	13.2	251,323,803	371,253,751	425,073,552	443,615,310	434,111,092	446,008,374		
Weston	27.6	162,636,532	163,201,827	157,677,129	161,737,855	141,921,015	92,233,182		
Wilton	13.8	315,304,621	319,181,060	308,149,151	343,256,474	395,852,198	393,270,007		

#### Notes:

- a) No data collected between November and December, 2015
- b) The lower amount in usage in 2010 is attributed to a substation upgrade project that resulted in the meters not communicating properly due to the multiple open breakers during the project, which affected the data collecting of the meters.

Late Filed Exhibit HD-03 Dated: 01/14/2016 Q-LF-021 Page 1 of 2

Witness: Witness Panel

Request from: Connecticut Siting Council

#### Question:

Review feeding North Greenwich Substation from Cedar Heights Substation at 27.6 kV.

#### **Response:**

To feed North Greenwich Substation transformers from Cedar Heights Substation at 27.6 kV with a capacity of 50 MVA, the transmission and distribution systems at Cedar Heights Substation would require significant modifications. Those modifications are explained below, along with their approximate costs. The total cost of this proposal is approximately \$202 million, \$62 million more than the Proposed Project, and would achieve only a small portion of the benefits that would be realized from the Proposed Project.

• Upgrade two transmission cables:

Replace HPFF cable in existing pipe for the two parallel underground transmission lines from Glenbrook to Cedar Heights substations, approximately 4.9 miles, to increase the long-term emergency rating from 103 MVA to 138 MVA (in order to increase available capacity to a total of 50 MVA) on each cable. The estimated total cost of this work would be \$44 million and include the following components:

- Inspect existing 12 vaults and steel pipes
- Drain out the high pressure fluids from the system
- Remove the existing cable (500 kcmil copper)
- Repair and upgrade the existing vaults and steel pipes if necessary
- Install the new cable (1000 kcmil copper)
- Replace the potheads at Glenbrook and Cedar Heights Substations
- Refurbish pump house at the Glenbrook Substation
- Cedar Heights Substation work would cost about \$13 million and include the following components:
  - Extend 115-kV bus and add support structures
  - Add two 115- to 27.6-kV 60 MVA transformers and associated disconnect switches
  - Add 27.6-kV bus and cables from the transformers to the switchgear
  - Add Double Bus switchgear
  - Add additional station service for transformer cooling and switchgear
  - Expand the substation yard, which would include cutting into the hill and building retaining walls

- Add distribution feeders from Cedar Heights Substation to North Greenwich Substation, which would cost approximately \$137 million and include the following components:
  - Install ten miles (the approximate distance between the 2 substations) of duct bank
  - Install three feeder cables one cable per transformer, which equates to 30 circuit miles in total
  - Install extra manholes due to very winding road configuration
- Prospect Substation work would cost about \$8 to \$12 million and include the following components:
  - Upgrade transformers
  - Replace switchgear

The Prospect Substation work would be required in this scenario because this proposal would not achieve any reduction in load at Prospect Substation. Consequently, the Prospect Substation work is included in the total cost of this proposal. These modifications would cost approximately \$202 million in total, substantially more than the Proposed Project (approximately \$62 million more) and only provide 50 MVA of additional capacity. Further, these modifications would not address the feeder capacity issues. Additionally, these modifications would not provide the same reliability benefits as the Proposed Project.

Late Filed Exhibit HD-03 Dated: 01/14/2016 Q-LF-022 Page 1 of 1

Witness: Witness Panel

Request from: Connecticut Siting Council

#### Question:

Identify the interrogatory response that lists the distances for the Greenwich area substations

#### **Response:**

In response to a question from the OCC (Tr. 1/21/16 p. 115) about how far away North Greenwich Substation is from the proposed substation, Mr. Bowes mentioned that there was a previously filed interrogatory response. Eversource filed a table with direct geographical straight line distances from various substations to Prospect Substation in the response to Q-OCC-016, which is repeated below. Note that the proposed Greenwich Substation site is located next to the Prospect Substation.

Substations		
From	to	Miles
Byram		1.19
Cos Cob		1.84
Mianus		2.71
Tomac	D	3.74
Waterside	Prospect	4.22
North		5.12
Greenwich		
South End		5.31
Glenbrook		6.52
Cedar Heights		7.15

Late Filed Exhibit HD-03 Dated: 01/14/2016 Q-LF-023 Page 1 of 1

Witness: Witness Panel

Request from: Connecticut Siting Council

#### Question:

Provide a schematic of the OH segments in LF-3.

#### **Response:**

Please see the attached plan and profile drawings and cross section drawings that depict the overhead segments in the Company's response in Q-LF-03.

In the plan and profile drawings, preliminary structure heights and cross section references are identified in the rotated text area above each structure.

This text area includes the following information in the listed formats:

1 sta=0+00.01	Indicates structure number and station, or distance along alignment	
Ht=120.00 ele=23.22	Indicates Structure Height and ground elevation above mean sea	
	level	
Transition Poles	Generic Structure Description	
2 Foundations	Footing Description either directly embedded pole or concrete	
	foundation	
Cross Section A	Reference to illustrative cross section drawings attached separately	

Late Filed Exhibit HD-03 Dated: 01/14/2016 Q-LF-024 Page 1 of 1

Witness: Witness Panel

Request from: Connecticut Siting Council

#### Question:

Identify the interrogatory response where it lists how many times Cos Cob SS has gone down in the last 5 years.

#### **Response:**

The Company's response to Q-OCC-042 provides information on the July 2015 failures of feeders from Cos Cob Substation ("Cos Cob Substation feeders"); however, these failures did not impact customers. In order to avoid customer outages, the Cos Cob Substation feeders that remained in service were operated over their normal ratings.

Customers served from Cos Cob Substation were impacted twice since 2011 due to problems occurring at Cos Cob Substation and Cos Cob Substation feeders.

- During June 2011, North Greenwich Substation lost its power supply source due to Cos Cob Substation feeder faults. A total of 5,100 customers were impacted and without power. Additional load shedding was needed to relieve load on the Cos Cob Substation feeders that remained in service. During this event customers were impacted from 75 minutes to 18 hours.
- During October 2011, due to an animal contact a fault occurred on the Cos Cob Substation 27.6-kV bus causing the loss of the three 27.6-kV power transformers. All customers fed by Cos Cob Substation's 27.6-kV system were impacted including the Greenwich secondary network, North Greenwich, Prospect and Byram substations. The outage ranged from 1 hour to 2.5 hours.

In addition, customers served from Cos Cob Substation were affected by transmission supply line outages during November 2011 (customer outages ranged from 1 hour and 14 minutes to 2 hours and 25 minutes) and August 2012 (customer outages ranged from 4 hours and 22 minutes to 8 hours and 50 minutes). The loss of the transmission supply lines also impacted Greenwich customers fed from Tomac Substation.

Late Filed Exhibit HD-03 Dated: 01/14/2016 Q-LF-025 Page 1 of 1

Witness: Witness Panel

Request from: Connecticut Siting Council

#### Question:

Provide the structure heights in the photo simulations.

#### **Response:**

Attached are the photo simulations with structure heights.

Photo Location

Proposed Overhead Route

































































PHOTO LOCATION ORIENTATION

6 EVERSOURCE RIGHT OF WAY NORTHEAST







PHOTO LOCATION ORIENTATION

6 EVERSOURCE RIGHT OF WAY NORTHEAST















PHOTO LOCATION ORIENTATION

7 COS COB PARK WEST



















